The role of the demographic transition to changes in income distribution in Brazil[1]

Simone Wajnman[2]

Cassio Turra[3]

Abstract

Brazil is among the 30% wealthiest economies in the world, measured by its per capita income. Yet, about one third of the Brazilian population is below the poverty line. Fortunately, in the last decade, poverty rates have been declining mainly because of more equal income distribution in a context of better macroeconomic conditions. Nonetheless, other factors responsible for these improvements need to be examined more systematically, including demographic changes. Considering the rapid demographic transition, one should expect large effects on social and economic measures from changes in population composition. In this article, we examine how changes in the age and sex composition of adults have affected income inequality measures in Brazil. We use a counterfactual micro-simulation model to disentangle each one of these effects during two time periods that were characterized by important economic and demographic changes.

[1] Paper presented at the "IV Congreso de la Asociación Latinoamericana de Población", Havana, Cuba, 16 - 19 November, 2010.
[2] Associate Professor, Department of Demography and Cedeplar, UFMG, Brazil, wajnman@cedeplar.ufmg.br
[3] Associate Professor, Department of Demography and Cedeplar, UFMG, Brazil, turra@cedeplar.ufmg.br

Introduction

Brazil is among the 30% wealthiest economies in the world, measured by its per capita income. Yet, about one third of the Brazilian population remained below the poverty line in the beginning of this decade (Barros et al. 2006). Whereas the prevalence of poverty is still high, there has been a substantive decline in extreme poverty during the current decade (about 5 percentage points, between 2000 and 2008), and the proportion of the extreme poor (about 4%) is now significantly lower in Brazil than in many other developing countries. Because of these improvements, the first of the Millennium Goals established by the United Nations was adapted in the Brazilian case, becoming more ambitious: instead of reducing extreme poverty rate by half of the 1990 level, the current goal is to reduce it to one quarter.

There is a high correlation between poverty rates and income inequality in Brazil. The 10% richest of the Brazilian population accounts for about 45% of the total income (Barros et al. 2006) and thus, policies that improve the income distribution are key to reduce poverty (Barros, Henriques e Mendonça, 2001). Accordingly, in the last century, despite the large increase in the GDP per capita (from US$1.8M in 1950 to 6.7M in 2000), the persistency of income inequality (the 2000 Gini coefficient of 0.593 was close to the historical average) has prevented significant declines of poverty rates in Brazil. It was only in the last decade that we saw a steady decline in inequality level, and, as a consequence, a substantive reduction in poverty. Between 2001 and 2008, while the Gini coefficient declined from 0.596 to 0.545, the per capita income of the 10% poorest grew by 7% per year, almost three times faster than the national average (Barros, 2009).

Several reasons explain the current pattern. First, the set of measures taken in the 1990 decade to stabilize the Brazilian economy that kept inflation under control with positive effects for wages, mainly for the poorer. Second, the policy of minimum wage increases which has had favored low-wage workers and beneficiaries of the social security system.

Finally, since the last two decades, the development and expansion of two large cash transfer programs: *bolsa familia* directed to poor families, particularly those with school age children and the *BPC-LOAS*, the non-contributory pension system in Brazil that extended coverage to elderly unable to fulfill the usual contribution criteria.

The demographic changes have been also responsible for poverty alleviation, since they have reduced family size and the dependency ratio within the families, through increases in the relative number of adults (Hailu e Soares, 2009). Nonetheless, we still have to learn more about how these demographics effects are associated to inequality measures trends. To do that, in this article, we examine how changes in the households' age composition over the last 23 years affected income inequality in Brazil. We use a counterfactual micro-simulation model developed by IPEA (2006) to disentangle each one of the demographic effects analyzing three distinct periods: 1985-1993, 1993-2001, and 2001-2008, which cover a good range of the process of demographic transition in Brazil and different scenarios of the social policy and the macroeconomic parameters. The first period (1985-1993) has been characterized by the Brazilian literature on income distribution as an "unacceptable stability" of poverty and inequality levels. The second one (1993-2001) comprehend the initial effects of the stabilization program eliminating inflation (Plano REAL), which started to reduce poverty and inequality measures. Finally, the third period (2001-2008) was marked by the steady and strong decline in inequality.

