BRAZILIAN POVERTY BETWEEN AND WITHIN GROUPS: DECOMPOSITION BY GEOGRAPHICAL, GROUP-SPECIFIC POVERTY LINES

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Abstract

This study investigates Brazilian poverty by exploiting geographical differences in the cost of living and questions whether the standard approach in measuring poverty is informative enough when the population is heterogeneous. To do so, we apply the reformulation of the FGT class of poverty measures proposed by Chiappero and Civardi (2006). This decomposition aims to compute poverty within groups, using group-specific poverty lines, and poverty between groups by adopting a community-wide poverty line. The North and the Central-West reveal a dominance of the within component. The North-East shows the highest level of poverty, even higher than the North and the Central-West, but the high within group component is counterbalanced by a higher between group component, attributable to the high level of inequality of the North-East. The South and the South-East have between group components that dominate over within group ones. Our findings suggest that the analysis of poverty between and within groups is more exhaustive than the standard methodology when differentiated poverty lines are exploited.

Keywords: poverty between and within groups, geographical disparities, Brazil

JEL codes: I3, I32

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1 Introduction

The purpose of this study is twofold: first, to investigate Brazilian poverty by exploiting geographical differences in the cost of living. Second, it questions whether the standard approach to measuring poverty is informative enough considering that the population is clearly not homogenous.

Brazil is a country with huge regional disparities. In 2002, 56% of real Brazilian GDP was generated by the most economically developed region of Brazil, the South-East, including metropolitan areas such as Rio de Janeiro and São Paulo. By contrast, the two most depressed regions of the country, the North and the North-East, together produced only 0.6% of national GDP.[1] Regional differences are sharp not only in terms of GDP values or income distribution data, but also in terms of social and demographic variables, such as ethnicity and family structures.[2] Hence, the study of these geographically-specific discrepancies becomes crucial for the understanding of causes of poverty and targeting more focused policies.

The adoption of differentiated poverty lines provides a more complex picture of the poverty situation, and it has been applied in the literature on poverty measurement.[3] However, so far empirical studies adopting differentiated poverty lines have provided poverty evaluations simply as a result of a simple aggregation of poverty outcomes for each homogenous group, defined by the set of group-specific poverty lines adopted.

The implementation of this approach recognizes the importance of applying group-specific poverty thresholds. What is lacking in this kind of application is the detection of poverty resulting from comparison between groups, using a community-wide poverty threshold.[4]

Chiappero and Civardi (2006) propose a reformulation of the three most famous poverty indexes, better known as the Foster, Greer and Thorbecke (FGT) class

[1] These values are taken from the IBGE publication, *Conta Regionais do Brasil*, 2002, IBGE(2005).

[2] There are several studies showing that in Brazil non-monetary features are not equally distributed as income. For example, Justino, Litchfield and Niimi (2004) analyze the uneven distribution of education, health status and political participation.

[3] Regarding Brazil, Ferreira, Leite and Litchfield (2006) and Ferreira and Litchfield (2001) analyze poverty adopting differentiated poverty lines (Litchfield 2001). Bottiroli-Civardi and Chiappero-Martinetti (1999) study the Italian poverty situation by applying a set of differentiated poverty lines.

[4] The importance of investigating on differentials not only within groups but also between groups has been widely explored by Stewart (2001) in her paper on horizontal inequality.

of measures,[5] that aims at decomposing poverty within and between homogenous groups by implementing differentiated poverty lines.

After comparing each individual position within its homogenous group using the group-specific poverty line, people belonging to different groups are compared to each other by adopting a community-wide poverty line in order to capture poverty between groups.

This alternative conceptual and analytical approach to poverty measurement has potentially remarkable implications especially where the differentiation among poverty lines is very significant.

To the best of our knowledge, this is the first work that applies Chiappero and Civardi's 2006 poverty indexes reformulation to Brazilian data. We aim to discover whether the computation of poverty between and within groups provides valuable information on Brazilian heterogeneity. The attraction of this reformulated measures is that it allows us to look at poverty situation for each group singularly, captured by the within-group component, but also to get a rough measure of the importance of poverty across groups by applying a community-wide threshold, as the between-group component tell us how poor people are relative to other groups. The significance of poverty between groups is sometimes overlooked also when differentiated poverty lines are adopted. This has significant negative implications for our understanding and for making policy. As such this paper seeks to investigate the value of a more inclusive approach.

To run our empirical exercises we use the 2002 Brazilian households survey, *Pesquisa Nacional por Amostra do Domicilios* (PNAD). The dataset contains information on incomes and other socio-economic data available for Brazil and is collected annually by the *Instituto Brasileiro de Geografia e Estatística* (IBGE).

Since geographical location is one of the most relevant determinants of Brazilian heterogeneity, we exploit this criterion in our empirical analysis to establish homogenous groups and their related poverty lines. The construction of differentiated poverty lines based on this criterion divides the population into geographically-specific homogeneous groups. To do so, we apply Rocha's 2003 estimation of absolute poverty lines.

[5] In their work, Foster, Greer and Thorbecke (1984) aggregated in an unique formula the most common well-known poverty indexes, such as the Headcount Ratio, the Poverty Gap and the Squared Poverty Gap by weighing for a parameter α. Later on in this section, this procedure of aggregation is better described.

In this respect, two important remarks need to be highlighted. By adopting geographically-specific poverty lines we recognize the geographical feature, such as living in a specific region and in an urban or rural area, as the only source of heterogeneity of the Brazilian population. We understand that this approach might be too narrow and we recognize that the geographically-specific groups are far from being homogenous in terms of other criteria, such as household type, educational level or ethnicity. However, this work aims to investigate poverty within and between groups by focusing on geographical disparities as a typical feature of the Brazilian society. Moreover, Rocha's geographically-specific poverty lines are absolute poverty lines. Hence this study only looks at absolute poverty within and between groups and does not consider any notions of relative poverty, but it analyzes how the persistence of inequality might have an impact on the levels of absolute poverty, in particular on the between-groups component.

Starting from geographically-specific absolute poverty lines, we investigate Brazilian poverty using standard methodology. Then, by applying Rocha's differentiated poverty lines and the reformulation of FGT class of poverty indexes, we focus on the extent to which the between- or within-group component of poverty is able to explain the pattern of regional disparities in Brazil. Hence, we run two different empirical exercises, first at the national level and then at the regional level.

Our findings suggest that when differentiated poverty lines are exploited the analysis of poverty between and within groups is more exhaustive than the standard methodology. In the empirical exercise at the regional level, we find that in the North and the Central-West the within-group component is dominant because of the high level of absolute poverty within all homogenous groups. On the other hand, the South-East and the South show the dominance of the between-group component. Finally, the North-East follows a pattern similar to the North and the Central-West, though with a lower contribution of the within-group component: this might be due to the high level of inequality which causes the between-group component diminish the within-group effect.

These results throw new light on the intricate relation existing between poverty and inequality. By looking at absolute poverty levels within and between groups it becomes clear how inequality affect the level of poverty between groups.

The structure of this paper is as follows. Section 2 depicts Brazilian poverty analysis. Section 3 explains the conceptual and analytical framework that we have

adopted. Section 4 proposes the empirical results by computing poverty between and within groups. Finally, Section 5 concludes.

2 The profile of Brazilian poverty

Brazil is a country characterized by dramatic differences among geographical regions and these gaps have persisted across more than fifty years of Brazilian history (Baer, 2001).

The dataset employed is constructed on the basis of the annual Brazilian household survey, *Pesquisa Nacional por Amostra do Domicilios* (PNAD) for 2002.[6] We decide to consider 2002 as relatively stable economic period with constant economic growth and stabilized prices after decades of macroeconomic adjustments.[7] From this survey we take nominal household monthly income as the measure of welfare, as it includes income from employment or self-employment, social insurance transfers for old-age, disability or survivor's pensions, sickness and maternity benefits, work injury and unemployment benefits and family allowances. Finally, monthly income also considers other sources of income such as rental incomes, dividends or interest payments on savings and investments.

