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The Gini Coefficient, Inclusive Growth and Income Policies: The Brazilian Experience

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Abstract: This paper analyzes the relationship between growth patterns in mean income, inequality and social welfare in Brazil during the last two decades. It focuses on the role played by changes in different income sources. From a methodological point of view, the paper derives a dynamic decomposition using the Gini coefficient which is the most widely used measure of inequality found in the literature. One contribution is the proposal of a measure of social welfare growth, departing from the specification proposed by Sen (1974). Our dynamic social welfare decomposition links growth rates in mean income and in income inequality measured by the Gini index. The other contribution is a decomposition methodology that explores linkages between these components and different income sources from labor earnings to different social programs. Every income source mean and inequality changes are mapped into social welfare changes. The proposed methodology is applied to the Brazilian National Household Survey (PNAD) covering the period 1992-2012. The empirical analysis demonstrates that some Brazilian official income policies such as Bolsa Família played an important role in promoting income growth among the poorest segments while others such as other poverty alleviation policies such as BPC and also Social Security benefits are much less well targeted. Overall the paper shows that labor income played the leading role to explain changes in both mean income and inequality in Brazil.

Keywords: Inequality; Poverty; Growth; Pro-Poor Growth; Labor Market; Social Policy

JEL Classification: D31; I32; N36; O15; J21; I38

1. Introduction

The Gini coefficient is the most popular measure of inequality. It is frequently used in policy debates and in academic papers as well. The Gini has a direct interpretation as the normalized distance between any two pairs of people incomes found in a given society ranging between 0 and 1 and has an appealing geometric interpretation derivation departing from the Lorenz curve, which provides the most general assessment of inequality comparisons. These features may perhaps explain this inequality measure popularity. However, a given change in the Gini coefficient does not have any particular intuitive meaning. This paper departs from Sen's (1974) derivation of the Gini coefficient from a specific social welfare function to provide a dynamic decomposition of social welfare changes. In this context Gini index rate of change is interpreted as the change of welfare that accrues from changes in income dispersion. Furthermore, the impacts of changes in different income sources impact social welfare through both growth and inequality change channels.

This paper derives a dynamic decomposition of social welfare changes by income sources that encompasses growth and Gini index changes and applies it to the recent Brazilian experience.

The paper is organized as follows. Section 2 provides a general description of the social welfare function approach that will be applied here. Section 3 measures the extent to which different income sources are pro-poor, or inclusive, in the sense that they contribute to equity in the distribution of income. Section 4 presents a methodology to calculate the contribution of different income sources to the total pro-poor growth rate. Section 5 provides the trends in social welfare and inequality in Brazil in the 1992-2012 period. Section 6 considers different income sources to explain the reduction in inequality in Brazil. The following section provides proposes a targeting indicator to measure which income sources contributed more to social welfare and by how much. Section 8 analyses the pro-poor growth rates in Brazil in the 1992-2012 period, subtracting growth rate in per capita income from the growth rate in per capita welfare, which gives us the gains and losses in social welfare, or pro-poor, growth rates. Section 9 extends the pro-poor growth rates analysis to various income sources in Brazil for the 1992-2001, 2001-2012 and 1992-2012 periods. It measures the pro-poorness of the different income sources. Section 10 measures the contributions of various income sources to the pro-poorness of the per capita income. The last section provides the main conclusions of the paper.

2. Social Welfare Growth Rate

Suppose x is the real income of an individual, which is a random variable with density function $f(x)$. Then the mean income of the population is defined as

$$\mu = \int_0^{\infty} xf'(x)dx \quad (1)$$

A country's performance in average standard of living can be measured by the growth rate γ given by

$$\gamma = \Delta \ln(\mu) \quad (2)$$

Economic growth has an impact on each individual in a different manner. Following Kakwani and Pernia (2000), growth is defined as pro-poor (or anti-poor) if the poor benefit proportionally more (or less) than the non-poor, i.e., growth results in a redistribution of income in favor of the poor. When there is a negative growth rate, growth is defined as pro-poor (anti-poor) if the loss from growth is proportionally less (more) for the poor than for the non-poor. This is a relative concept of pro-poor (anti-poor) growth because growth leads to a reduction (or increase) in relative inequality¹.

The pattern of growth can be described by two factors: (i) the growth rate in mean income defined by γ and (ii) how inequality changes over time. To measure the pattern of growth, we need to specify a social welfare function, which gives a greater weight to utility enjoyed by the poor compared to utility enjoyed by the non-poor. We have chosen the most popular Gini social welfare function proposed by Sen (1974):

$$W = 2 \int_0^{\infty} x[1 - F(x)]f(x)dx \quad (3)$$

where $F(x)$ is the cumulative distribution function. According to Sen (1974), the weighting function implicit in W in (3) captures the relative deprivation suffered by the poor relative to the non-poor in society. Following him, a simple way to capture relative deprivation is to assume that an individual's deprivation depends on the number of persons who are better off than him/her in society.

¹ Pro-poor growth can also be defined in a stronger absolute sense: growth is pro-poor if the poor enjoy greater absolute benefits than the non-poor. When growth is negative, growth is absolute pro-poor if the absolute loss from growth is less for the poor than for the non-poor. Absolute pro-poor (anti-poor) growth reduces (increases) absolute inequality. See Grosse, Harttgen and Klasen (2008) and Kakwani and Son (2008) for a detailed discussion of absolute pro-poor growth, see. In this paper, our focus will be on relative pro-poor growth.

