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Multidimensional Inequality: An Empirical Application to Brazil*

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Abstract

This paper illustrates two empirical approaches to the measurement of multidimensional inequality. The first approach is based on the analysis of the independent distribution of monetary and non-monetary welfare attributes. The second approach considers pair-wise joint distributions of those attributes, hence allowing for differences in the various distributions, as well as possible correlations between the attributes. The analysis is based on household survey data from Brazil for 1996. We focus on inequalities in income, education, health and political participation outcomes. We calculate the extent of vertical and horizontal monetary and non-monetary inequalities, examine the determinants of both types of inequality and analyse their impact on household welfare. Our results show that economic analyses based solely on the distribution of income variables will not portray fully the degree of socio-economic and political inequalities in Brazil. In fact, traditional analysis of inequality may overestimate the extent of inequality, as education and other non-monetary welfare attributes appear to be more equally distributed in Brazil than income.

JEL codes: C23, D31, D63, I19, I29, O12, O54.

Keywords: Multidimensional inequality; education inequalities; health inequalities; political inequalities; household data; Brazil.

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1. INTRODUCTION

One of the key contemporary issues in development economics is the relationship between economic growth, poverty and inequality and there is an extensive literature on the nature and direction of the causal links between them. Although not all the types of inequality are adverse,[1] inequalities that arise from lack of opportunities, political connections and forms of discrimination are often associated with the exclusion of some population groups from the process of development and may pose constraints to economic growth and the establishment of fully functioning market economies.[2] The potentially negative effects of inequality and the recent increase in income inequality observed in a significant number of industrialised and developing countries have led, in recent years, to the revival of inequality as a central topic in economics (Atkinson (1996), Kanbur and Lustig (1999), Milanovic (1999)).

Much less empirical work however exists that examines the multidimensional aspects of inequality, that is the dispersion of the various distributions of quantities of consumption of different functionings for different individuals (Tsui, 1999), on the assumption that income (measured by, for example, GDP per capita, or equivalised household income or expenditure) is a good proxy for other welfare outcomes. Using the mean, or the first moment of the distribution, may not always be a reasonable assumption to make for welfare rankings as a simple observation of some recently available data suggests. Table 1 portrays the extent of income inequality in four world regions, measured by the Gini coefficient, and compares it with land, health and education inequalities. For instance, although Asian and Sub-Saharan African countries are characterized by lower income and land inequalities than countries in Latin America, their levels of education inequalities are some of the highest in the world.

Measuring inequality along several dimensions is, however, not an easy task. The construction of most conventional inequality indices is based on the assumption that individuals and groups of individuals can be ranked according to specific characteristics. Although ranking individuals along income or consumption levels is a straightforward exercise, ranking individuals along educational, health and other non-monetary attributes is a more complex exercise since it often implies making subjective judgements. A large literature, pioneered by Kolm (1977) and Atkinson and Bourguignon (1982), has,

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[1] In fact, inequalities that arise in a market economy as a result of rewards to risk-taking, enterprise, skill acquisition and saving, may create important incentives for technological advance and increased productivity. Killick (2002) makes the distinction between *functional inequalities* and contrasts them with *dysfunctional inequalities*, i.e. inequalities that arise from lack of opportunities and social and political exclusion of certain population groups.

[2] An extensive literature, which has focused mostly on the experience of Latin America countries, has shown that a large number of individuals and households remain poor, not because they live in poor countries, but because high levels of inequality create exclusion and pockets of persistent poverty amongst certain population groups (Ravallion (1997), Ravallion and Chen (2003), World Bank (2003a)). Further studies have analysed other potentially negative impacts of inequality on economic growth (Saint-Paul and Verdier (1992), Galor and Zeira (1993), Bénabou (1996)).

nonetheless, attempted to develop consistent theoretical frameworks for the analysis of multidimensional inequality.[3] While a successful effort has been made to extend most of the axioms that define measures of unidimensional inequality to the multidimensional case, the literature is, however, still far from reaching a consensus in determining if one given distribution is more or less unequal than another when each individual is characterised by a variety of attributes of well-being.