Since income data refer to households rather than to individuals, technical adjustments should be applied in order to evaluate intra-household welfare. The adjustment of household income by adopting equivalence scales[8] improves the reliability of the data because it takes into account the potential heterogeneity of individuals within households and the effect of economies of scale.

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[6] The PNAD is based on a nationally representative random sample of households and adopts a three-stage sampling procedure, by selecting municipalities, census sectors and, finally, households. While some municipalities are automatically included, some rural municipalities in the Northern states of Rondônia, Acre, Amazonas, Roraima, Parà, Amapà, are excluded because of their very low population density and their location in remote areas of the Amazonas. Moreover, it is estimated that these excluded municipalities count just for the 2.1% of the entire Brazilian population. In order to guarantee the representativeness of the sample, population weights are estimated. Hence, the PNAD for 2002 counts 409,152 individuals aggregated into 102,500 households, but the weighted individuals are 166,270,000.

[7] See Ferreira, Leite and Ravallion (2007), Ferreira, Leite Litchfield (2006) and Rocha (2004).

[8] When expenditure data are used, equivalence scales are mostly estimated by the adoption of two different techniques: the Rothbarth method, based on expenditure data on goods consumed by children versus adults, and the Engel method, based on the relation of food expenditure versus total expenditure. For further discussion, see Deaton (1997, section 4.3). When income data are exploited, the most common and simplest technique is to compute per capita income. Besides that, the most common equivalence scales applied to income data requires weighting the household size, n, to a parameter θ that is defined among [0,1] (Buhnmann et al., 1988)

However, the majority of studies on Brazilian poverty have tended to avoid adjustment via equivalence scales and to prefer per capita values, although the simple per capita adjustment tends to overestimate poverty, as stressed by Glewwe and Van der Gaag (1990). For comparative reasons, in this study we adopt per capita income following the mainstream in the Brazilian literature (Rocha, 1997).

Before going deeper into Brazilian poverty issues, it is worth looking at general economic indicators for Brazil and its regions.[9] Table 1 provides some summary statistics for the entire nation and for each geographical region showing mean and median income values as well as the most common inequality indicator, the Gini coefficient.

The huge differences across Brazilian regions are strikingly portrayed in Figure 1. Looking at the level of income, the poorest region is the North-East followed by the North, the South and the Central West.[10] The South-East is the richest geographical region of the country with a median per-capita income twice that of the North-East region.

This pattern of regional disparities is well-known in Brazilian history. During the last century, the South-East region has always dominated of the regional distribution of national income, while the North and the Central-West were typically the most deprived regions.[11] This allows us to recognize the important jump in terms of contribution to Brazilian GDP made by the North and the Central-West regions and, at the same time, to detect a worrying depression for the North-East.

The distribution of income among regions tracks a trend similar to the one obtained from the levels of income. In fact, the most unequal region is the North-East with a Gini coefficient even higher than the value for the whole country. The Central-West ranks second, followed by the North, then the South-East and, finally, the South.[12] In

[9] In the PNAD survey, the choice of geographic locations is among 27 different municipalities. To analyze Brazilian situation by region, these municipalities have been aggregated in the five geographical regions: the North (Rondônia, Acre, Amazonas, Roraima, Parà, Amapà and Tocantis), the North East (Maranhão, Piauì, Cearà, Rio Grande do Norte, Paraìba, Pernambuco, Alagoas, Sergipe, Bahia), the South East (Minas Gerais,pìrito Santo, Rio de Janeiro, São Paulo), the South (Paranà, Santa Catarina, Rio Grande do Sul) and the Central West (Mato Grosso do Sul, Mato Grosso, Golàs, Distrito Federal).

[10] The ranking between the South and the Central-West varies with the definition of income we look. Using per capita income the South is richer than the Central West, but if we use other two equivalent income values, we find the reversal.

[11] A detailed description of changing in regional differences during the past century is well reported in Baer' book (Baer, 2001, chapter 14).

[12] In particular, if we use per capita income, the ranking is clear: from the most unequal we have the North-East, the Central-West, the North, the South-East and, finally, the South. When we use both

order to deepen the investigation of Brazilian distribution of income, Table 2 shows mean incomes per decile by region.

One additional important issue should be stressed before moving to poverty indexes analysis. As reported in many publications,[13] the data coming from national household surveys are often very different to data elaborated by the National Accounts system.

Table 3 reports total GDP and monthly per capita GDP in 2002 Reais[14] provided by National Account data. National accounts reveal sharp differences in regional contributions to GDP, which is consistent with the findings coming from survey data. But, in terms of value, the Brazilian per capita income reported by the National Accounts, is roughly twice the per capita income of that computed using survey data.

Finally, in the last row of Table 3, the growth of total value added is provided accumulated by period 1994-2002. The reported values confirm what we have already seen, i.e. the North and the Central-West are the two regions showing greater economic improvements.

The investigation of Brazilian welfare through levels and distribution of income among regions should provide a more informative analysis when coupled with a detailed poverty profile study. Moving toward poverty analysis, the identification of poor people can be conducted only when poverty lines are set. In this study we adopt a set of absolute poverty lines constructed by Rocha (2003) on the basis of geographical differences, in order to highlight regional differences.

Studies of Brazilian poverty have used several definitions of poverty lines, mostly based on the concept of absolute poverty. The most common method for defining Brazilian poverty lines has been the adoption of the minimum wage or its multiples.[15]

With more available consumption data, poverty lines can be assessed by using information on the structure of household consumption. However, the only two

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equivalent incomes, the ranking is, always starting from the most unequal: the North-East, then the Central-West and the North come together and, finally, together again, the South-East and the South.

[13] For further discussions on discrepancies between National Account data and Household Survey data, see Deaton (1997, section 1.2). Litchfield discussed this issue specifically for Brazil stressing the problem in comparing incomes coming from these two types of dataset (Litchfield, 2001, page 51).

[14] In the reference week of the 2002 PNAD survey, the exchange rate US dollar against Brazilian Reais was 3.12.

[15] Referring to Rocha (2003), among the most famous studies that constructed poverty lines on the basis of the minimum wage, we should remember Pfeffermam and Webb (1983), Hoffmann(1984), Fox and Morley(1991) and Tolosa (1991).

expenditure surveys that are available in Brazil are the *Pesquisa de Orçamentos Familiares* (POF) for 1987/88 and the *Estudo Nacional de Despensa Familiar* (ENDEF) for 1974/1975. Looking at the literature that has tried to estimate Brazilian poverty lines based on consumption data,[16] the choice of measuring poverty taking by geographically differentiated poverty lines is well-established and it provides more reliable results.

Rocha estimates geographically-specific poverty lines on the basis of the cost of basic needs approach.[17] This approach estimates the minimum cost of food required to achieve the recommended calorie intake.[18] Obviously, food baskets vary across geographical locations, such as municipalities, metropolitan areas, urban and rural areas, since preferences and prices change substantially. Rocha (2003) estimates the minimum cost of food baskets for nine metropolitan areas by using the POF survey and then she estimates values for urban and rural areas by the implementation of conversion factors provided by Fava (1984) and based on the ENDEF survey. For the non-food expenditure component, Rocha estimates adjusted values for each metropolitan area, avoiding the standard method that exploits the inverse of the Engel coefficient (Rocha, 1997). Thus, the final value of each geographically-specific poverty line is the sum of the food and non-food components. In her recent book (2003), Rocha reports 24 specific poverty lines at 1990-99 current prices.

In order to measure poverty by region, we need to match Rocha's poverty line areas with the five geographical regions, as reported in Table 4. The values of these poverty lines are in 2002 prices: the conversion has been made using the CEPAL deflator equal to 166.1 with 1995 as base year (ECLAC, 2004).

By applying Rocha's poverty lines, we are able to compute the poverty indexes for Brazil and each of its regions, together with their standard errors shown in Table 5. Looking at regional differences, the pattern that we find in income distribution analysis is reproduced.