The function W in (3) implies that the relative deprivation suffered by an individual with income x is proportional to the proportion of individuals who are richer than this individual. This welfare function is linear in x and the weight attached to it decreases as the person becomes richer.

The idea of pro-poor growth is now developed. To do so W in (3) can with a slight manipulation can be written as

$$W = \mu(1 - G) = \mu E \quad (4)$$

where G is the Gini index, which is a relative measure of inequality. $E=(1-G)$ is a measure of equity in income. This is the form of social welfare function that Sen (1974) proposed. Taking logarithm of both sides of (4) gives

$$\ln(W) = \ln(\mu) + \ln(E)$$

which on taking the first difference gives

$$\gamma^* = \gamma + g \quad (5)$$

where $\gamma^* = \Delta \ln(W)$ is the growth rate of social welfare W , $\gamma = \Delta \ln(\mu)$ is the growth rate of average income of the society and $g = \Delta \ln(E)$ is the pro-poor growth rate, which will be positive (negative) if growth is pro-poor (anti-poor). Thus pro-poor (anti-poor) growth is defined as the growth that leads to an increase (decrease) in equity of income. There will be a gain (loss) in growth rate when growth is pro-poor (anti-poor).

For instance if $\gamma^* = 6\%$ and $\gamma = 4\%$, it means that there is a gain of 2% in growth rate in social welfare entirely attributed to the pro-poorness of growth. The gain in growth rate signifies that economic growth is providing greater benefits to the lower income groups of the society than the average gain to the society. This motivates the idea of pro-poor growth, which can be measured by the gain in growth rate due to increasing equality in income so that the larger the gain, the greater is the improvement in equality.

3. How much are Income sources Inclusive?

Households generate income from many sources. Labor is the primary source of income - generated by family members who are employed in the labor market. Who is employed in the family and how much income is generated by those employed is determined by a complex set of households' demographic characteristics. In addition to labor income, households derive income from other sources such as public and private transfers and financial assets, etc. This section measures the extent to which different income sources are pro-poor in the sense that they contribute to equity in the distribution of income.

Suppose households draw their income from k sources or there are k mutually exclusive income components and $v_i(x)$ is the income from the i^{th} source of a household with total per capita income x such that

$$x = \sum_{i=1}^k v_i(x) \quad (6)$$

then the mean of the i^{th} income source is given by

$$\mu_i = \int_0^{\infty} v_i(x) f(x) dx \quad (7)$$

then substituting (6) into (7) gives

$$\mu = \sum_{i=1}^k \mu_i \quad (8)$$

This equation can be used to estimate the contributions of each income source (component) to average income of the population. $100 \times \mu_i/\mu$ is the percent contribution of the i^{th} income source to the total average income.

Similarly we can calculate the mean social welfare of the i^{th} income source from (3) as:

$$W_i = 2 \int_0^{\infty} v_i(x) [1 - F(x)] f(x) dx \quad (9)$$

which in view of (3) and (6) gives

$$W = \sum_{i=1}^k W_i \quad (10)$$

This equation provides the contribution of each income component to total social welfare. $100 \times W_i/W$ is the percent contribution of the i^{th} income source to total social welfare.

The mean social welfare of the i^{th} income component in (9) can also be written as

$$W_i = \mu_i(1 - C_i) = \mu_i E_i \quad (11)$$

where C_i is the concentration index of the i^{th} income component (Kakwani, 1977 and 1980). The concentration index C_i informs how the i^{th} income component is distributed across income ranges. The concentration index lies between -1 and +1. Suppose the i^{th} income component is the income received by beneficiaries of the Bolsa Família Program (BFP), then for instance if the concentration index is 0, then all individuals in the society are equal beneficiaries, if $C_i = -1$, then the poorest person receives all the benefits of the program and if $C_i = +1$, then the richest person receives all benefits. The concentration index is a measure of inequity of an income component. Therefore, a measure of equity of the i^{th} income component is defined as $E_i = (1 - C_i)$, so the larger the value of E_i the more equitable will be the i^{th} income component. E_i equals 1 if all individuals enjoy the same i^{th} component income. This could be the benchmark: as such, the i^{th} component is equitably (inequitably) distributed if E_i is greater (less) than 1.

Substituting (4) and (11) into (10) gives

$$E = \sum_{i=1}^k \frac{\mu_i}{\mu} E_i \quad (12)$$

which shows that equity in total income is a weighted average of equity in each income component where weights are proportional to the shares of income components in the mean income.

Taking logarithms and first differences of both sides of (11) gives

$$\Delta \ln(W_i) = \Delta \ln(\mu_i) + \Delta \ln(E_i) \quad (13)$$

Denoting

$$\gamma_i^* = \Delta \ln(W_i)$$

$$\gamma_i = \Delta \ln(\mu_i)$$

$$g_i = \Delta \ln(E_i)$$

which gives

$$\gamma_i^* = \gamma_i + g_i \quad (14)$$

which shows that growth rate of social welfare for the i^{th} component is a sum of the two growth rates: (1) growth rate of mean of the i^{th} income component and (2) growth of equity index of the income component. We define the growth of the i^{th} income component as pro-poor (anti-poor) if the equity index of the i^{th} income component increases (decreases). Thus, the i^{th} component is pro-poor (anti-poor) if there is a gain (loss) in growth rate of welfare of the i^{th} income component.

