The Opportunities We Cannot Forgo: economic consequences of population changes in Brazil *

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Abstract

During the last few decades, Brazil has witnessed impressive demographic changes. From a young quasi-stable age structure in 1970, the age distribution has gradually shifted to an older distribution. The transformation in the age structure of the population can have important impacts on the economic growth. Mason and Lee (Forthcoming) show how the rise in the share of working age population and individual response to demographic changes lead to two demographic dividends. This paper estimates demographic dividends in Brazil. We show that demographic changes have positive impacts on the economic growth, but lack of investments in human capital and poor institutions led to a smaller growth than what the demographic dividends would predict.

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1 Introduction

Bloom, Canning, and Sevilla (2003) summarize the effects of demographic change on economic growth by the views of three main groups. The pessimistic view argued that population growth would slow down economic development and harm the future of the population. Both economic theory, stressing the importance of technology and productivity growth, and empirical evidence did not support this view. On the opposite side, Optimists argued that population growth would act as an asset to economic growth. And a third group, supported the view that economic growth is independent of population dynamics (Kelley 2001). These three views concentrated on the relation between population and economic growth, paying less attention to the impacts of age structure [1].

The consequences of population change, in particular age structure, have regained interest in recent years (Cutler, Poterba, Sheiner, Summers, and Akerlof 1990; Bloom, Canning, and Sevilla 2003). Demographers and economists alike are interested in examining the extent to which interactions between population age structure and both fertility and mortality declines yield economic development and growth (Bloom, Canning, and Sevilla 2001). This process, usually called demographic dividend or demographic bonus, has been recently presented as a combination of two separate dividends (Mason and Lee Forthcoming). The first dividend is usually related to a temporary increase in the share of the population that is of working age and can be effectively measured by increases in the ratio of producers to consumers in the population (Mason 2005). The second dividend, which has gone virtually unnoticed among most scholars, comes in succession to the first dividend and is related to the creation of wealth that arises in response to population aging. The magnitude of this effect depends largely on how wealth is created (Mason 2005). Rapid capital accumulation or larger transfers from younger generations, private and public, can meet consumption demands of an increasing elderly population. Only in societies where capital-deepening prevails will the effects of population aging ultimately increase the output per effective consumer (Lee, Mason, and Miller 2003).

Unfortunately, the demographic dividends are not automatic and depend

[1] The debate population growth and economic development dates back to Malthus (1798). Boserup (1981) developed a model showing positive impacts of population growth on economic development. Coale and Hoover (1958) is the first major effort analyzing the impacts of age structure changes in developing economies.

on institutions and policies to transform changes in population age structure into economic growth (Bloom and Canning 2001; Bloom and Canning 2004). For example, it is fundamental that the labor market creates enough opportunities for the growing working age population, and that a developed financial market exists to fulfill individual's willingness to save (Mason 2005). Therefore, it comes as no surprise that some emerging economies that could benefit substantially from the demographic transition are also the ones that are more likely to fail in taking advantage of this process (Mason 2005).

Despite unabated interest among researchers in issues pertaining to macroeconomic consequences of population aging in developed countries, little is known about these issues in emerging economies. Brazil is one example of an important context for elaborating linkages between economic and population changes that has not been fully examined yet. Brazil has been characterized by rapid demographic changes (de Carvalho and Wong 1999), such as rapid fertility decline and improvements in life expectancy (Figure 1). From a young quasi-stable age distribution in 1970, the distribution has been gradually shifting to an older one. This transition in age structure implies in rapid growth of the working age population until 2045, from which the first dividend arises (Wong and de Carvalho 2005). Indeed, in a recent analysis, Rios-Neto (2004), using income data from Brazilian municipalities, shows that the association between working age population growth and income growth was positive and significant during the period 1991-2000. Yet, we expect that income growth would be greater if Brazil had stronger institutions, macroeconomic stability and more appropriate policies in place. Unfortunately, there are strong forces promoting stagnation (Pritchett 1997).

