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A Note on the Measurement of Unfair Inequality in Brazil

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Abstract

This paper measures unfair inequality in Brazil using the "responsibility-sensitive" fairness principle. The results show that the levels of fairness in Brazil did not decrease as much as the income concentration levels for the period.

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1. Introduction

The Brazilian economy has been put through remarkable changes in the past few decades. Trade liberalization, price level stabilization and the consequent development of a favorable environment for the adoption of income transfer programs led to a series of non-negligible economic effects, among which changes in the income distribution framework, characterized by improvement in social indicators (e.g., income concentration, poverty, and welfare) are of special note.[1]

According to a strict egalitarian fairness ideal, this scenario allows concluding that Brazil has become a fairer country. However, not even modern egalitarians, such as Rawls (1971), regard perfect equality as an ideal parameter for fairness. Inspired by the Rawlsian tradition, authors such as Sen (1985) and Roemer (1998) advocate that income varies (is unequal) as a function of different needs, efforts, or preferences.

A usual criterion described in the literature assumes that individuals' outcomes are determined by "responsibility" and "nonresponsibility" factors (Roemer, 1998). In other words, part of an individual's income is the result of her effort (e.g., investment in human capital), also known as "responsibility" factors; another part of the income is influenced by circumstances (e.g., social background), also known as nonresponsibility factors.

An indirect implication of this criterion is that only inequality caused by differences in circumstances, or in nonresponsibility factors, is socially undesirable (Devooght, 2008). Based on these arguments, the egalitarian rule is relegated to second place, giving rise to the "responsibility-sensitive" principle of fairness.

Therefore, the relationship between continued reduction in Brazil's income inequality and greater social justice is brought into debate, given that a possible disregard for effort inequalities is likely to steer the country into a rather unfair scenario.

The aim of this study is to measure the level of unfairness in Brazil between 1995 and 2009. To do that, the present paper uses the "responsibility-sensitive" concept proposed by Bossert (1995), Konow (1996), and Cappelen & Tungodden (2007), and the distance measure between the fairness rule and the observed income inequality developed in Cowell (1980).

2. Method and Empirical Strategy

This section introduces the criterion for the determination of the fairness rule proposed by Bossert (1995), Konow (1996), and Cappelen & Tungodden

[1] See Figueiredo & Ziegelmann (2009).

(2007), and the statistical method for the measurement of unfair.

2.1 Individual Fairness Levels

Consider a society with $N = \{1, ..., n\}$ individuals. Each individual i is characterized by a pair (y_i, z_i), where y_i is the observed income and z_i is the fair income. Bearing in mind an egalitarian society, the fairness parameter is denoted by $z_i = \mu$, with $\mu = n^{-1} \sum_i y_i$. In other words, deviations of the observed income from the distribution's mean income, $u_i = y_i - z_i$ are considered to be unfair.

The main problem with this criterion is that it does not take into account the differences in merit among individuals. Because of this limitation, let us assume that the current income y_i of individual i is a function of responsibility and nonresponsibility (or environment) factors, respectively r_i and e_i, so that $y_i = f(r_i, e_i)$ (Roemer, 1998). Following Bossert (1995), Konow (1996), and Cappelen & Tungodden (2007), individual i's fair income, z_i, is given by:

$$z_i = \frac{g(r_i, e_1, ..., e_n)}{\sum_j g(r_j, e_1, ..., e_n)} \sum_i y_i. \qquad [1]$$

Where $\sum_i y_i$ is the sum of income in society, subscript i and j indicate that the variable belongs to individual i and j, respectively, and the individual's claim, $g(r_i, e_1, ..., e_n)$, is given by:

$$g(r_i, e_1, ..., e_n) = \frac{1}{n} \sum_j^n f(r_i, e_j).$$

As already defined, $f(r_i, e_i)$ is the income of an individual with responsibility characteristics r_i and nonresponsibility characteristics e_i. Thus, $f(r_i, e_j)$ is the virtual income of a person with the responsibility characteristics of person i and the nonresponsibility characteristics of person j. That is, an individual's claim is given by what the average income in a hypothetical situation would have been if everyone had the same responsibility factors as this individual. Hence, an individual's claim not depends on the non-responsibility factors of all the individuals in the economy, but only on the individual's own responsibility factors (Almås, 2008).