4. Determinants of Inclusive Growth

This section presents a methodology to calculate the contribution of various income sources to the total pro-poor growth rate. For instant it will inform how much different social welfare programs contribute to the total pro-poor growth of income.

Suppose μ_t is the mean of per capita income in year t and μ_{it} is the mean of the i^{th} income component in year t. Then based on (8) we have

$$\mu_t = \sum_{i=1}^k \mu_{it} \quad (15)$$

It can be shown that

$$\Delta \ln(\mu_t) \sim \frac{1}{2} \sum_{i=1}^k \left(\frac{\mu_{i(t-1)}}{\mu_{(t-1)}} + \frac{\mu_{it}}{\mu_t} \right) \Delta \ln(\mu_{it}) \quad (16)$$

which shows that the growth rate of per capita mean income is the weighted average of the growth rates of individual income components - the weights being proportional to the average of income shares in each period. This equation informs the magnitude of the contribution of each income component to the growth rate of per capita mean (average standard of living).

Suppose W_t is the social welfare in year t and W_{it} is the social welfare of the i^{th} income component, then based on (10) we have

$$W_t = \sum_{i=1}^k W_{it} \quad (17)$$

Then it can be shown that

$$\Delta \ln(W_t) \sim \frac{1}{2} \sum_{i=1}^k \left(\frac{W_{i(t-1)}}{W_{(t-1)}} + \frac{W_{it}}{W_t} \right) \Delta \ln(W_{it}) \quad (18)$$

which shows which shows that the growth rate of social welfare is the weighted average

of the growth rates of social welfare of individual income components – the weights being proportional to the average of social welfare shares in each period. This equation informs the magnitude of contribution of each income component to the growth rate of social welfare.

The pro-poor growth rate from (5) is given by

$$g_t = \Delta \ln(W_t) - \Delta \ln(\mu_t) \quad (19)$$

Which in view of (16) and (18) gives the contribution of each income component to the pro-poor growth rate of per capita total income.

5. Trends in Social Welfare and Inequality in Brazil

This section provides trends in social welfare and inequality in Brazil from 1992 to 2012. The nationwide survey called PNAD is utilized in the empirical analysis. This is an annual survey conducted by the Instituto Brasileiro de Geografia e Estatística (IBGE) since 1967. Per capita real household income is used as individuals' welfare measure. Per capita real income is defined as per capita nominal income adjusted for prices. The consumer price indexes corresponding to the PNAD survey periods are used to adjust for prices.

Table 1 presents the estimates of average real income and social welfare per person. Like income, social welfare is also measured in money metric (Real per month in 2012 prices). The trends depicted in Figure 1 show that both income and social welfare have been consistently increasing. The trend growth rates presented in the last row of the table indicates that per capita income increased at an annual rate of 2.4 per cent per annum between 1992 and 2001 but in the subsequent period between 2001 and 2012 the rate of growth in income increased to 3.6 per cent annually. More importantly, per capita welfare increased even more rapidly at an annual rate of 5.1 per cent. From these results it is evident that Brazilians are becoming better off, particularly in the new millennium.

The higher growth rate of social welfare compared to income signifies declining income inequality. The last column in the table gives the estimates of the Gini index of per capita income. The trend growth rate of inequality is depicted in Figure 2, which shows that a sharp decline in inequality has occurred in the new millennium. The Gini index declined

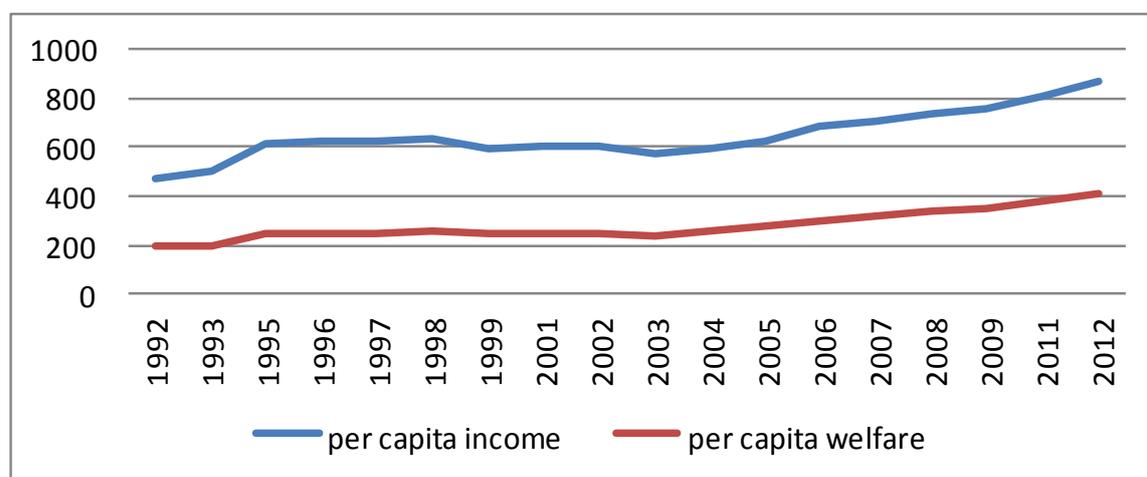
at an annual rate of 0.65 percentage points. Such a sharp and persistent reduction in inequality has not been observed anywhere in the world. We attempt to explain this by means of contributions made by different sources of income, including social programs.