Since 1980 the economy has been stagnant, with an annual growth rate of 2.17%, compared to a strong average annual rate of 7.5% in 1950-1980. Indeed, the years between 1980 and 1993 were characterized by macroeconomic instability and successive attempts to combat high inflation rates. It was only in 1994 that a successful economic plan consolidated price stability. In recent years, several other factors have jeopardized economic growth and put at risk the demographic dividends. First, the rising ratios of public debt as a share of GDP (56% in 2002) have reduced the fiscal capability of the public sector to invest in human capital. At the same time, large public transfers to the elderly that have been recently documented in Brazil (Turra and Rios-Neto 2001), may represent an extra burden for future working age populations, reducing the ability and willingness of workers to save for future consumption. Third, income inequality has been persistent over the past few

decades. Brazil has a much higher Gini coefficient (0.6) than the average coefficient for Latin America (0.4), and despite some improvements in educational attainment (Saboia 1998), educational levels remain remarkably low. Finally, the labor market has not been able to absorb the growing working age population. During the last two decades unemployment and informality rates have increased (Table 1).

Despite the growing interest in this area, we are not aware of any study aiming to quantify the demographic dividends and to explain possible reasons for the inability to exploit the dividends in Brazil. In an influential study, de Carvalho and Wong (1999) pointed out the need for policy makers to respond ahead of time in order to benefit from increases in working age population. Turra and Rios-Neto (2001) demonstrate that fiscal gains from demographic changes are transitory and may not last long given current public policies. Turra and Queiroz (2005a) show how the absence of appropriate policies mitigate temporary benefits of population change, and aggravate adverse effects of population aging, in the case of the Brazilian social security system. In this paper, we contribute to the debate by providing a detailed study of macroeconomic consequences of population changes in Brazil. First, we estimate the size of the two demographic dividends and the gap between potential and observed economic growth. We then take advantage of simulations to shed light on the role played by the stagnation forces on the estimated gap. Next, by looking into the future, we project the second dividend and estimate the potential economic growth under different scenarios of savings and public transfers.

2 Demographic Dividends

The first dividend arises and dissipates as changes in age structure interact with the lifecycle of production and consumption (Mason 2005; Mason and Lee Forthcoming). The first dividend is related to a temporary increase in the share of the working age population and can be effectively measured by increases in the ratio of producers to consumers in the population. In this sense, it measures increases in income due to the growth of working age population. The first dividend is temporary and not always positive. As population ages and the share of the elderly grows faster than the working age group, output growth will be depressed.

The second dividend comes in succession to the first dividend and is

related to the creation of wealth that arises in response to population aging (Mason and Lee Forthcoming; Mason 2005). With rising elderly population, consumption in the future can only be maintained by accumulating capital or transfer wealth (Lee 1994). The accumulation of capital also influences economic growth, whereas transfers do not. It is important to note, however, that accumulation of capital does not need to be as high as when working age population is growing at rapid rates. Since there are fewer number of effective producers, the amount of capital necessary to keep capital-labor ratio constant is reduced.

We follow Mason and Lee (Forthcoming) to formalize the demographic dividends. According to the authors, output per effective consumer can be expressed by Equation 1:

$$\frac{Y_t}{N_t} = \frac{L_t}{N_t} * \frac{Y_t}{L_t} \tag{1}$$

where Y_t is the total output, N_t is the effective number of producers, and L_t is the effective number of consumers. The effective number of producers is the population weighted by the age income profile, and the effective number of consumers is the population weighted by the age consumption profile (Cutler, Poterba, Sheiner, Summers, and Akerlof 1990; Mason 2005). The support ratio is given by the ratio of effective producers (N_t) to the number of effective consumers (L_t).

By taking the natural log of both sides of Equation 1 and deriving it in respect to time, Mason and Lee (Forthcoming) obtain rates of growth (Equation 2):

$$\dot{y}_t = \dot{L}_t - \dot{N}_t + \dot{y}_t^l \tag{2}$$

Therefore, the rate of growth in output per effective consumer is equal to the sum of two components: the rate of growth of the support ratio (i.e. the first dividend), and the rate of growth of productivity, that reflects the second dividend (Mason 2005).