Demographic Factors in the Analysis of Income Inequality and Poverty Rates

It is noteworthy that, as in many other developing countries, the demographic transition started late in Brazil (early 1950s), but once it started, mortality and fertility rates changed very fast. Over four decades, total fertility rate had declined from about 6 to 2 children per women and life expectancy at birth increased by 25 years. In this context of rapidly

demographic transition, one should expect large effects on social and economic measures from changes in population composition.

The role played by demographic compositional effects on per capita family income inequality and poverty rates can be measured in many different ways. For example, one could use the age dependency ratio (share of adults) within the family as a measure of the weight of potential income earners living in the family. The association is straightforward: children generally do not earn income and therefore, the larger the share of adults in the family, the larger the *per capita* family income should be (IPEA, 2006, p. 34). Since poor families tend to have more offspring than wealthy families, the higher dependency ratios among the poorer should contribute to larger inequality and poverty rates in the population. If fertility is declining faster among the poor families, such has been the case for Brazil in the past years (Berquo & Cavenaghi 2006) one should expect declining inequality and poverty rates because of the first-order effects of changes in age composition within the families.

The share of adults in the family summarizes a wide range of demographic characteristics which potentially affect family size and structure. These include changes through new births, deaths, divorces, marriages, and, in a broader sense, through the departure of individuals who start new families. Therefore, the share of adults is a too broad measure and one should consider that changes in the age of adults in each family are not neutral with respect to family income distribution. This is true because younger and older adults may have lower income.

Recent changes in Family Composition in Brazil

The composition of families has changed in Brazil, as a result of both of demographic and socioeconomic factors (Camarano et al., 2004; Medeiros and Osório, 2000). The decline in fertility, the increasing frequency of divorces, and the excess male mortality have led to increasing numbers of widows. These sociodemographic phenomena directly affected family

composition, reducing its size and the number of offspring and increasing average age and number of households with only one individual (mainly women).

Socioeconomic conditions are intrinsically connected with the choices of individuals regarding co-residence and family formation, thus affecting marriage, divorce, early departure, and co-residence of adult offspring and grandchildren with the elderly. In many developed countries, income, mobility and level of education are positively correlated with the tendency of the elderly to live alone (see Michael, Fuchs and Scott (1980) for evidence for the U.S. case). In Brazil, co-residence has been favored by the increasing time spent by children in school, which has postponed the end of youth economic dependence to older ages. In addition, the recent extension of social insurance programs to an increasing share of the elderly population has provided this age group with better financial conditions which may increase the likelihood of co-residence between old and young generations (Camarano et al., 2004), although Paulo (2008) showed it may indeed increase the chances of elderly to live alone.

Methodology

Data

Our results are based on data from PNAD, a nationally representative household survey collected annually in Brazil since the 1970s, except for the census years. We use data from the years 1985, 1993, 2001 and 2008 surveys, in order to compare the different patterns of income inequality over the last twenty three years that have been reported in the literature, namely, the stability in high level inequality between 1985 and 1993, the very beginning of the decline process, between 1993 and 2001, and the steadily decline in income inequality between 2001 and 2008.

Although the concept of family income inequality has been employed throughout this article, it should be noted that our unit of analysis in the simulations is, in fact, the household. Usually, family refers to groups connected by bonds of kinship (including non-biological offspring and conjugal relationships which may or may not be legally established) not limited by the boundaries of the physical household (Medeiros & Osorio, 2000). Given the difficulty of identifying kinship bonds in the survey, we use the concepts of household and family as they were interchangeable in our analysis. While a household may be made up of several families, in the case of Brazil, we expect extended families to constitute a minor proportion within the sample.

Model

In this study, we use counterfactual micro-simulations to measure the role played by demographic changes on income inequality and poverty rates according to changes in the age distributions of adults within the families. We answer "what if" type of questions by asking what would happen to income inequality and poverty rates in the following decade, if the distribution of age among adults for each family were kept constant.

Assuming that *per capita* income is $y = a.r$ where *a* equals the number of adults in the family and *r* is the income per adult in the family, we perform two micro-simulations. In the first one, we only consider changes the proportion of adults in the family. In the second simulation model, we combine income distribution by age with the age and sex distribution of adults in each family. Therefore, *per capita* family income is the product of the number of adults by age, sex and age-sex-specific income: $y = \sum_{i=1}^{k} \frac{n_i^A}{n} \left(\frac{1}{n_i^A} \sum_{j \in i} y_j \right)$. To keep our analysis parsimonious while still capturing the age effect, we categorize age according to 14 groups: male adults 15 to 24, 25 to 34, …, 75 and older; and female adults to 24, 25 to 34, …, 75 and older.