Table 1: Average per capita real income and social welfare per month: Brazil 1992-2012

Year	Per capita income	Per capita welfare	Inequality (%)
1992	475	199	58.05
1993	500	199	60.23
1995	619	249	59.86
1996	630	252	60.02
1997	629	251	60.02
1998	636	255	59.84
1999	600	245	59.21
2001	609	247	59.39
2002	609	251	58.73
2003	574	240	58.10
2004	593	256	56.89
2005	629	273	56.63
2006	688	303	55.95
2007	706	316	55.20
2008	739	338	54.27
2009	760	350	53.86
2011	807	382	52.72
2012	872	414	52.57
Trend 1992-2001	2.44	2.42	-0.02
Trend 2001-2012	3.64	5.11	1.47
Trend 1992-2012	2.14	3.06	0.92

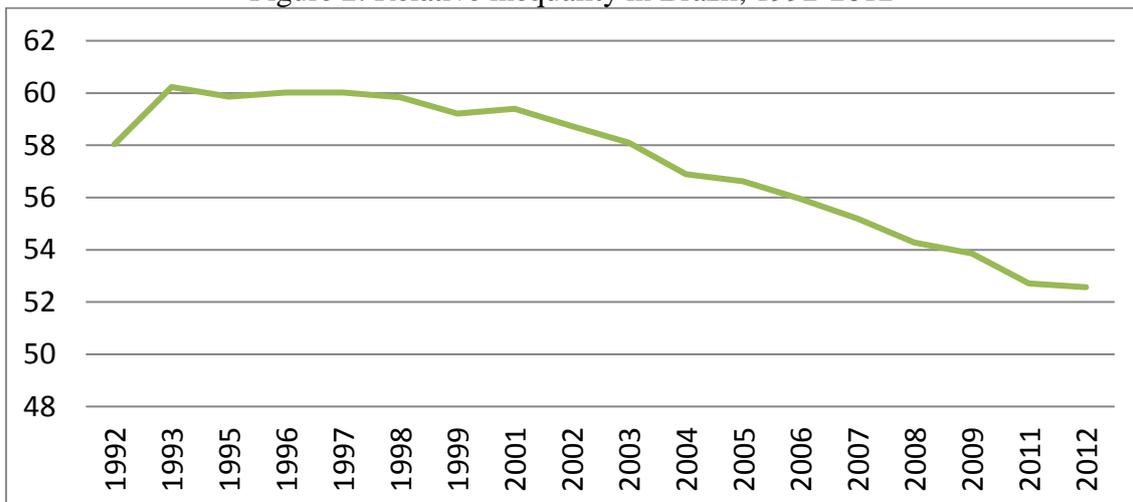
Source: microdata from PNAD/IBGE. Prepared by the authors.

Figure 1: Per capita income and welfare (in Real per month) in Brazil, 1992-2012



Source: microdata from PNAD/IBGE. Prepared by the authors.

Figure 2: Relative inequality in Brazil, 1992-2012



Source: microdata from PNAD/IBGE. Prepared by the authors.

6. Explaining Inequality Reduction in Brazil

The following income sources are considered in explaining reduction in inequality in Brazil:

- a. Labor income
- b. The Bolsa Família Program (BFP)
- c. The Benefício de Prestação Continuada (BPC)
- d. Social Security
- e. Non-social income

Labor income includes all earnings from employment by all household members. A household's labor income depends on two main factors: (i) the number of household members who are employed and (ii) the level of earnings of working individuals.

Until 2003, Brazil had implemented four major cash transfer programs (i) *Bolsa Escola*; (ii) *Fome Zero*; (iii) *Bolsa Alimentação*; and (iv) *Vale Gás*. *Bolsa Escola* was an income grant for primary education. *Fome Zero* and *Bolsa Alimentação* provided income grants related to food security while *Vale Gás* helped poor households buy cooking gas. The Bolsa Família Program took shape in 2003, early in the first term of Brazilian President Luiz Inácio Lula da Silva. It was established out of a merger of the four major cash transfer programs. It has now become a popular program benefiting about 50 million people.

The BPC is an unconditional disability and old age grant targeted at the poor. It is a non-

contributory social assistance program entirely comprised of a subsidy to the beneficiaries.

Social security is the main component of social income in Brazil, second only to labor earnings among all other sources collected by PNAD. The major portion of benefits is made of transfers that are to some degree linked with past contributions. Still the beneficiaries of social security do get public subsidies because the volume of transfers exceeds the volume of contributions.

The non-social income includes various types of incomes to which the government does not make any contribution. They include private transfers from other families and non-government organizations, private pensions, rents and other earnings from assets such as interests and dividends.

In the 1990s income inequality increased at an annual rate of 0.044 percentage points. This increase was largely contributed by social security, which attracts large amount of government subsidy. It contributed to the increase in inequality with 0.343 percentage points per annum. The labor income which is generated from the labor market (with no government subsidy) contributed to the reduction in inequality at an annual rate of 0.233 percentage points. Bolsa Família and BPC were relatively very small programs in the 1990s and thus contributed insignificantly.

In the new millennium, Brazil completely turned around the ever increasing inequality to a sharp reduction. Inequality declined at annual rate 0.65 percentage points. This is an amazing turn around. How did it happen? Table 2 provides the answer. It was largely the labor income that contributed to the reduction in inequality at an annual rate of 0.384 percentage points. It is difficult to exactly point out why labor income has become so much equalizing. There are two factors that stand out. One is the large increase in real minimum wage with no adverse unemployment impact. The adverse unemployment impact was not felt because of the mining boom. Secondly, Brazil expanded its education sector which helped the poor more than the rich. The rates of return from education increased more for the poor than for the rich.