The second dividend is different the first in one main point: it is not transitory since capital deepening has permanent effect on income. However, they share an important similarity: both depend on institutions and policies to be realized (Mason and Lee Forthcoming; Bloom and Canning 2001).

3 Data and Methods

Mason (2005) uses consumption profiles for the USA, in 2000, and Taiwan, in 1998, to quantify the two demographic dividends in developed and developing countries. Mason assumes that the cross-sectional consumption and income profiles are constant during the period of analysis, for all countries. This assumption ignores how socioeconomic development might have affected the patterns of income and consumption, which might be important in an emerging economy such as Brazil. Also, Mason does not take into account how demographic changes might have affected the arrangements of intergenerational transfers (Preston 1984), nor how the expansion of public programs (i.e. public education and social security) might have affected the patterns of consumption (Becker and Murphy 1988). We use detailed information on consumption and labor income from 1970 to 2000 to estimate the demographic dividends in Brazil. By using a longer series of data we will capture how the economic, demographic, institutional and political spheres affect income and consumption age profiles.

3.1 Income Profile

We use data from the *Pesquisa Nacional por Amostra de Domicilio* (PNAD) to estimate age profiles of income. The PNAD is a nationally representative stratified random sample of the Brazilian population collected annually since 1971. The PNAD contains a comprehensive and comparable set of demographic and socioeconomic variables, including detailed information on employment status, occupation, income and education for all members of the household.

Information on labor earnings is collected for all individuals ages 10 and older who worked for pay during the survey's reference week. Labor earnings are self-reported and include income before taxes from all jobs held during the reference week as well as the value of fringe benefits. To estimate labor earnings we include both employment and self-employment income. For self-employed individuals, we assume that 2/3 of their earnings is labor income and 1/3 is return to capital (Lee and Mason 2004).

3.2 Consumption Profile

We make extensive use of four different Brazilian Consumer Expenditure Surveys to estimate age profiles of consumption (1974 Endef, 1996 PPV , and 1986 and 2002 POF's). These surveys contain a comprehensive and comparable set of demographic and economic variables, including detailed information on household budget and expenditures.

To estimate age profiles of consumption we apply different rules depending on how data on expenditures were collected in the survey (i.e. individual or household data). We directly draw out-of-pocket expenditures on education and health from the survey, information which all respondents reported. Expenditures on cigarettes are allocated proportionally among adults aged 15 and older in the household. Expenditures on children and adult apparel are distributed proportionally among persons between ages 0 and 15 and persons aged 15 and over, respectively. Residuals expenditures are allocated by age using an *ad hoc* allocation rule. Consumption of individuals living within any household is assumed to be proportional to an equivalence scale that is equal 1 for adults aged 20 and above, declines linearly from age 20 to 0.4 at age 4, and for those age 4 and younger is constant at 0.4 (Lee and Mason 2004). Following the Lee transfer framework (Lee 1994), the age consumption profile also includes: the mean value of public consumption by age(e.g. public education and health), and the value of services provided by consumer durables and housing, which are allocated by age using the same allocation rule described above.

3.3 Demographic Variables

We use mortality and fertility estimates (actual and projected) in our population projections from the Population Division of the United Nations and the Brazilian Statistics Agency (IBGE). We project the population of 1970 using the cohort-component method of projection in five-year intervals of time and age (Preston, Heuveline, and Guillot 2001). To capture the full effects of demographic transition, we end the projection period in the year 2045. Actual demographic rates are used from 1970 to 2000, whereas projected rates are applied in the period 2000-2045.

4 Preliminary Results

In assessing the impacts of demographic change on the Brazilian economy, it is important to start by examining the broad features of economic dependency. Usually, youth and old-age dependency ratios are used to describe the trends in the economic lifecycle (Figure 1). However, income and consumption age profiles provide a more detailed and richer information about the lifecycle and economic dependency. Figure 2 depicts income and consumption age profiles pattern in Brazil estimated by Turra (2000). The results show that the lifecycle pattern in Brazil is quite similar to patterns found in developed nations (Lee 2003a). Like in most developed nations today, where retirement emerges as an important stage of the lifecycle, the old-age dependency starts around age 60 in Brazil. On the other hand, youth dependency ends at about age 20. As Mason (2005) points out, the age profiles imply a gradation of dependency. For example, those aged 70 and over are more economically dependent than those aged 60-69, and children age 0-9 are more dependent than those aged 10-19.