There are three main approaches to deal with the measurement of multidimensional welfare (Maasoumi (1986), Duclos, Sahn and Younger (2001)). The first is the combination of the various indicators of well-being into one uni-dimensional index, whose distribution can then be analysed. The Human Development Index is one of such indicators. This approach relies, however, on the use of arbitrarily defined weights for each dimension of well-being. The second approach consists in the comparison of individual distributions of various dimensions of well-being. This method underlines most of the recent analyses of non-monetary poverty (Saith (2001), Ruggeri Laderchi, Saith and Stewart (2003)), as well as recent studies on education and health inequalities (Checchi (2000), Thomas, Wang and Fan (2000), Gakidou, Murray and Frenk (2000), Wagstaff (2000)). Although this method has provided important insights into the understanding of non-monetary poverty and inequality, it does not, however, take into account possible correlations between the various dimensions of welfare. The third method considers pair-wise joint distributions of *n* indicators of well-being, where one of the welfare attributes is a discrete variable. Total population is then divided into groups according to the values of the discrete welfare attribute and the distribution of continuous *n-1* attributes is compared within and between the various population groups. This approach captures thus not only differences between the various distributions but also possible correlations between the various attributes of welfare. This approach has been successfully used to analyse multidimensional poverty by Duclos, Sahn and Younger (2001) and extended to the analysis of multidimensional inequality in Justino (2004).[4]

In this paper, we illustrate how the second and third frameworks can be empirically applied to real datasets and compare and contrast the results yielded by the two methods. The empirical analysis is based on household data from the 1996 Brazilian household survey. We start by providing an analysis of the independent distribution of four different attributes: income, education, health and political representation. We then extend the conclusions of that analysis in order to allow for the pair-wise joint distribution of the various attributes. The paper is structured as follows. Section 2 provides a

[3] See also Maasoumi (1986), Atkinson and Bourguignon (1987, 2000) and Tsui (1995, 1999). Justino (2004) provides an up-to-date review of the literature.

[4] Justino (2004) adapts the bivariate approach to poverty analysis, developed by Duclos, Sahn and Younger (2001), to the analysis of inequality when the welfare measure is defined along *n* attributes. Justino (2004) demonstrates how this method can also be empirically applied to the case of *n-1* discrete variables and one continuous variable.

description of the data and the main variables used in our analysis. In section 3, we analyse the distribution of three non-monetary attributes across a sample of Brazilian households interviewed in 1996. These are the maximum level of education of the household, health status (represented by the mean of stillborns in the household per pregnancy) and political participation (proxied by the ratio of household members represented by labour unions). This analysis is done both along vertical axes and across horizontal dimensions (regional, rural/urban and between racial groups). We apply conventional generalised entropy measures (GE(α)) and Gini coefficients to distributions of education, health status and political representation. In section 4, we compare and contrast income and non-income inequalities in Brazil. We examine the determinants of non-income inequalities in Brazil and analyse whether these differ from known determinants of income inequality. In section 5, we analyse the relationship between non-monetary inequalities and the economic performance of Brazilian households in 1996 and compare those effects with the impact of income inequality on household economic welfare. Section 6 summarises our main results and concludes the paper.