While in the 1990s social security was the main source of increasing inequality, in the new millennium it became an important source of inequality reduction. Social security

expanded considerable in the new millennium encompassing a large number of lower income employees, making this income source more equitable.

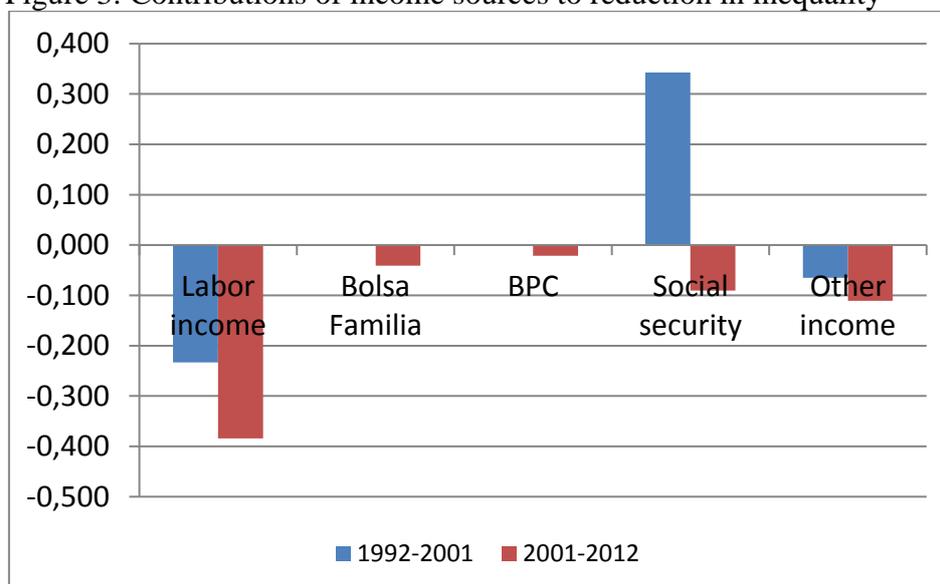
There is a general perception that Brazil has been able to achieve large reduction in inequality because of its popular Bolsa Família Program. This perception is not supported by the evidence presented in Table 2. The program contributed to an annual reduction in inequality of only 0.041 percentage points. Compared to the total reduction of inequality of 0.65 percentage points annually, the relative contribution of Bolsa Família is very small.

Table 2: Contributions of income sources to reduction in inequality in Brazil, 1992-2012

Income source	1992-2001	2001-2012	1992-2012
Labor income	-0.233	-0.384	-0.420
Bolsa Familia	-0.002	-0.041	-0.026
BPC	0.001	-0.021	0.000
Social security	0.343	-0.090	0.143
Non-social income	-0.065	-0.111	-0.086
Non-labor income	0.277	-0.263	0.030
Total income	0.044	-0.648	-0.390

Source: microdata from PNAD/IBGE. Prepared by the authors.

Figure 3: Contributions of income sources to reduction in inequality



Source: microdata from PNAD/IBGE. Prepared by the authors.

7. Targeting Indicator

The small contribution of Bolsa Família to inequality reduction does not imply that the program is not well targeted to the lower income families. Policy making will benefit from determining the targeting efficiency of various income sources, which income sources contribute more to social welfare and by how much. An income source can be said well targeted to low income families if it contributes more to social welfare relative to its contribution to income. This motivates us to propose a new index:

$$\varphi_i = \frac{W_i \mu}{W \mu_i} = \frac{E_i}{E} \quad (20)$$

Where $E_i = (1 - C_i)$ is a measure of equity of the i^{th} income component and $E = (1 - G)$ is a measure of equity of total income.

If φ_i is greater than 1, this implies that controlling for the income share, the i^{th} income source contributes more to social welfare. This index is like a targeting index informing how well a particular income source is targeted to the lower income families. Table 3 presents the values of the targeting indicator for various income sources.

The targeting indicator for total income is 1, which is the bench mark. An index value greater than 1 implies that the particular income source benefits the lower income families more than the average. The larger is the value of index, the greater the targeting efficiency.

Figure 4 shows that Bolsa Família is by far the most efficiently targeted program with values of the targeting indicator greater than 3. The targeting indicator for the labor income is around 1, which means that a transfer of one Real from Bolsa Família will increase the social welfare by about three times than that of one Real earned from the labor market.