Figure 3 presents the support ratio and the first dividend. These preliminary results were estimated using Brazilian profiles for 1996. We assume that the cross-sectional profiles are fixed during the whole period. The two vertical lines indicate when the support ratio crosses 1.0 (in 1995) and when the growth rate of the support ratio turns negative (i.e. the first dividend equals to zero), in 2020. The support ratio is less than 1.0 until 1990. High fertility rates and declining infant and child mortality led to a larger proportion of children causing the low support ratio. Gradually we observe improvements in the support ratio because of the fertility decline since 1970s and the consequent increase in working age population (Figure 1). The support ratio reaches its peak in 2015 (1.127), accumulating an increase of about 25% from 1970 to 2015. During this period the economy should have grown 0.6% per year on average due to the first dividend. The effects of population aging are already observed after 2000, when the first dividend starts to increase at lower rates, but they are more evident after 2020 when support ratio start to decline until goes below 1.0 in 2045.

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Variable	1976	1981	1985	1996	2003
GDP per Capita (U$ 2003)	2577	2808	2875	3157	3212
Annual Inflation Rate (%)	46.2	95.20	235.13	9.33	7.66
Unemployment Rate(%)	1.82	4.26	3.38	9.95	5.24
Average Years Schooling	3.23	3.9	4.3	5.4	6.3
Formal Employment Rate (%)	57	41	39	55	58
Gini Index	0.62	0.58	0.59	0.60	0.58
Economic Growth (a.a.%)	10.26	-4.25	7.85	2.66	0.54

Source: Ferreira and de Barros (1999) and Ipeadata, 2005

Table 1: General Economic Indicators, Brazil, 1976-2003 (selected years)