The North-East region is not only the most unequal region but also the poorest. The North and the Central-West follow, both with values substantially above the Brazilian

[16] Referring to Rocha (2003), the first poverty lines estimations based on consumption data are Thomas (1982) and Fava (1984). Rocha (1988) estimates poverty lines using consumption data derived from ENDEF. Then, following studies adopted consumption data coming from the POF, such as Rocha (1993) and Rocha (2003).

[17] On the Basic Need approach, see Streeten (1981).

[18] The minimum caloric requirement is estimated by FAO (1985), as Rocha indicated in her book (Rocha, 2003, page 54).

average. Finally, the South-East and the South are the regions that contain the fewest poor people. Figures 2, 3 and 4 give an even clearer picture of regional differences by poverty index.

After computing Brazilian poverty and income distribution via simple descriptive statistics, the investigation on the main characteristics of poor people by geographical region has been found necessary. The poverty profile for Brazilian households is provided in table 6. It follows the methodology previously used by Fishlow (1972) and simply takes the Headcount ratio and analyzing the characteristics of household heads below the poverty line for each region.

We explore several individual characteristics of the household head, such as gender, age, race and level of schooling, as well as characteristics of the household head related to her employment situation, i.e. whether she is active, whether she works in the formal sector, and if so, in which economic sector and in which position. More general characteristics related to the whole family are also considered. The first one is the geographical location within regions, including urban or rural status. We also consider other family characteristics, i.e. the family size, the number of workers and children per family.

The personal characteristics of the household head do not vary much by region. On average, household heads among the poor are men aged between 35 and 45 years with an intermediate level of schooling.

The main difference among regions when looking at personal characteristics of the household head is *race*. Not surprisingly, the majority of the Brazilian poor are black, while the non-poor are white: hence skin colour can be considered as a crucial determinant of poverty in Brazil.[19] Focusing on regional patterns, in the North and North-East the majority of the population is black, so both poor and non-poor people are predominantly black. The reverse is true in the South, where the population is primarily white. The South-East and Central-West follow a similar pattern to that of the country as a whole: the majority of the black population is poor, while the majority of non-poor population is white.

Level of education is another crucial characteristic of the Brazilian poverty profile. Almost all the household heads among the poor have mid level education. But very

[19] Giving the fact that racial discrimination is a fundamental problem in Brazil, a number of papers have investigated Brazilian income inequality and poverty by race, such as Lovell (1999), Telles (2006) and Wood (1991).

few people have attended high school and in the profile we produce, no poor household heads have attended college. These findings are in line with other empirical studies on social conditions in Brazil showing that low returns to secondary school education and a lack of access to graduate and postgraduate education for the majority of the population are the most important determinants of Brazilian inequality and poverty.[20]

As a likely consequence, the majority of the poor household heads work in blue collar professions without any significant variations across regions.

Moving to other characteristics related to the labour market, we notice that the majority of the poor household heads are economically active. Obviously, having a job cannot be deemed as a cause of poverty; the mechanism behind our empirical findings can be hypothesized to be that it depends primarily on the position of occupation and on the economic sector. While occupational position is almost constant across regions, the *economic sectors* where poor household heads are employed varies across regions. We can individuate two main groups: in the North and in the North-East, poor household heads predominantly work in agriculture and trade; while in the South, the South-East and the Central-West, poor people are employed not only in the agricultural and commercial sectors, but also in construction and industry, particularly in the South.

The characteristic *formal* identifies if the household head works in the formal sector. The percentage of people working in the informal sector is always more than one third and is higher for poor people. Particularly, it is noticeable that in the North we find that the majority of poor people are employed in the informal sector.

The variable *urban* shows how the Brazilian poor are concentrated in urban areas.

Looking at characteristics related to family structure among poor people, the *family size* variable considerably varies across regions: in the North and in the North-East the majority of poor families have over 6 members, while, in the rest of Brazil, poor families consist on average of four or five individuals.

Although the majority of Brazilian households have two or three workers, families with one worker are more likely to be poor than families with two or three workers. As a consequence, poor families are likely to show higher dependency ratios

[20] A large literature on Brazilian welfare focuses on education as the major determinant of income inequality and poverty, for example Ferreira and Paes de Barros (1999) and Ferreira and Litchfield (2001).

computed as family size over number of worker because poor individuals belong to larger households with fewer workers. Also the number of children per family varies considerably between poor and non poor families. On average poor families tend to have two or three children while the majority of non-poor Brazilian families do not have children or have only one.

3 A reformulation of the FGT class of poverty measures

The standard approach to measuring poverty consists of computing the well-know FGT class of measures by using a unique poverty line, i.e. the critical threshold below which one can be considered poor.[21]

The definition of a poverty line implies crucial methodological choices that significantly affect the overall figures of poverty analysis as well as the sketched poverty profile. This threshold can be set by adopting a one-dimensional indicator of welfare, such as income or consumption. However, there is a growing consensus within the economics community in favor of the adoption of a wider concept of welfare that might include more subjective criteria, from education, health and housing to vulnerability and dignity.[22]

In this study we have chosen to measure poverty using a one-dimensional indicator of welfare, but this still involves several important choices. First of all, we take into account the often debated choice between income and consumption. As stressed by Deaton (1997) and by Ray (1998), consumption is generally preferred to income for two fundamental reasons: consumption accounts for self-owned production and non-employed income and is a long-term measure of welfare not affected by fluctuations in income.[23] For studies of Latin American countries income is generally used due to the greater availability of data, whereas in other developing countries consumption data is more often available. The underreporting of overall welfare implied by the adoption of income as an indicator instead of consumption

[21] See the World Development Report 2000/2001: Attacking Poverty (World Bank, 2000).

[22] Plenty of economists have explored different notions of well-being in contrast with the money-metric approach. Surely, the most important references are Sen's works (1976, 1983b, 1985, 1992). The literature spans from Lipton and Ravallion (1995) and Baulch (1996) to the new multidimensional poverty approach, such as Bibi (2003), Atkinson (2003) and Bourguignon and Chakravarty (2003).

[23] Although consumption is generally preferred because its consistency with the life-cycle theories of consumption, it might not hold when a lack of access to insurance and credit markets is detected, as is likely in developing countries and more broadly speaking in the most vulnerable and deprived part of the population (Lipton and Ravallion, 1995).

characterizes Latin American household surveys, including the Brazilian survey, and should be taken into account when interpreting data and outcomes (Wodon et al, 2000).

A second and even more contentious issue related to the definition of the poverty line is the choice between absolute versus relative poverty lines. The absolutist concept of poverty embraced by Sen (1983a) starts from the fundamental assumption that there is a certain level of needs below which it is not possible to survive, while the relative concept is anchored to the income levels, or consumption levels, of other individuals in a given country.

The choice between a unique poverty line and a set of differentiated poverty lines is the third critical issue. The limitations in adopting a unique poverty line are well-explored by poverty literature and Chiappero and Civardi (2006) suggest the implementation of differentiated poverty lines for homogenous population groups.

The most evident weakness in considering the whole population as an homogenous group, and using an unique threshold for poverty measurement, is that it fails to acknowledge one of the most important characteristics of the real world. The heterogeneity of individuals and households among the entire population cannot be ignored: differences in personal characteristics and in the social environment affect the level and composition of needs and, as a consequence, the level of deprivation.

The hypothesis of the "representative agent" in the context of poverty analysis does not take into account the existence of many dissimilar personal and household characteristics as well as different socio-economic contexts. In studying levels of poverty and welfare we should keep in mind that individuals usually compare their condition to other analogous situations, thus the idea of relative deprivation cannot be ignored and methodological tools should take this into account in order to sketch more reliable poverty profiles.

In their work, Chiappero and Civardi (2006) propose a conceptual framework that considers the potential heterogeneity of individual and households and advances a new analytical approach by reformulating the FGT class of measures for absolute, relative and hybrid[24] poverty lines.

Their methodology can be summarized in four steps. A set of homogenous groups can be identified following a specific criterion. Then a specific (absolute or relative)

[24] For further information on the notion of hybrid poverty lines, see Citro and Michael (1995).

poverty line has to be defined for each homogenous group. The third step involves the choice of a common community-wide threshold. Finally, the level of poverty is measured via this reformulation of the FGT class of poverty indexes that is able to capture the within- and between-group components.