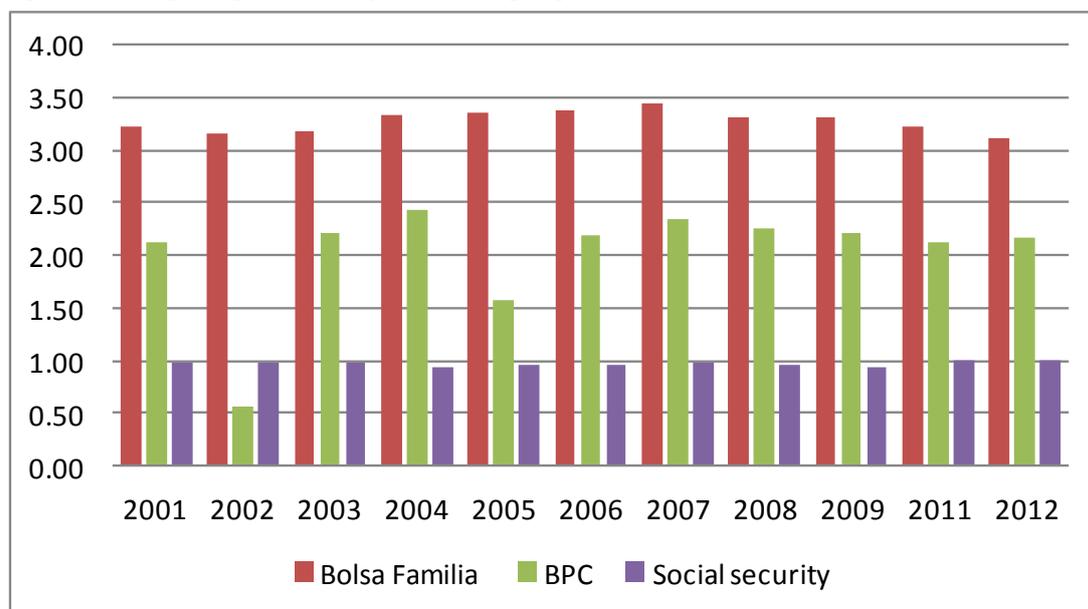
The value of the targeting indicator for the BPC has been around 2, which suggests that BPC is also efficient in targeting the lower income families but its degree of impact is much smaller than of the BFP. Social security, which has a large component of public subsidy, has been having the value of PSPI much less than 1 throughout the decade and thus cannot said to be well targeted.

Table 3: Targeting indicator of various income sources - Brazil 1992-2002

Year	Labor Income	Bolsa Família	BPC	Social Security	Non-social income
2001	1.01	3.23	2.12	0.98	0.81
2002	1.01	3.16	0.55	0.99	0.85
2003	1.01	3.17	2.21	0.97	0.82
2004	1.00	3.34	2.42	0.94	0.80
2005	1.00	3.35	1.57	0.96	0.79
2006	0.99	3.37	2.19	0.96	0.83
2007	0.99	3.44	2.33	0.98	0.85
2008	0.99	3.32	2.25	0.95	0.80
2009	0.99	3.31	2.20	0.95	0.86
2011	0.97	3.23	2.12	0.99	0.84
2012	0.97	3.12	2.18	1.01	0.73

Source: microdata from PNAD/IBGE. Prepared by the authors.

Figure 4: Targeting efficiency of social programs in Brazil, 2001-2012



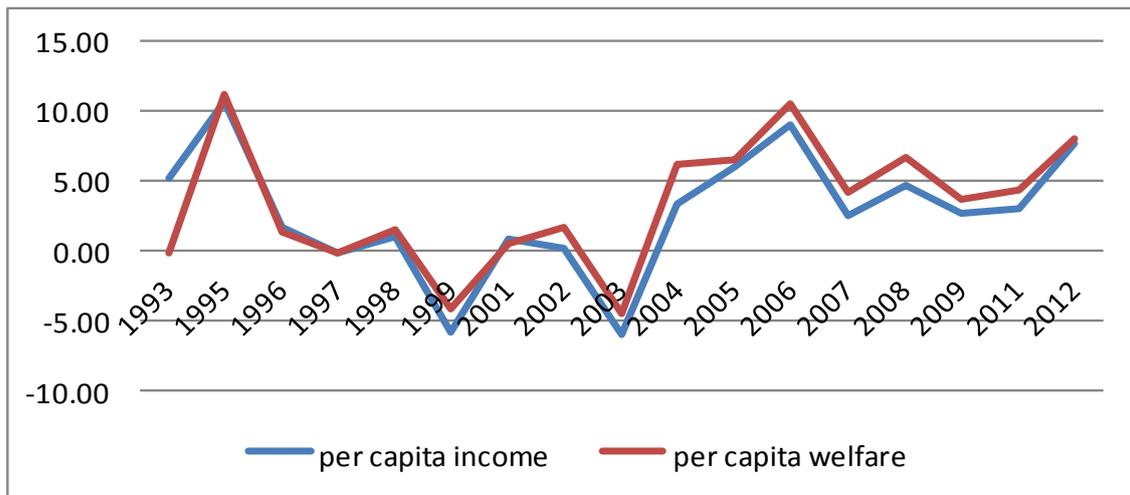
Source: microdata from PNAD/IBGE. Prepared by the authors.

8. Pro-poor Growth Rates in Brazil: 1992-2012

Figure 5 presents the annual growth rates of per capita income and social welfare. The growth trends presented show that growth rates of social welfare are consistently higher than that of income throughout 2001-2012. In the period 1992-2001, growth rates of social welfare were slightly lower than that of income. The series in Figure 6 is obtained by subtracting the growth rates of income from those of social welfare presented in Figure 5. Gains in growth rates imply a decline in inequality, while losses in growth rates imply an increase in inequality. Thus an increase in inequality incurs cost to the society in terms of loss of growth rate in social welfare. The society makes gains in growth rates when inequality is reduced. The pro-poorness of economic growth in any period can be measured by the gain or loss of growth rates.