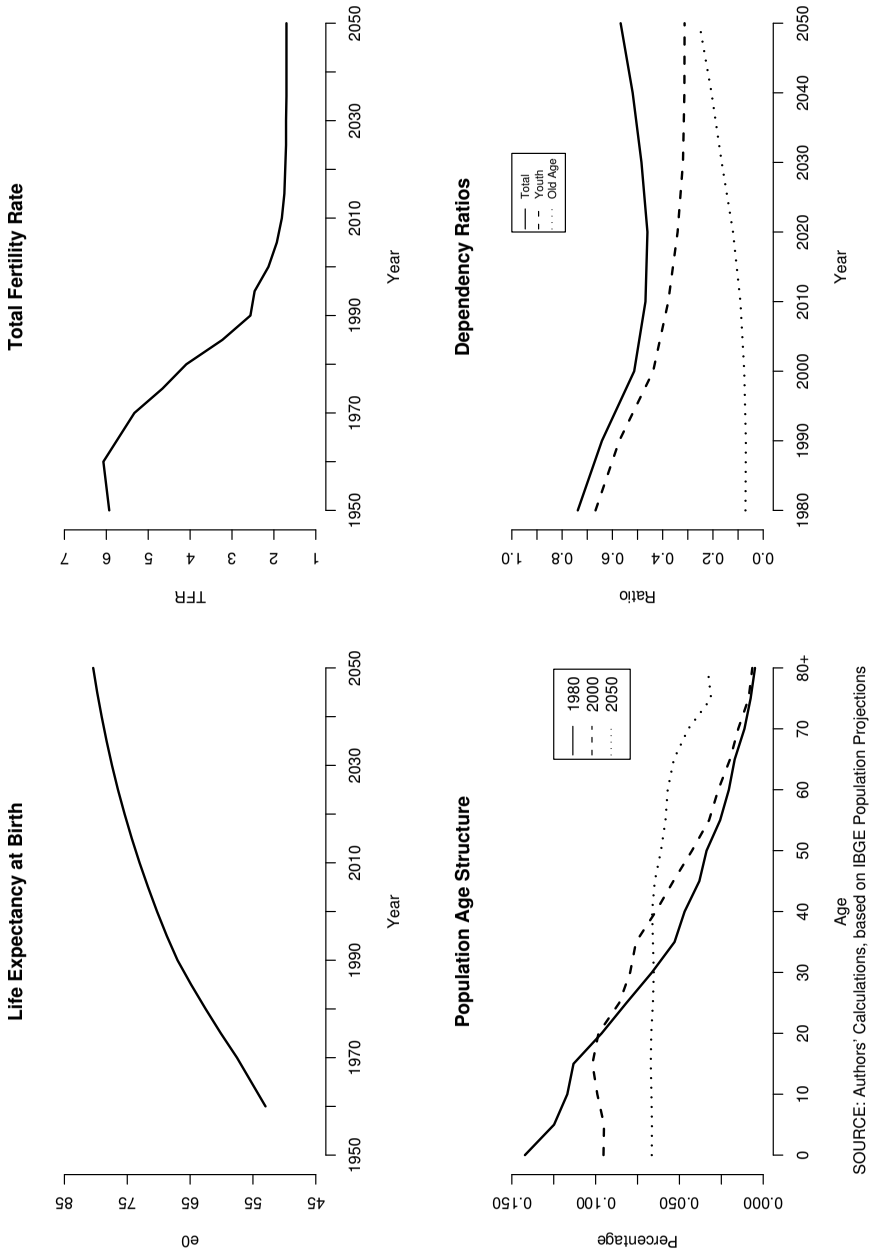

Figure 1: Demographic Transition in Brazil, 1950-2050

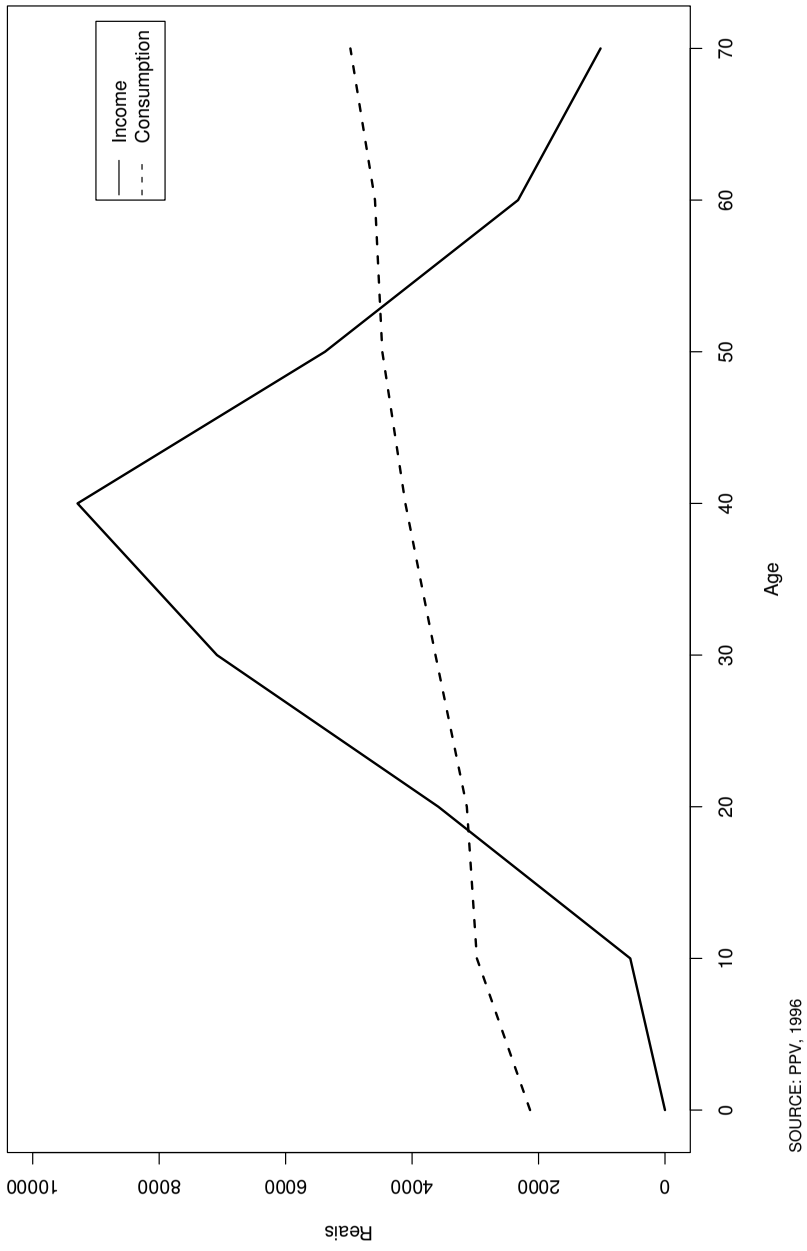