This method for computing poverty generates a poverty analysis that conveys not only how much poverty there is within each homogeneous group, but also how much poverty exists between different groups.

The within-group component identifies poverty existing in each homogenous group once its own group-specific poverty line is applied. The outcomes from the within component computation are equal to poverty outcomes resulting from the standard FGT class of measures using differentiated poverty lines.

The between-group component tells us to what extent individuals from each homogenous group are deprived relatively to a community-wide poverty line. This community-wide poverty line is basically a poverty line taken as a reference for comparison between groups. This reference point can be a conventional threshold computed as a given percentage of the mean or median income or estimated from consumption behavior, or it can be a poverty line chosen from the set of differentiated poverty lines assigned to the homogenous groups (Chiappero and Civardi, 2006).

There are many criticisms that might arise once this new approach is analyzed. The problem of "subjectivity" in defining the criteria employed to identify homogenous group is an unsolved topic. The problem in choosing relative versus absolute poverty lines is still present. When relative poverty lines are adopted, poverty outcomes are affected by the degree of inequality existing in the society. Similarly, if all the individuals are above an absolute level of needs, the poverty issue vanishes for even higher level of inequality.

Below we briefly outline the analytical framework of this reformulation, restricted to the case of purely absolute poverty lines. The reason for this restriction is the fact that the empirical exercises proposed in Section 4 adopt only differentiated absolute poverty lines.

We start from the standard FGT class of measures that incorporates the three most common poverty indexes, such as the Headcount Ratio (H), the Poverty Gap (PG) and the Squared Poverty Gap (SPG).

For each $\alpha \geq 0$, this class of measures is usually formulated by

$$P_\alpha(y_j; z) = \frac{1}{n}\sum_{j=1}^{q}\left(\frac{z - y_j}{z}\right)^\alpha, \qquad \text{for } y_j < z, \tag{1}$$

where y_j is a vector of the income of each individual or household j with $j=1....q$ poor individuals among a population of n individuals. The poverty line is identified by z, while the term α is the weight given to income gaps below the poverty line.

When $\alpha=0$ the above formula becomes the Headcount Ratio, P_0, The *Headcount Ratio* gives the incidence of poverty as follows

$$P_0 = H = \frac{q}{n}. \tag{2}$$

If $\alpha=1$ the formula becomes the Poverty Gap, P_1, which describes the intensity of poverty as follows

$$P_1 = PG = \frac{1}{n}\sum_{j=1}^{q}\frac{z - y_j}{z}. \tag{3}$$

Finally, if $\alpha=2$ the measure becomes the *Squared Poverty Gap* or P_2, which gives the severity of the poverty, i.e. the inequality among poor people as follows

$$P_2 = SPG = \frac{1}{n}\sum_{j=1}^{q}\left(\frac{z - y_j}{z}\right)^2. \tag{4}$$

The greater the α term, the greater the weight given to the lower part of the income distribution, hence in the Squared Poverty Gap, incomes far from the poverty line carry more weight.

We assume that the population size, n, can be divided into k groups, mutually exclusive, following a specific criterion that is able to define homogenous groups, i.e. gender, ethnicity or regional location.

For each k group a specific absolute poverty line, z_i, with $i=1…k$, is identified; in this case, an absolute poverty line, z_k, defines a minimum level of basic needs that should be reached for the specific k-group of the population in order to be considered non-poor. Differences in this minimum level of basic needs among groups might depend on differences in their availability and differences in their prices.

This reformulated poverty measures aims to identify a within-group component, i.e. the number of people living below the group-specific poverty line, and the between-group component, which captures the level of poverty within each group when measured against a community wide poverty line.

Let y_j be a vector of household incomes and z_i be the set of differentiated poverty lines, both ranked in a non-decreasing order, the overall poverty $P_{WB\alpha}$ is the sum between the within component $P_{W\alpha}$ and the between component $P_{B\alpha}$ as follows

$$P_{WB\alpha}(y_j; z_i) = P_{W\alpha}(y_j; z_i) + P_{B\alpha}(y_j; z_i). \quad (5)$$

The within component is given by

$$P_{W\alpha}(y_j; z_i) = \sum_{i=1}^{k} P_{\alpha i}(z_i)\frac{n_i}{n}. \quad (6)$$

The within component is then equal to the overall poverty if there is no difference among poverty lines, i.e. $z_1 = z_2 = ... = z_k$.

The between component is formulated by

$$P_{B\alpha}(y_j; z_i) = \sum_{i=1}^{k-1} [P_{\alpha i}(z^*) - P_{\alpha i}(z_i)]\frac{n_i}{n}. \quad (7)$$

where z^* represents the reference point, i.e. the threshold used as a community-wide poverty line. As Chiappero and Civardi (2006) highlight, the between component is positive when $z_i<z^*$ and it is negative when $z_i>z^*$. The reference point z^* can be a conventional value, such as a given percentage of the median income, or a poverty line taken from the given set of k poverty lines.

In our empirical analysis, we decide for the purpose of this study to compare each group to the group with the highest poverty line in order to compute the between-group component, hence $z^*=z^k$. This means that each group is compared with the kth poverty line after having arranged this set in a non-decreasing order and that the between-group component is always positive.[25] The choice to use the group with the highest poverty line as the community-wide threshold is motivated by the extent to the possibility of income redistribution at the national or regional level in order to eradicate poverty.

Although differentiated poverty lines do not necessarily correspond to different standards of living, we can look at them as a frame of reference in detecting those groups that are more privileged than others. Hence comparing each group to the one

[25] The between components show positive values only due to the fact that we choose the highest poverty lines among the set of Rocha's differentiated poverty lines as community-wide reference. Hence, the final values of the reformulated poverty indexes are always greater compared to the values obtained by using the standard FGT class of measures. However, when the community-wide threshold has a values in betweens the values of the differentiated poverty lines that have been employed, the between component can result positive or negative. Hence, in general poverty resulting from the application of the reformulated decomposition is not necessarily greater than values computed with the standard methodology.

with the highest poverty line can give the extent to how far away they are from this selected reference group.

From the policy-maker's perspective, this approach reflects the need for an estimate of the effort needed to reach a convergence among different groups toward a common desirable relatively higher threshold. For this reason, we find appropriate to set the community-wide threshold at the level of highest poverty line.

Now, we can write the reformulation of the three poverty indexes and individuate the within- and between-group components in each case.

The *Headcount ratio* can be written as follows:

$$H_{WB}\left(y_j; z_i\right) = \sum_{i=1}^{k} H_i(z_i)\frac{n_i}{n} + \sum_{i=1}^{k-1}\left[H_i(z^k) - H_i(z_i)\right]\frac{n_i}{n} \tag{8}$$

where the first term identifies the within component, H_W, as a weighted average of the headcount ratios, and the second term represent the between component, H_B, where each headcount ratio is compared with the headcount ratio of the k^{th} group taken as reference group.

Similarly, the *Poverty Gap* is defined by the following formula:

$$PG_{WB}\left(y_j; z_i\right) = \sum_{i=1}^{k} PG_i(z_i)\frac{n_i}{n} + \sum_{i=1}^{k-1}\left[PG_i(z^k) - PG_i(z_i)\right]\frac{n_i}{n} \tag{9}$$

and the *Squared Poverty Gap* is defined as:

$$SPG_{WB}\left(y_j; z_i\right) = \sum_{i=1}^{k} SPG_i(z_i)\frac{n_i}{n} + \sum_{i=1}^{k-1}\left[SPG_i(z^k) - SPG_i(z_i)\right]\frac{n_i}{n} \tag{10}$$

where, for both indexes, it is possible to identify the within-group component, which is the first term, and the between-group component, which is the second term at the right hand side of both equations.

By computing the values of the additive terms as percentages of the overall indexes, it is possible to check which component is dominant.