2. DATA AND VARIABLES

The main data sources for this paper are the Brazilian household surveys. Brazil has a comparable and nationally representative household survey for almost every year between 1981 and 2001, the Pesquisa Nacional de Amostra de Domicilios (PNAD) collected by the Instituto Brasileiro de Geografia e Estatistica (IBGE).[5] The main questionnaire contains a variety of information derived from a sample of households selected according to a three-level multi-stage sample procedure in every state in the Federation. Examples of the household information contained in the PNAD include types and conditions of dwellings, geographic location and specific information on political participation, data on race, as well as education and health variables. In this paper, we use the 1996 PNAD, which covers 84947 households and 331263 individuals.[6] Our analysis is based on a sub-sample of 80857 households.[7]

The 1996 PNAD is a particularly interesting survey. It includes a supplementary section on social mobility and parents' characteristics, which we explore in our analysis of the determinants of inequality in Brazil in section 4. The 1996 PNAD has also the additional advantage of having been

[5] Though nationally representative, the surveys do not cover rural populations in the Northern states of Rondônia, Acre, Amazonas, Roraima, Pará and Amapá, situated in the Amazon area of Brazil. Reasons cited for not including these regions are remoteness, sparse population densities and perceived danger for survey interviewers. The rural population in these states is estimated to be around 3% of the total Brazilian population. See Litchfield (2001) for further details.

[6] These numbers refer to households that completed the interviews.

conducted in the same year as the latest Brazilian demographic and health survey (DHS). We intend to use the 1996 DHS to explore further in a future paper, or revised paper, some aspects of health inequalities that cannot be extracted from the PNAD.[8] Since the demographic and health surveys do not contain data on household income or expenditure, we will need to match this data to the household surveys information using techniques of matching data across surveys as outlined in Hentschel, Lanjouw, Lanjouw and Poggi (1998).

Our unit of analysis is, in the first instance, the household, as individuals' well-being often depends on the resources available to the household, the size and structure of the household and the way resources are shared within the household. Our definition of household includes the head, spouse, children, other relatives and other dependents. We have excluded lodgers, domestic help and their family from our main unit of analysis. The more detailed analysis of health inequalities based on the DHS surveys will be performed both at household and state level, for comparison purposes.

The analysis in this paper is based on four welfare indicators that can be extracted from the Brazilian household surveys. The first is household income, which is measured using the distribution of per capita household income and household income per adult equivalent. The PNAD provides data on household incomes, but not consumption. Although data on incomes is generally not considered as reliable as consumption data,[9] the PNAD data is of reasonable quality.[10] The income variable included in the PNAD encompasses gross income from employment and self-employment (cash and in-kind payments), as well as social insurance receipts and other gross income (rents from property, dividends, interest payments and other undefined income).[11]

It is a well known fact that gross household income does not take into account possible economies of scale within the household and differences in the needs of the different household members, which

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[7] We dropped 2396 households with missing income values (2.82% of original sample), 1677 households with zero incomes (1.97% of the original sample) and 17 households with no information about race (0.02% of original sample).

[8] The Brazilian DHS were carried out in 1986, 1991 and 1996. They cover 13283 households in 1986 and 1996 and only 6064 households in the Northeast region in 1991. The surveys contain valuable information on number of children ever born and living, infant and child mortality, nutritional status of individuals and age of death of women, as well as data on household assets, living conditions, education, demographics, race and religion. These data allow us to explore several dimensions of health inequalities in Brazil.

[9] Unlike income data, consumption expenditure provides an indication of permanent incomes (as households may tend to smooth consumption across time by saving) and may thus be less variable than income data. Income data may also be more subject to severe under-reporting as people may be more reluctant to report incomes than consumption. Non-monetary welfare variables (education, health and political representation) are less likely to have this shortcoming.

[10] See Ferreira, Lanjouw and Neri (1999) for a comparative evaluation of the national PNAD income data in relation to other, geographically restricted, surveys of income (the LSMS-type survey of the Northeast) and earnings (from the urban employment survey).

will vary by age groups and by gender. Because the PNAD datasets do not contain data on consumption expenditure, we are not able to differentiate between different needs amongst household members. We can, however, use a simple parametric class of equivalence scales, developed by Buhmann, Rainwater, Schmaus and Smeeding (1988), that allow us to adjust household incomes to possible economies of scale. The class used is:

$$y_i = \frac{Y_i}{n^\theta},$$

where y_i is the equivalised income, Y_i is the total household income and n is the household size. θ is the parameter indicating the extent of economies of scale in the household: $\theta = 0$ indicates very high economies of scale, whereas $\theta = 1$ is the per capita income (i.e. no economies of scale). In our analysis we take the mid-point $\theta = 1/2$.