Following the methodology proposed by IPEA (2006), we estimate three effects responsible for changes in *per capita* family income in each micro-simulation round. They are: the marginal change in the distribution of adults according to age; the marginal change in the family income distribution per adult according to age; and the interaction between the two marginal changes plus other sources of variation non-explained. We measure each of these effects based on the construction of a random variable x, which bears the order of each family in the distribution of the age groups. We then assign, randomly, values of family income observed in three years of data according to the random variable x, to measure the effects discussed above. The random assignment of families protects our results from being biased by heterogeneity among families.

We chose to summarize the effect of changes in the age distributions on income inequality by means of the Gini coefficient.

Results

The level of inequality did not change significantly in Brazil, between 1985 and 1993, rising slightly from 0.595 to 0.6079. The first simulation, which divides the population into two large age groups (children and adults) shows that changing only the distribution of the proportion of adults to the 1993 levels, while holding everything else constant, would reduce the Gini coefficient by 39,7%. However, other forces have buffered the favorable pure demographic effect. When we varied only the income per adults distribution, the inequality got worse by 133,7%. In addition, the effects of interaction between income and demographic changes increased the Gini coefficient by 6,0%.

In the following decade (1993-2001), the pure demographic effect keeps pushing down the inequality level; 38,7% of the total reduction in the Gini coefficient over this period. Contrary to the previous decade, however, varying income distribution alone, while

holding everything else constant, produced the largest negative effect on inequality: about 139% of the total decline of the Gini coefficient. Association of the two distribution changes, however, acted making the income distribution worse, buffering the decline.

In the third period (2001-2008), the Gini coefficient was strongly reduced and the pure demographic effect explains 7,7% of this trend, while changes in the distribution of the adults income explain 90,4% of the whole decline.

As mentioned earlier, having only two age groups (children and adults) makes the demographic dimension too crude. Therefore, in the second simulation, we increased the number of groups, from two to fifteen (children, male adults and female adults per age group) in order to control for additional age and sex compositional effects. The decomposition of the proportion of adults by age and sex groups for the whole period in the second simulation did not change the results significantly. Yet, the increasing proportion of older adults among richer families made the demographic effect to be less strong than in the first simulation: 16,7% of the decline in the period, instead of previous 22,1% obtained by the simulation1.

Discussion

The proportion of adults per household started to increase in Brazil in the 1970s, with the steady decline in birth rates. In the last decades, other demographic forces, such as higher longevity, larger proportion of divorces and the higher economic dependency of the youth as well the increasing financial autonomy of the elderly have reinforced this compositional change. The decline of dependency ratios has been more pronounced within poorer families, reducing inequality and poverty levels.

As we showed in our simulations, changes of the proportion of adults in the Brazilian families have contributed significantly for the improvement in income distribution, although it was not able to buffer the faster increase of income among the wealthiest families during

the first period analyzed. In the following periods (1993-2001 and 2001-2008), the demographic effects kept acting, since the ongoing population aging process changed the composition of adults among the poorer families, from younger to older individuals, who have higher income. Over these periods, however, the role of the demographic change was losing relative importance to the effects of social policies that promoted progressive income transfers.

Our findings have at least one important policy implication. The population aging process currently in progress in Brazil, combined with the strong social protection mechanisms available for the elderly will result in even better income distribution in the future. This is true particularly if we consider that there is more room left for population aging among the poorer than the wealthier. However this result depends on two main challenges: to keep the current flows of public transfers to the elderly, even under the strong fiscal pressure coming from the population aging, and guarantee that old people reallocate resources within families. The tendency of elderly people living alone may compromise the private transfers to younger members of the family.