When the within-group component is dominant, it means that poverty exists primarily within homogenous groups. Conversely, if the between-group component dominates, poverty between groups is greater than within groups due to significant heterogeneity between groups with respect to the community-wide threshold.

4 Empirical exercises on decomposability of the FGT class of measures

The empirical exercises we present in this section are based on the conceptual and analytical reformulation of the FGT class of poverty indexes carried on by Chiappero and Civardi (2006). The data come from the Brazilian households survey for 2002 and have been summarized in section 2.

Starting from Rocha's 2003 definition of group-specific absolute poverty lines by geographical location, the computation of poverty between and within these groups should provide additional information on poverty in Brazil.

As already mentioned, this poverty decomposition allows us not only to compute absolute poverty levels within each homogeneous group, but also to capture the between-group component that is otherwise ignored.

The within-group component is the sum of the poverty levels calculated for each homogeneous group by adopting its group-specific absolute poverty line. The between-group component emerges by applying the same community-wide threshold to each homogenous group.

Table 7 shows the results of this poverty decomposition after adopting homogenous geographically specific poverty lines, while using the Brazilian group with the highest poverty line used as the community-wide reference group. As a consequence of this empirical design, the between-group component is always positive and provides the aggregate value of additional poverty experienced by each group when compared with the reference group. In particular, this group for Brazil, following Rocha's estimations, is the metropolitan area of São Paulo and its poverty line is adopted as the community-wide threshold for this exercise.

As discussed in the previous section, the choice of setting the community-wide threshold at the level of the highest poverty lines is driven by a specific *ratio*: the policy maker should be interested in working for the convergence of each group toward a common desirable level of welfare. For this reason it is worthwhile to compute how far each group is from this community-wide threshold that is captured by the between-group component, following the methodology we have adopted.

The table reports the total values of the reformulated FGT class of measures together with their within- and between-group components. The absolute value of both

components shown in the table is followed by the share of that component as a percentage of the total value.

The table also records the contribution to both components provided by each region. It is important to highlight that each region is not a homogenous group, since we adopt 25 geographically specific groups. Each region has more than one homogenous group. Analyzing the contribution of each Brazilian region to either the within- or the between-group component might help us to better understand Brazilian regional disparities in analyzing poverty.

The overall values for the reformulated FGT class of measures are greater than the standard FGT values shown in table 5 because of the positive between-group components. The within-group component is dominant for the Headcount ratio, but looking at the Poverty Gap and the Squared Poverty Gap, the between-group component becomes increasingly significant. The measurement of the depth and severity of poverty is more sensitive to the between-group component than is the poverty incidence.

Again, the contribution of each Brazilian region to determining both components can help us to get a more complete picture of the situation. Because the North-East is the region with the highest poverty and inequality levels, it is also the region that makes the largest contribution to both the within- and between-group components.

The second region largest contribution comes from the South-East: this is a quite surprising result. Our previous investigations convey that the South-East is the richest region in terms of mean income, GDP values and traditional poverty measures. Clearly using the reformulated poverty measures adds some important information.

Such differing results are likely due to the fact that both components are weighted by the population share of each region, and the fact that the between-group component is very sensitive to the heterogeneity of the poverty line values. The South-East is the most populated region, and as such its poverty levels are weighted more heavily when the poverty measure takes population shares into account. Moreover, the between-group component of this region is noticeably inflated by the great variability of its set of poverty lines.

A final comment is that the contribution of each region varies across poverty measures. In particular, the contribution of the North-East becomes increasingly significant as we move from the Headcount Ratio to the Poverty Gap and Squared

Poverty Gap, and it diverges increasingly from the South-East and other regions. It seems that when we consider poverty depth and severity the North-East is the region that performs worst.

It is important to highlight a primary reason why between-group components are so dominant in this poverty decomposition exercise. We are using an estimated population from a sample that covers the entirety of Brazil.

Hence we are comparing a large number of geographically homogenous groups with respect to a unique reference for the entire country. Having analyzed the huge differences in poverty and income distribution across the country, the between-group component is predictably dominant when we use a large number of different poverty lines.

In order to run a more detailed exercise, we apply this poverty decomposition for each region; this means applying the same procedures to each of the five geographical regions separately taken, always using the group with the highest poverty line in each region as the community-wide reference group.

As geographic location is one of the main sources of heterogeneity in Brazil, we find it more reasonable to assume that an individual living in, say, Amazons, compares herself with people living there. If she wants to compare herself with different people, she is more likely to compare herself to the wealthiest people living in Belem, the capital of that region, rather than with the wealthiest in São Paulo.

Table 8 provides findings from the poverty decomposition by region separately taken, but following the same structure as table 7. The within-group component dominates for all of the indexes in the North, North-East and Central-West. The pattern changes for the remaining Brazilian regions, where the within-group component gets noticeably smaller, while the between-group component dominates when looking at the depth of poverty for the South and at the severity of poverty for both remaining regions.

So, what we find is that in the North the within-group component dominates due to the high level of poverty in all of the homogenous groups. The North-East has a very consistent within-group component, but the sharp differences among groups generate large values for the between-group components, and noticeably shrink the within-group component, although the latter is still dominant. The South-East shows a small within-group component because of the low level of poverty in this region compared to the two previous ones. Hence the variation given by the between-group

component does not have to be very large to dominate the within-group component. The South shows an even more dramatic situation. Since this region has the lowest level of poverty, it is within-group component is very low. Finally, the Central-West presents a situation similar to the North because of the high level of poverty within each homogenous group.

These findings cannot be immediately intuitive, but we can suggest some observations that might be useful in interpreting this pattern. The dominance of the between-group component is not dependent on the size of the sample for each region, nor on the number of groupings within each region, because the reformulation of the poverty indexes is still weighted by population. That said, the population size of each group belonging to each region is important in determining the weight of both components.

The mapping of the differentiated poverty lines, i.e. the delineation of each homogenous group, also plays a crucial role in determining the dominance of the between or of the within-group component. In particular, the definition of the reference group, and its size in terms of population, is fundamental in establishing the value of the between-group component.

The sensitiveness of poverty lines for each homogeneous group to shifts towards the highest poverty threshold as well as the poverty levels of the homogenous groups with a significant weight in term of population size are crucial factors that affect the extent to which between or within components dominate. The between-group component tends to be large when the community-wide poverty line is significantly higher than the group-specific poverty lines, and when the population of the lower income groups is very large. This circumstance generates the sharpest changes in the poverty measures.

Finally the relationship between inequality and the dominance of the between-group component does not seem to be so straightforward. Inequality among different homogenous groups within the regions determines the dominance of one or the other component.

In the exercise at national level, at the beginning of this section, we infer the existence of a relationship between inequality and the between-group component because inequality deepens potential discrepancies in welfare among heterogeneous groups. This second empirical exercise which decomposes poverty for each region separately taken provides no evidence for a strong relationship between inequality and the

dominance of the between-group component. Were there a strong relationship between inequality and the between-group component, the most unequal regions are expected to have the highest values for the between-group component. The North, North-East, and Central-West show instead a dominance of the within-group component. By contrast, the most egalitarian regions of Brazil, the South and the South-East, show the highest dominance of the between-group component.

In these two regions, the between-group component easily dominates due to the low level of poverty within homogenous groups. When the within-group component is huge, the between-group component needs to be large in order to be able to dominate. When the within-group component is small, the between-group component does not need to be very large to dominate.

To sum up, the within-group component is dominant in the North and the Central-West due to the high level of poverty within each group. By contrast, in the South-East and the South, where poverty levels are lower, the between-group component dominates. The North-East follows a pattern similar to the North and the Central-West but with a lower contribution of poverty within groups. This may be surprising given that the North-East is the region recording the highest level of poverty, and thus would be expected to have the highest contribution of the within-group component across regions. Nonetheless it is also the region with the highest level of inequality and this inequality allows the between-group component to shrink the within-group term. Thus the within-group component is still dominant in the North-East due to the high levels of poverty, but not to the same extent as in the North and Central-West, as the North-East also has a very high level of between-group poverty.