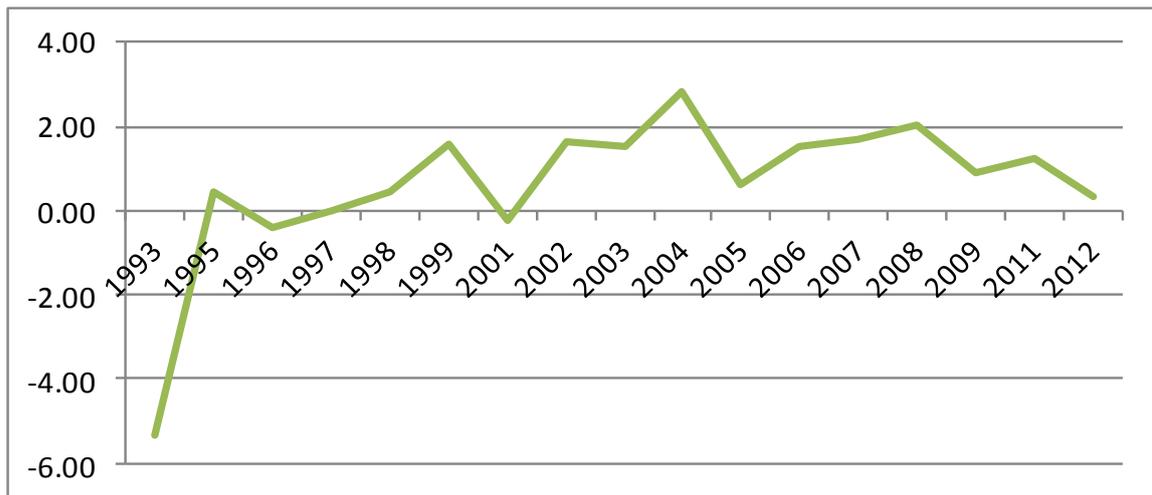
Figure 6 depicts the gains and losses in yearly growth rates from 1992 to 2012. Substantial gains in growth rates are noticeable in the new millennium between 2001 and 2012 but in the 1990s (from 1992 to 1999), such gains are not noticeable. While the growth rate in the standard of living in Brazil measured by per capita income was also generally higher in the 2001-2012 period compared to that in 1992-2001, per capita welfare has substantially improved in last period in comparison with the earlier one. In the 1992-2001 period as a whole there virtually no gains in social welfare growth rates above mean growth rates, equivalent to a fall of 0,02 per year of the former with respect to the later concept that reached 2.44 per capita yearly. By contrast, in the 2001-2012 period, there were large gains in growth rates from 3.64 to 5.11. This growth pattern has led to an unprecedented reduction in inequality in Brazilian documented History. Thus, it can be unambiguously concluded that Brazil has achieved since 2003 not only sustained growth in the standard of living of its population but also this growth has been pro-poor since 2001.

Figure 5: Growth rates of per capita income and welfare - Brazil 1992-2012



Source: microdata from PNAD/IBGE. Prepared by the authors.

Figure 6: Equality growth rate - Brazil 1992-2012



Source: microdata from PNAD/IBGE. Prepared by the authors.

What are the factors that have contributed to Brazil's success in both fronts? This issue is explored in the subsequent sections.

9. Inclusive Growth by Income Sources

As depicted in Table 4, per capita income is derived from several income sources of which labor income is the most dominant one. It grew at annual rate of 1.80 per cent in the period 1992-2001 but in the subsequent period, the growth rate accelerated to 3.61 per cent. The social welfare of labor income grew at a slower rate of 1.76 per cent in the first period but

in the subsequent period this growth rate surged to 4.71 per cent. Thus there was loss in growth rate of 0.04 per cent in the first period but substantial gain in growth rate of 1.1 per cent in the second period. This gain is entirely attributed to the fall in inequity in the labor income. This indicates that in the new millennium the labor market conditions improved substantially for the poor relative to the non-poor; the labor income benefitted the poor more than the non-poor.

The changes in non-labor income are in sharp contrast with those in labor income. The non-labor income, which includes all the social programs, performed better than the labor income. The non-labor income grew at an annual rate of 3.75 per cent between 2001-2012 but its social welfare grew at a much higher rate of 6.43 per cent, which resulted in gain in social welfare of 2.69 per cent. Thus the non-labor income became highly pro-poor benefiting the poor more than the non-poor.

The non-labor income includes both social and non-social income. The social income derives mainly from three social programs: (1) Bolsa Família, (2) BPC and (3) social security. The non-social income includes rents, private transfers from other families and non-government organizations, private pensions and other earnings from assets such as interests and dividends.

The results reveal that all five non-labor income components have made a strong positive contribution to the gain in growth rates in social welfare. The implication of this result is that all five components of non-labor income have been highly pro-poor, benefiting the poor more than the non-poor. Thus the rapid reduction in inequality has been observed in Brazil because of the pro-poorness of all income components of both labor and non-labor income. Even the non-social income has been pro-poor.

Table 4: Trend growth rates of various income sources in Brazil, 1992-2012

	1992-2001	2001-2012	1992-2012
Growth rate in income			
Labor income	1.80	3.61	1.73
Bolsa Família	0.00	20.40	17.18
BPC	22.89	15.48	23.60
Social security	5.87	4.04	4.10
Non-social income	2.10	-0.27	0.16
Non-labor income	5.01	3.75	3.69
Total income	2.44	3.64	2.14
Growth rate in welfare			

Labor income	1.76	4.71	2.44
Bolsa Família	0.00	21.86	18.15
BPC	29.29	21.45	27.10
Social security	4.88	5.67	4.55
Non-social income	6.05	1.02	2.69
Non-labor income	5.32	6.43	5.41
Total income	2.42	5.11	3.06
		Gains/Losses in growth rates	
Labor income	-0.04	1.10	0.71
Bolsa Família	0.00	1.46	0.97
BPC	6.39	5.97	3.49
Social security	-0.99	1.63	0.45
Non-social income	3.96	1.29	2.53
Non-labor income	0.31	2.69	1.72
Total income	-0.02	1.47	0.92

Source: microdata from Pnad/IBGE. Prepared by the authors.