Figure 2: Income and Consumption Age Profiles, Brazil, 1996

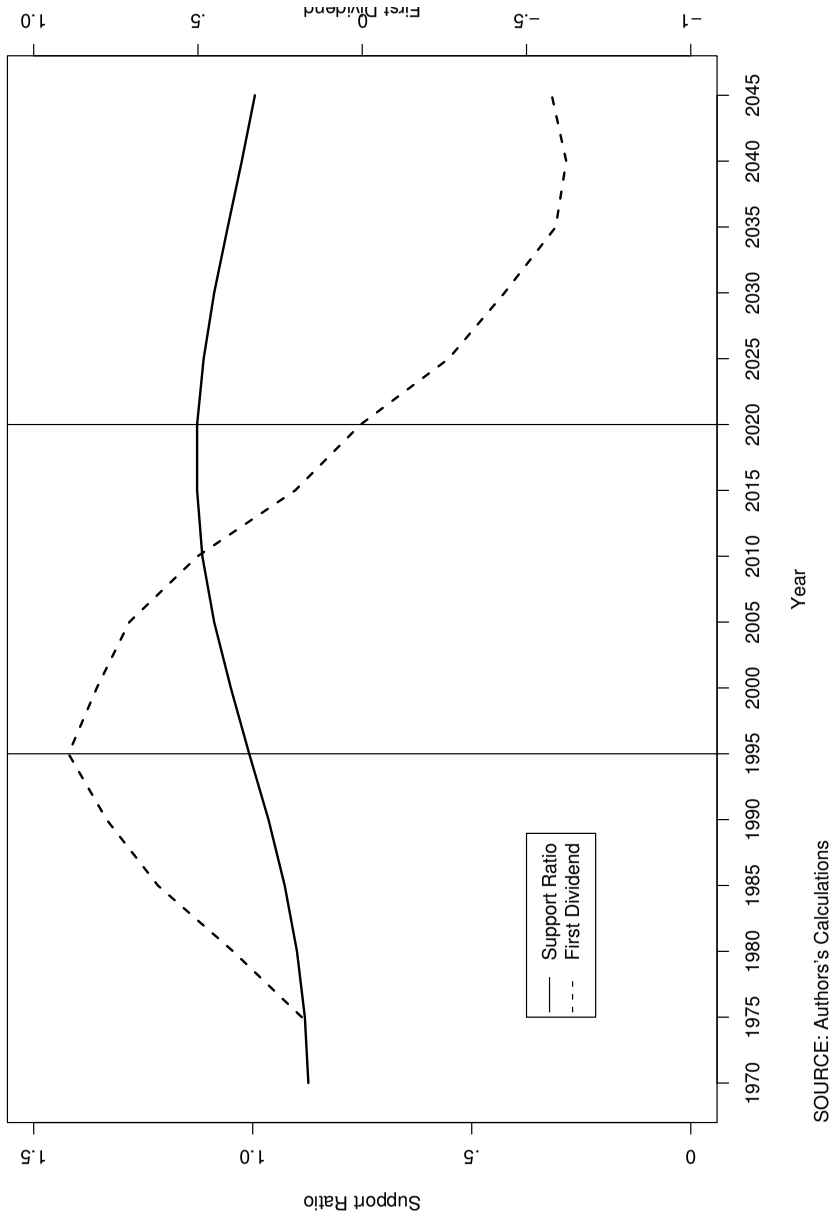

Figure 3: Support Ratio and First Demographic Dividend, Brazil, 1970-2045