Empirically, $f(r_i, e_i)$ will be estimated by the log-linear equation:

$$\log y_i = \beta r_i + \gamma e_i + \epsilon_i. \qquad [2]$$

However, some remarks need to be made on its specification. First, it is not always possible to have a well defined set of variables (r_i) and (e_i), such as information on family background. So, the major problem with (2) is the

treatment given to error term (ϵ_i) which, in theory, represents brute luck, but now includes both responsibility and nonresponsibility factors owing to the omission of relevant variables.

Thus, Devooght (2008) uses a normative criterion which includes (ϵ_i) in the set of compensation variables (e_i). That is, $\log f(r_i, e_i) = \beta r_i + \xi_i$, with $\xi_i = \gamma e_i + \epsilon_i$. To achieve that he substitutes (2) into (1), obtaining:[2]

$$z_i = \frac{\exp(\beta r_i)}{\sum_j \exp(\beta r_j)} \sum_j y_j. \qquad [3]$$

Parameter (3) is built upon the following concept of fairness: population groups are defined according to their responsibility variables, and any within-group inequality is deemed unfair. This means that if hours worked is regarded as the only responsibility parameter, r_i, all individuals who work the same number of hours should have the same income level. If this pattern is broken, any income inequality will be unfair (see Devooght, 2008, Almås, 2008, and Almås et al., 2010).

2.2 Distance between Distributions

As soon as the fairness rule is concerned, one should find a tool that can measure its distance from the observed income inequality. As stressed in Devooght (2008), this type of investigation requires an indicator that sets itself apart from the anonymity principle. It is then suggested that the distance measures between distributions, initially proposed by Cowell (1980), be used.

Hence, let y and z be the current and fair distributions, respectively. As shown in Cowell (1980, 1985) and Jenkins and O'Higgins (1989), for construction, both distributions have an equal mean ($\mu = \bar{z}$). Thus, the distance between distributions can be measured by:

$$J_\alpha(y, z) := \frac{1}{n\alpha(\alpha - 1)} \sum_{i=1}^{n} \left[\left(\frac{(y_i)^\alpha (z_i)^{1-\alpha}}{\mu} \right) \right], \qquad \alpha \neq 0, 1. \qquad [4]$$

Where α is a sensitivity parameter. When $\alpha \to \infty$, sensitivity to changes is heightened in the upper tail of the distribution; otherwise, $\alpha \to -\infty$, sensitivity is greater in the lower tail of the distribution. Usually, for $\alpha \to 0, 1$, we have:

[2] Let $C_i = \exp(\beta r_i)$ and $D_i = \exp(\gamma e_i + \epsilon_i)$, so $f(r_i, e_i) = C_i D_i$. Then $g(r_i)/\sum_j g(r_j) = n^{-1} \sum_j C_i D_i / (\sum_h n^{-1} \sum_j C_h D_j) = C_i \sum_j D_j / \sum_h C_h \sum_j D_j$. Since $\sum_j D_j$ is a constant, this simplifies to $C_i / \sum_h C_h$ (Almås, 2008).

$$J_0(y,z) = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{z_i}{\bar{z}}\right)\log\left(\frac{z_i}{y_i}\right). \quad [5]$$

$$J_1(y,z) = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\mu}\right)\log\left(\frac{y_i}{z_i}\right). \quad [6]$$

For a z equal to distribution mean μ, $J_\alpha(y,z)$ converges to the Theil mean log deviation index.

3. Results

The data used in this study were obtained from the Brazilian National Household Survey (PNAD). The collected data refer to information on male household heads, or spouse, aged 25 to 65 years, who lived in urban areas of all Brazilian regions.