With regard to the methodological limitations of this kind of study, one should note that our counterfactual simulations measure only the first order effects of demographic variables and adult income. Income and demographic composition, however, are known to be correlated. There is considerable literature examining the effects that changes in income, including non-labor income, exert on the decisions regarding the union and dissolution of families. Also, changes in income affect both mortality and fertility rates, which are other closely-related determinants of household composition. On the other hand, changes in the number of offspring, life expectancy and household mobility are not neutral regarding the choice between leisure and work, and the supply of labor, affecting the available income for the families. There are also institutional aspects, such as development of social security

programs, which may simultaneously affect demographic composition and adult income. Our simulations do not, therefore, take into consideration any inter-relations among demographic variables or between them and income of adults.

From a methodological point of view, however, our results demonstrate the usefulness of micro-simulations in studies that combine demographic and economic variables to examine changes in socioeconomic differences among individuals or families in a population. Compared to the usual macro-simulations, the micro approach is much less limited in measuring the variations in the distribution of attributes across the population. Also, the use of counterfactual simulations is simple and instructive, measuring each effect individually in complex and multifactorial events.

References

BERQUO, E. CAVENAGHI, S. Fecundidade em declínio: breve nota sobre a redução do número médio de filhos por mulher no Brasil. CEBRAP, Novos Estudos, n. 74, march, 2006.

BARROS, R.; HENRIQUES, R., MENDONÇA, R. 2001. A estabilidade inaceitável. IPEA, Texto para Discussão, n. 800, Rio de Janeiro, June, 2001.

BARROS, R., CARVALHO, M., FRANCO, S, MENDONÇA, R.Uma analise das principais causas da queda recente dna desigualdade de renda brasileira, Economica, Rio de Janeiro, v. 8, n.1, p.117-147, july de 2006.

CAMARANO, A. A., KANSO, S., MELLO, J. PASINATO, M.T. Famílias: espaço de compartilhamento de recursos e vulnerabilidades. In: CAMARANO, A. A.(org.) *Os novos idosos brasileiros: muito além dos 60?* Rio de Janeiro, IPEA, p.137-167, 2004.

HAILU, D. SOARES, S., What explains the decline in Brazil's inequality? One Pager, International Poverty Centre for Inclusive Growth, n. 89, July, 2009.

IPEA, 2006. Sobre a recente queda da desigualdade de renda no Brasil. IPEA, Brasilia, Nota Técnica.

LEME, M.C., WAJNMAN, S. Diferenciais de rendimento por genero. In: LISBOA, M.B., MENEZES-FILHO, N.(orgs.) Microeconomia e Sociedade no Brasil. Editora Contra-Capa, Rio de Janeiro, 2001

MARTIN, M.A. Family Structure and Income Inequality in Families with Children 1976 to 2000. *Demography*, 43(3), 421-445. 2006.

MEDEIROS, M., OSÓRIO, R. Arranjos domiciliares e arranjos nucleares no Brasil: classificação e evolução de 1977 a 1998. *Texto para Discussão* nº 788, IPEA, Brasília, 2000.

MICHAEL, R., FUCHS, V., SCOTT, S. Changes in the Propensity to Live Alone: 1950-1976, *Demography*, 17(1), 39-56. 1980

PAULO, M. A. 2008. A composição domiciliar dos idosos no Brasil: um estudo sobre o impacto do recebimento do Benefício de Prestação Continuada. Belo Horizonte, Cedeplar. Master Thesis.

Table 1 – Demographic and Income Effects on Inequality in Brazil, 1985-2008

	Simulation 1 (two age groups:children and adults)			
	1985-1993	1993-2001	2001-2008	1985-2008 (whole period)
Gini at the start of the observation period	**0,5959**	**0,6079**	**0,5962**	**0,5959**
Effect of change in adults distribution	-39,69%	38,68%	7,74%	22,09%
Effect of change in familiar income distribution	133,66%	139,41%	90,37%	90,78%
Association of both effects	6,03%	-78,09%	1,89%	-12,72%
Gini at the end of the observation period	**0,6079**	**0,5962**	**0,5455**	**0.5455**

Table 2 - Simulation 2 (children and 14 groups of adults by age and sex) compared to Simulation 1

	Simulation 1 1985-2008	Simulation 2 1985-2008
Gini at the start of the observation period	**0,5959**	**0,5959**
Effect of change in adults distribution	22,09%	16,70%
Effect of change in familiar income distribution	90,63%	110,54%
Association of both effects	-12,72%	-27,24%
Gini at the end of the observation period	**0,5455**	**0,5455**