5 Conclusions

The aim of this paper is to apply and interpret the empirical findings arising from the application of Chiappero and Civardi's 2006 poverty measures reformulation to Brazilian household survey data.

The reformulation aims to decompose poverty into between- and within-group components by applying group-specific poverty lines. The empirical exercises have been conducted using Brazilian data and applied geographically specific absolute poverty lines provided by Rocha (2003) to identify homogenous groups. This choice is mainly due to the fact that Brazil is a country characterized by sharp regional discrepancies. Thus geographic location plays a significant role in dividing the country into homogeneous groups.

We run two empirical poverty decomposition exercises. First we consider the whole country and we refer to a unique reference group, the metropolitan area of Brazil, São Paulo. We find that the between-group component dominates due to the huge differences in income between all of the Brazilian homogenous groups and the metropolitan area of São Paolo.

Then, being aware of the deep differences among Brazilian regions, we run the poverty decomposition for each region taken separately, assigning a reference group to each region.

The North and the Central-West analysis reveals a dominance of the within-group component, due to the high level of poverty in these two regions. The North-East shows the highest level of poverty, even higher than the North and the Central-West, but the high within-group component is counterbalanced by a higher between-group component, attributable to the high level of inequality of the North-East. The other two regions both reveal a dominant between-group component. More precisely, the South and the South-East have the lowest levels of poverty, and the between-group component therefore easily dominates the within-group component.

Looking at these findings, we believe that this poverty decomposition approach, using both between-and within-group measures, is more informative than the standard approach when differentiated poverty lines are adopted.

This alternative way of measuring poverty highlights the importance of keeping poverty and inequality analysis separate. Indeed, both analyses are important and they cannot substitute for one other, as argued by Sen (1983a).

This is particularly important with regard to policy implications. When a rise in inequality is detected, policy makers should be more focused on fiscal policies and particularly on policies related to social mobility that could improve income distribution in the long run. By contrast, increases in poverty may demand more immediate interventions to combat destitution and to increase access to basic needs and income.

In summary, we should be aware that behind our analysis of the dominance of the between- or the within-group components of poverty lies a deep understanding of the complex relationship between poverty levels, income distribution and the robustness of poverty lines. This last remark renews the importance of having a critical eye in interpreting the many different indexes of poverty.

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Annexes

Table 1: Summary statistics for Brazilian regions using per capita income, 2002

	Brazil	North	North-East	South-East	South	Central-West
Sample size	102,500	10,126	30,886	32,504	17,572	11,412
Weighted individuals	166,270,000	9,837,205	47,676,831	71,678,789	25,285,970	11,790,515
Mean	329.85	237.51	181.89	415.89	378.59	377.57
Median	171.43	126.67	92.50	226.67	225.00	187.50
Gini Index	0.58	0.56	0.59	0.55	0.52	0.58

Source: Author's calculations from the PNAD 2002.

Table 2: Mean incomes per Decile by Region, 2002

	Brazil	North	North-East	South-East	South	Central-West
1	30.83	30.54	18.81	48.50	48.04	42.82
2	59.80	53.08	36.81	89.36	89.38	76.67
3	88.42	71.59	50.76	124.13	125.13	103.68
4	119.20	92.63	65.06	161.69	163.55	135.63
5	152.59	115.21	81.88	204.23	204.03	169.40
6	194.59	142.80	102.63	255.11	253.74	207.57
7	251.85	184.12	133.08	328.15	319.08	268.48
8	346.19	243.07	180.06	443.98	428.39	381.09
9	534.15	368.71	264.45	672.95	625.54	607.84
10	1533.37	1078.60	894.35	1834.12	1556.51	1798.50

Source: Author's calculations from the PNAD 2002.

Table 3: General indicators from National Accounts, 2002

	Brazil	North	North-East	South-East	South	Central-West
Total GDP (in millions of $R)	1,346,028	67,790	181,933	758,374	237,729	100,202
Per capita GDP, monthly (in $R)	635,91	411,58	307,83	840,50	763,08	680,50
Value Added[(a)] (percent)	0.24	0.51	0.22	0.20	0.23	0.36

(a) The evolution of the total value added is accumulated by period 1994-2002;
Source: IBGE, (2005), *Conta Regionais do Brasil*, 2002, Rio de Janeiro: IBGE ed.

Table 4: Brazilian per capita poverty lines, in 2002 prices

Geographical Regions matched with Rocha's Regions		Value (in $R)
Region 1: North		
Region VII	Metropolis of Belem	119.99
	Urban	104.59
	Rural[(a)]	77.64
Region 2: North-East		
Region V	Metropolis of Fortaleza	119.82
	Metropolis of Recife	163.97
	Metropolis of Salvador	153.43
	Urban	102.83
	Rural	62.02
Region 3: South-East		
Region I	Metropolis of Rio de Janeiro	164.79
	Urban	102.53
	Rural	74.84
Region II	Metropolis of São Paulo	198.57
	Urban	126.88
	Rural	79.83
Region IV	Metropolis of Belo Horizonte	136.38
	Urban	91.69
	Rural	54.28
Region 4: South		
Region III	Metropolis of Curitiba	134.03
	Metropolis of Porto Alegre	103.45
	Urban	89.16
	Rural	60.11
Region 5: Central-West		
Region VI	Brasilia	189.06
Region VIII	Goiania	177.53
	Urban	135.17
	Rural[(a)]	77.64

Source: Rocha, 2003, re-adapted by the Author.
(a) We impute to the rural poverty line for Region VII, the same value of the rural poverty line for Region VIII, following Ferreira and Litchfield (2001).

Table 5: Summary statistics of FGT class of measures by region, 2002

	Brazil	North	North-East	South-East	South	Central-West
Headcount	0.3359	0.4225	0.5156	0.2582	0.1455	0.4173
s.e[(a)]	0.0019	0.0060	0.0035	0.0030	0.0035	0.0053
Poverty Gap	0.1357	0.1681	0.2247	0.0968	0.0480	0.1729
s.e.[(a)]	0.0010	0.0032	0.0021	0.0014	0.0015	0.0029
Squared Poverty Gap	0.0742	0.0897	0.1292	0.0500	0.0236	0.0236
s.e.[(a)]	0.0007	0.0022	0.0015	0.0010	0.0009	0.0009

Source: Author's calculations from the PNAD 2002.
(a) Standard errors are bootstrapped.

Table 6: The profile of Poverty in Brazil for 2002, values in percentages of poor and non-poor population

	North		North-East		South-East		South		Central-West		Brazil	
	poor	non poor	poor	non poor	poor	non poor	poor	non poor	poor	non poor	poor	non poor
Gender of Head of HH												
Male	71	74.6	78.8	77.5	75	79	77.7	81	78.2	79	76.8	78.9
Female	29		21.2	22.5	25	21	22.3	19	21.8	21	23.2	21.1
Age of Head of HH												
age<25	6		5.4	3.2	4.7	2.9	6.1	3.6	6.5	4.1	5.3	3.3
25≤age≤34	27	20.4	23.5	15.4	26.1	15.9	25.8	18	27	19.9	25.1	16.7
35≤age≤44	28.4	27.1	29.1	22	32.9	26.6	34.7	28.7	31.4	27.9	30.9	26.2
45≤age≤54	20.9	22.6	21.5	21.8	19.1	25.2	18.9	23.8	18.5	23.8	20.2	24
55≤age≤64	11	14.1	12.5	18.3	10.2	15.6	10	14	10.2	14.3	11.3	15.6
age≥65	6.7	11.3	8	19.3	7.0	13.8	4.5	11.9	6.4	10	7.2	14.2
Race of Head of HH												
White	21.3	31.3	23.9	34.3	46.6	67	68.7	83.7	32.9	50.5	35	60.6
Black	78.5	68.3	75.9	65.5	53.3	32.2	31.2	15.9	66.9	48.7	64.9	38.8
Asian	0.2	0.4	0.2	0.2	0.1	0.8	0.1	0.4	0.2	0.8	0.1	0.6
Education of Head of HH												
illiterate	21.9	16.4	29.8	22.8	14.6	9.3	14.2	9.2	17.8	12.1	22.1	12.6
elementary	22	19.4	28.1	28	27.1	28.7	28.8	30.6	24	20.9	27	28
intermediate	55.8	57	41.9	41.4	57.4	49.4	56.8	50.2	57.7	53.8	50.5	48.5
high school	0.3	6.8	0.2	7.4	0.9	11.9	0.2	9.4	0.5	12.4	0.4	10.3
college plus	0	0.4	0	0.4	0	0.7	0	0.6	0	0.8	0	0.6
Head of HH Economically Active												
active	81.5	83.1	83	78.3	81.9	78.5	85.3	84.4	84.7	84.9	82.9	80.3
no active	18.5	16.9	17	21.7	18.1	21.5	14.7	15.6	15.3	15.1	17.1	19.7
Head of HH in Formal Sector												
formal	49.1	65.8	52.1	61.7	51.2	64.7	52.7	68.9	53.1	69.4	51.7	65.3
informal	50.9	34.2	47.9	38.3	48.8	35.3	47.3	31.1	46.9	30.6	48.3	34.7
Sectoral Distribution												
agriculture	15.3	8.8	35.7	24.5	11.3	8.1	27.8	17.8	19	14.2	24.1	13.8
industry	11.5	11.9	6.1	7.5	11.1	15.1	9.9	15.9	9.3	9.3	8.7	13.1