The analysis is carried out as follows: i) the earnings equations are estimated to obtain the parameters of the log-linear equation (2). An OLS regression is considered, using the logarithm of real income of all work as dependent variable and years of schooling, working hours, migration dummy, and experience (defined as age - years of schooling - 6), as explanatory variables (responsibility); ii) then, rules (3) are calculated, considering the error as compensation variable; iii) finally, the unfairness level is inferred using the class of distance measures.

The calculation of distance measures (5 and 6) for years 1995 to 2009 is summarized in Table 1. The results in the first column, $J_0(y,z)$, indicate that the distance between current income and the fairness rule fell by 6% between 1995 and 2009. This decrease is small compared to that of the Theil index (around 16%) in the same period. Nevertheless, the results are different when a greater weight is given to the upper tail of the distribution, $J_1(y,z)$. In this case, the distance between the current and fair distributions increases by approximately 13%.

These results allow building three scenarios for the analyzed period: 1) under strict equality, Brazil has become a fairer country; 2) with the use of a responsibility-sensitive fairness rule and an indicator with heavier weight on the lower tail of the distribution, the fairness level improved, but was still lower than that in scenario 1; 3) when the upper tail of the distribution is given a greater weight, the country becomes fairer.

To corroborate these results, distance measures (4) were calculated using sensitivity parameters $\alpha = -1, 2$. That was achieved by giving the lower and upper tails of the distribution heavier weights, respectively. The results

Table 1: Inequality Levels: Unfairness and Theil Index– 1995-2009

	Brazil		
Year	$J_0(y,z)$	$J_1(y,z)$	Theil
1995	0.3389	0.0744	0.5377
1996	0.3172	0.0721	0.5244
1997	0.3380	0.0730	0.5302
1998	0.3301	0.0768	0.5300
1999	0.3245	0.0732	0.5287
2001	0.3303	0.0768	0.5236
2002	0.3334	0.0781	0.5242
2003	0.3296	0.0800	0.5134
2004	0.3301	0.0798	0.4989
2005	0.3283	0.0806	0.4958
2006	0.3109	0.0746	0.4875
2007	0.3081	0.0722	0.4683
2008	0.3129	0.0785	0.4607
2009	0.3181	0.0839	0.4524

Note: With error term included in nonresponsibility variables.

did not change significantly, though. Distance $J_{-1}(y,z)$ showed a decrease of around 8%, from 0.6302 in 1995 to 0.5830 in 2009. On the other hand, $J_2(y,z)$ increased by nearly 9% (from 0.8470 in 1995 to 0.9291 in 2009).[3]

Regardless of the distance measure, the unfairness level did not decline as significantly as the levels of inequality did. This behavior was unexpected, as a more equal income distribution is necessarily believed to be fairer. Under a more specific approach, it could be stated that income transfer programs, implemented after economic stabilization, are efficient in reducing inequality and poverty levels, as advocated by Barros et al. (2001), but they do not eliminate unfairness.

This behavior might result from the fact that the design of Brazilian public policies (fiscal, educational, or income transfers) overlooks fairness elements. These issues are not dealt with in the international literature, except in Aaberge & Colombino (2011), Betts & Roemer (2005), Fleurbaey & Maniquet (2011), among others.

[3]It is important to highlight that the measure is sensitive to the choice of α. The difference between the measures is also reported by Cowel et al. (2009).

4. Final Remarks

This study sought to measure the level of unfairness in Brazil between 1995 and 2009. To do that, a responsibility-sensitive fairness rule, as proposed by Bossert (1995), Konow (1996), and Cappelen & Tungodden (2007), and the distance measure between the fairness rule and the observed income inequality, as developed in Cowell (1980), were used. The results reveal that the determination of the fairness level of the Brazilian economy relies on normative choices. Under strict equality, Brazil has become a fairer country. However, this conclusion does not hold when a responsibility-sensitive fairness rule is adopted.

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