10. Contributions of Income Sources to Inclusive Growth

The previous section measured the pro-poorness of various income sources. Now we gauge the contributions of these income sources to how inclusive is per capita income.

From Table 5, it is noted that the per capita income in Brazil has been increasing at an annual rate of 3.64 per cent over the 2001-2012 period. The contribution of labor income is 2.76 per cent, which means that the labor income has been the dominating factor in enhancing the average standard of living in Brazil. The Bolsa Família, which is the Brazil's flagship welfare program, has contributed only 0.1 per cent to the growth rate of per capita income. The contribution of BPC is even smaller at .06 per cent. After the labor income, social security is the largest program contributing 0.73 per cent to the growth in per capita income.

The social welfare, which is the inequality adjusted per capita income, has been growing at an annual rate of 5.11 per cent leading to a gain in growth rate of 1.47 per cent, which has resulted in pro-poor growth in Brazil. Labor income, contributing 0.81 per cent to the gain in growth rate, has been the major factor that has resulted in substantial increase in pro-poor growth of per capita income in Brazil. The remaining gain in growth rate of 0.66 per cent is contributed by non-labor income.

Furthermore, given the size, the 0.24 per cent contribution of Bolsa Família is notable. This shows that Bolsa Família is a well-targeted program benefiting the poor more than

the non-poor. The contribution of social security, which attracts substantial government subsidy, is only 0.26 per cent, which is relatively small relative to its size.

Table 5: Contributions of income sources to growth rates of per capita income: 1992-2012

	1992-2001	2001-2012	1992-2012
		Growth rate of income	
Labor income	1.50	2.76	1.35
Bolsa Família	0.00	0.10	0.06
BPC	0.01	0.06	0.06
Social security	0.82	0.73	0.67
Non-social income	0.10	0.00	0.01
Non-labor income	0.94	0.89	0.79
Total income	2.44	3.64	2.14
		Growth rates of welfare	
Labor income	1.47	3.57	1.88
Bolsa Família	0.00	0.33	0.21
BPC	0.03	0.18	0.12
Social security	0.71	0.99	0.75
Non-social income	0.19	0.05	0.10
Non-labor income	0.95	1.54	1.18
Total income	2.42	5.11	3.06
		Gains/Losses in growth rates	
Labor income	-0.02	0.81	0.53
Bolsa Família	0.00	0.24	0.15
BPC	0.01	0.12	0.06
Social security	-0.11	0.26	0.08
Non-social income	0.09	0.05	0.08
Non-labor income	0.01	0.66	0.39
Total income	-0.02	1.47	0.92

Source: microdata from Pnad/IBGE. Prepared by the authors.

11. Conclusions

This paper analyzed the relationship between growth patterns in mean income, inequality and social welfare in Brazil during the 1992 to 2012 period. From a methodological point of view, the paper derives a dynamic decomposition using the Gini coefficient which is the most widely used measure of inequality found in the literature. One contribution is the proposal of a measure of social welfare growth, departing from the specification proposed by Sen (1974). Our dynamic social welfare decomposition links growth rates in mean income and in income inequality measured by the Gini index. The proposed methodology is applied to the Brazilian National Household Survey (PNAD) covering the period 1992-2012. The trend growth rates presented in Brazil indicates that mean per capita income increased at an annual rate of 2.4 per cent per annum between 1992 and 2001 which equals the growth of social welfare in the same period which indicates the constancy of inequality. In the subsequent period between 2001 and 2012 the rate of growth in income increased to 3.6 per cent annually. More importantly, per capita welfare increased even more rapidly at an annual rate of 5.1 per cent.

The other contribution of the paper is a decomposition methodology that explores linkages between these components and different income sources from labor earnings to different social programs. It allows to gauge the role played by changes in different income sources. Every income source mean and inequality changes are mapped into social welfare changes. To be sure, we measure the contributions of various income sources to the pro-poorness of the per capita income. Per capita income in Brazil has been increasing at an annual rate of 3.64 per cent over the 2001-2012 period. The contribution of labor income is 2.76 per cent, which means that the labor income has been the dominating factor in enhancing the average standard of living in Brazil.

The social welfare, which is the inequality adjusted per capita income, has been growing at an annual rate of 5.11 per cent. Labor income, contributing 0.81 per cent to the gain in growth rate, has been the major factor that has resulted in substantial increase in pro-poor growth of per capita income in Brazil. The remaining gain in growth rate of 0.66 per cent is contributed by non-labor income.

In the non-labor income source part, Bolsa Família, which is the Brazil's flagship welfare program, has contributed only 0.1 per cent to the growth rate of per capita income.

Furthermore, given the size, the 0.24 per cent contribution of Bolsa Família to social welfare is notable. This shows that Bolsa Família is a well-targeted program. Social security is the largest official spending contributing 0.73 per cent to the growth in per capita income, which means a cost more than sevenfold the one of Bolsa Família but its impacts on social welfare is only threefold the one associated with program.

Overall the empirical analysis demonstrates that some Brazilian official income policies such as Bolsa Família played an important role in promoting income growth among the poorest segments while others are much less well targeted. Nevertheless, the paper shows that labor income played the leading role to explain changes in both mean income and inequality in Brazil.

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