construction	11	8.2	8.7	5.7	13.1	8.3	13.5	8.4	14	7.1	11.1	7.7
trade	12.6	16.5	10.5	12.7	11.7	13.2	8.5	13.5	11.3	17.1	11	13.6
tourism	3.3	2.6	2.3	2.3	3.2	2.8	1.9	2.3	3.2	2.7	2.8	2.6
transports	4.2	6	2.8	5.1	4.4	6.8	2.6	5.8	4.3	6.3	3.6	6.2
public adm	3.7	10.4	2.3	6.3	2.3	4.8	1.5	4.8	2.7	9.5	2.4	5.7
health, educ, etc.	12	12.5	7.8	9.1	11	10.3	9.6	8.7	11.4	10.5	9.5	9.9
others	26.4	23.1	23.8	26.8	31.9	30.6	24.7	22.8	24.8	23.3	26.8	27.4
Occupation of Head of HH												
professional/technicians	1.8	12	1.6	9.9	1.3	13.7	0.8	11.9	2.1	17.4	1.5	12.7
intermediate	32.3	34.1	22.6	24.5	30.9	27.9	21.2	24	28.9	29.3	26.5	26.8
blue collars	65.9	53.9	75.8	65.6	67.8	58.4	78	64.1	69	53.3	72	60.5
Location of Family												
urban	96	97.2	70.2	71	90.5	92.2	75.8	82.4	85.4	88.7	80.6	85.9
rural	4	2.8	29.8	29	9.5	7.8	24.2	17.6	14.6	11.3	19.4	14.1
Family Size												
1	0.2	2.6	0.4	3.8	0.4	4	0.3	3.5	0.4	4.8	0.4	3.8
2-3	11.8	27.6	14	32.4	18.3	37.6	15.5	39	20.4	35.4	16	36.1
4-5	37.2	43.3	40.4	42	46.6	45.9	47	46.4	50.7	46.6	43.5	45.1
over 6	50.8	26.5	45.2	21.8	34.7	12.5	37.2	11.1	28.5	13.2	40.1	15
Numbers of Workers per Family												
0	4.6	3.2	4.9	6.2	5.3	6.3	4.7	5.1	4.1	4.3	4.9	5.7
1	39.2	23.7	31.8	22.9	37.7	25.2	35.1	23.4	37	24.5	35	24.2
2-3	42.7	56	47.7	54.9	47.7	56.4	51.4	60.1	49.9	58.9	47.8	57
4-5	11.2	14.3	12.2	13.1	8	10.8	7.9	10.6	7.6	11.7	10	11.5
over 6	2.3	2.8	3.4	2.9	1.3	1.3	0.9	0.8	1.4	0.6	2.3	1.6
Number of Children per Family, 0-14												
0	8.7	32.6	12.4	43.3	15	48.1	9.4	42.3	17.2	45.9	13.2	45
1	17.4	31.1	22.3	30.4	23.1	29.3	21.1	31.7	25.1	28.8	22.4	30.1
2-3	47.6	32.3	45.1	23.9	48.3	21.4	48.9	24.5	46.4	24	46.7	23.3
over 4	26.3	4	20.2	2.4	13.6	1.2	20.6	1.5	11.3	1.3	17.7	1.6

Source: Author's calculations from the PNAD 2002.

Table 7: Poverty decomposition between and within groups with a unique reference group for the entire country[(a)], 2002

Brazil	**Hwb= 0.5447**				**PGwb= 0.2807**				**SPGwb= 0.1774**			
	Hw	**%**	**Hb**	**%**	**PGw**	**%**	**PGb**	**%**	**SPGw**	**%**	**SPGb**	**%**
	0.3358	**61.66**	**0.2088**	**38.34**	**0.1357**	**48.33**	**0.1450**	**51.67**	**0.0742**	**41.85**	**0.1031**	**58.15**
	Contribution of each region:											
North	0.0250	7.44	0.0145	6.95	0.0099	7.33	0.0111	7.62	0.0053	7.15	0.0080	7.71
North-East	0.1478	44.02	0.0738	35.33	0.0644	47.49	0.0689	47.48	0.0370	49.92	0.0550	53.31
South-East	0.1113	33.14	0.0710	34.02	0.0417	30.77	0.0393	27.09	0.0215	29.04	0.0245	23.76
South	0.0221	6.59	0.0425	20.33	0.0073	5.38	0.0211	14.57	0.0036	4.83	0.0126	12.21
Central-West	0.0296	8.81	0.0070	3.36	0.0123	9.04	0.0047	3.23	0.0067	9.07	0.0031	3.00

Source: Author's calculations from the PNAD 2002.

(a) The unique reference group for the entire country is the metropolitan area of São Paulo.

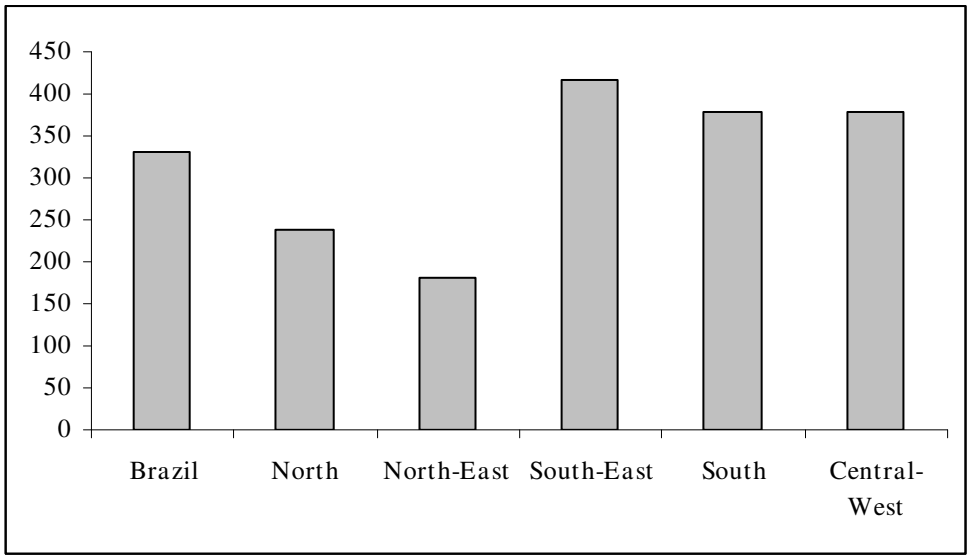
Table 8: Poverty decomposition between and within groups with a reference group for each Brazilian region[(a)], 2002

North	**Hwb= 0.4670**				**PGwb= 0.2013**				**SPGwb= 0.1113**			
	Hw	**%**	**Hb**	**%**	**PGw**	**%**	**PGb**	**%**	**SPGw**	**%**	**SPGb**	**%**
	0.4225	90.46	0.0445	9.54	0.1681	83.49	0.0332	16.51	0.0897	80.55	0.0216	19.45
North-East	**Hwb= 0.7078**				**PGwb= 0.3825**				**SPGwb= 0.2490**			
	Hw	**%**	**Hb**	**%**	**PGw**	**%**	**PGb**	**%**	**SPGw**	**%**	**SPGb**	**%**
	0.5156	72.84	0.1922	27.16	0.2247	58.74	0.1578	41.26	0.1292	51.88	0.1198	48.12
South-East	**Hwb= 0.4230**				**PGwb= 0.1880**				**SPGwb= 0.1068**			
	Hw	**%**	**Hb**	**%**	**PGw**	**%**	**PGb**	**%**	**SPGw**	**%**	**SPGb**	**%**
	0.2582	61.04	0.1648	38.96	0.0968	51.51	0.0912	48.49	0.0500	46.79	0.0569	53.21
South	**Hwb= 0.2797**				**PGwb= 0.1052**				**SPGwb= 0.0555**			
	Hw	**%**	**Hb**	**%**	**PGw**	**%**	**PGb**	**%**	**SPGw**	**%**	**SPGb**	**%**
	0.1455	52.01	0.1342	47.99	0.0480	45.60	0.0572	54.40	0.0236	42.46	0.0319	57.54
Central-West	**Hwb= 0.5034**				**PGwb= 0.2256**				**SPGwb= 0.1291**			
	Hw	**%**	**Hb**	**%**	**PGw**	**%**	**PGb**	**%**	**SPGw**	**%**	**SPGb**	**%**
	0.4173	82.89	0.0861	17.11	0.1729	76.66	0.0526	23.34	0.0950	73.57	0.0341	26.43

Source: Author's calculations from the PNAD 2002.

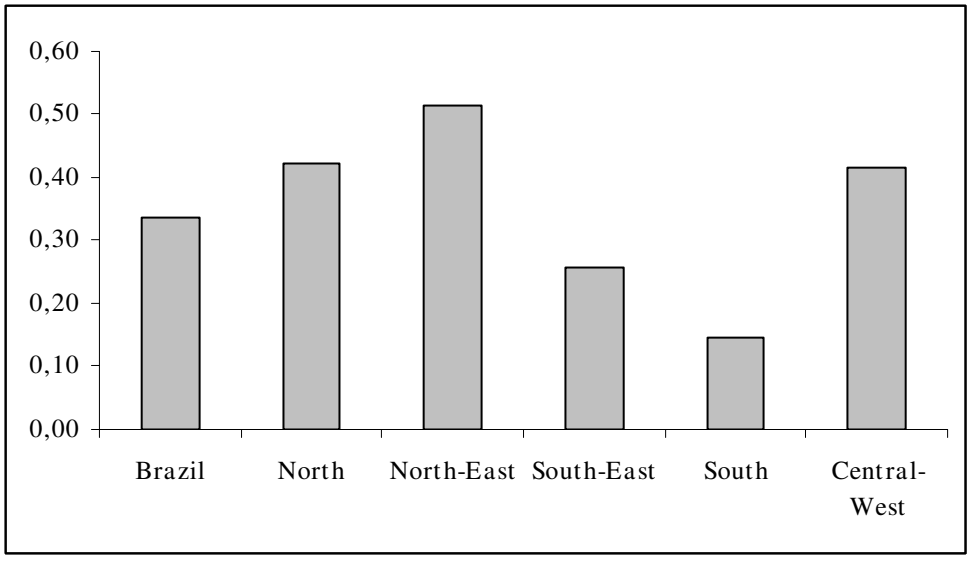
(a) The reference groups for each Brazilian region are the metropolitan area of Belem for the North, the metropolitan area of Recife for the North-East, the metropolitan area of São Paulo for the South-East, the metropolitan area of Curitiba for the South and Brasilia for the Central-West.

Figure 1: Regional differences in mean values, 2002



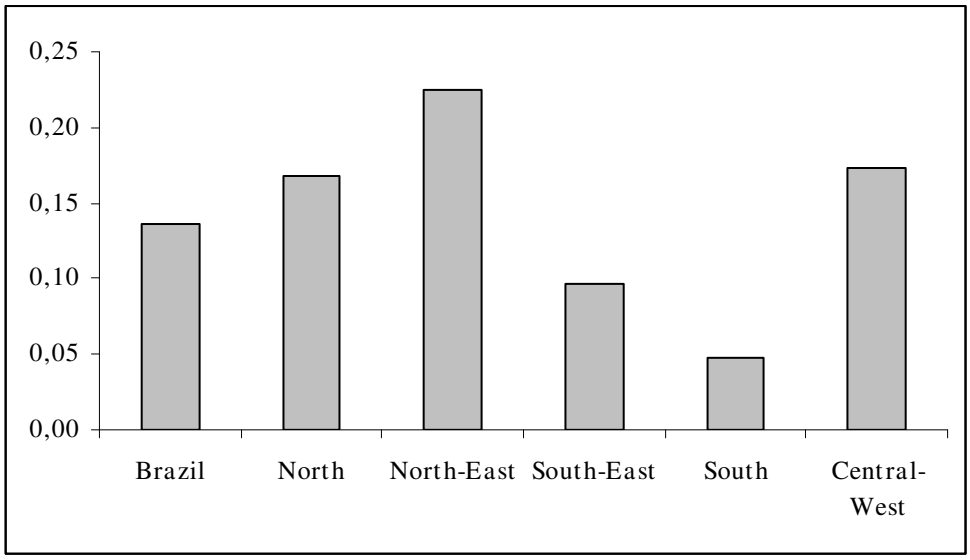
Source: Author's calculations from the PNAD 2002.

Figure 2: Regional differences in the Headcount ratio, 2002



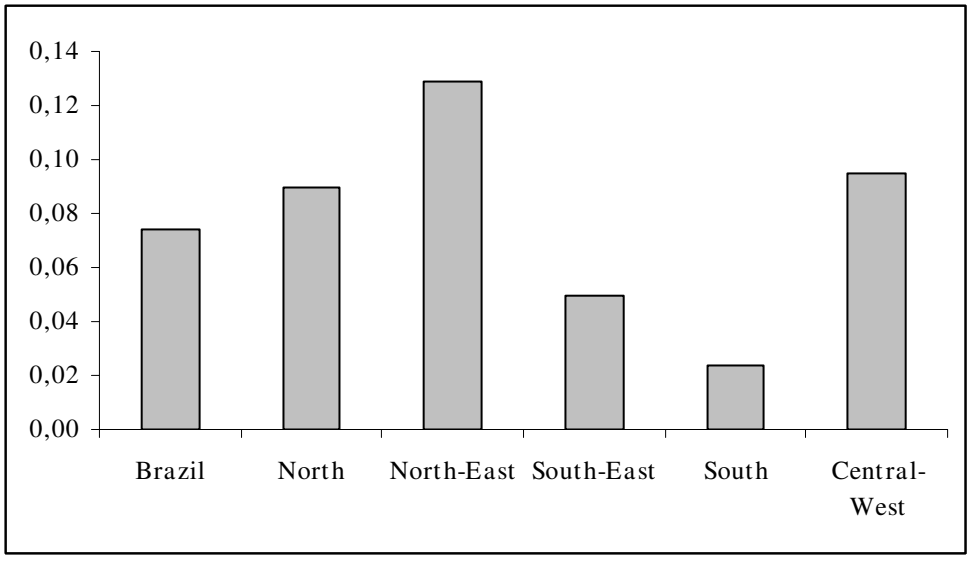
Source: Author's calculations from the PNAD 2002.

Figure 3: Regional differences in the Poverty Gap, 2002



Source: Author's calculations from the PNAD 2002.

Figure 4: Regional differences in the Squared Poverty Gap, 2002



Source: Author's calculations from the PNAD 2002.