The second welfare indicator is education, measured by the distribution of the maximum years of schooling achieved by any member of the household over the age of 15. This variable is likely to have an important welfare impact as all members of household may benefit from having an educated person in the household. We would expect the benefits to increase with the level of education of the most educated member of the household. This argument is similar to that used by Basu and Foster (1998) in their analysis of literacy in India. They argue that the access to a literate person in the household entails important externality effects that should be taken into consideration when measuring the rate of literacy of a given country. In this paper, we have extended Basu and Foster's argument and look not only at whether a member of any given household is literate or not but how long this person spent in formal education.[12]

Our third welfare indicator is health status, measured by the distribution of the rate of stillborns (i.e. number of stillborns divided by the number of pregnancies per woman). The household variable we used is the mean rate of stillborns for all the women in the household, where a stillborn is defined as a child born dead (after seven or more months of pregnancy), i.e. that did not show any sign of life at the moment of birth (breathing, crying, voluntary muscle activity or heart beat). This variable often constitutes a good indicator of the mother's health status as the likelihood of a woman giving birth to a stillborn is closely related to her nutritional status and health condition.[13] The variable carries the

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[11] For details see Litchfield (2001).
[12] For other analyses of distribution of years spent in school by adults see Checchi (2000) and Thomas, Wang and Fan (2000).
[13] For other analyses using distribution of child mortality risk and life expectancy of adults see Gakidou, Murray and Frenk (2000) and Wagstaff (2000).

additional benefit of being available in the various PNAD, which has allowed us to build a distribution of health status across the various households and compare this distribution directly with the other distributions of household income and non-income attributes. The main drawback of this variable was that, in 1996, only 6302 women reported having a stillborn in the past.[14] Due to the large number of missing values and zeros in this variable, we have decided to further analyse the extent of health inequalities in Brazil using other indicators of health status contained in the more detailed demographic and health surveys. We use four variables: the rate of infant mortality, the distribution of babies' weight at birth and male and female mortality rates. This analysis is being conducted both at the household and state level. Unfortunately, we are not able to include these results in the present version of this paper.

Our final welfare indicator is political participation. This is an important and often overlooked dimension of inequality. Political and social policy decisions in developing countries (including Latin America) are frequently determined by the interests of powerful families and large enterprises, who have a considerable influence on government policies. This influence may yield high costs for the rest of the population and lead to the persistence of political inequalities (Tilly (1998)). These, in turn, may result in the exclusion of large fractions of the population from the development process, decreases in the demand for pro-poor policies and redistribution and may create further barriers to the trickle-down of the potential benefits from economic growth to the whole population. For instance, in most high-inequality countries, the provision of public goods tends to systematically exclude the poor (World Bank, 2003b). This is because the link between inequality and political participation often creates barriers – when the poor cannot afford to vote or are bought out by richer votes – that prevent the poor from voicing their demands in equal weight to the rich.

One way to look at political inequalities consists in examining participation in labour unions. Labour unions can affect household welfare, as well-organized unions will be able to influence both local job practices undertaken by public and private enterprises and lobby for the interests of otherwise disadvantaged groups in the design of national policies (see Freeman and Medoff (1984)). Membership of these unions is thus likely to increase the capacity of households to voice their demands and needs, as well as influence political processes directly related to their own well-being. Union membership is thus likely to be a good proxy for the level of political inclusion and social representation as, in Brazil, belonging to a union seems to be associated with formal, more stable and

[14] Amongst the remaining households, there were 11446 households for which stillborn rates were missing because in those households there were no women who became pregnant in the past. In addition, 80 women that reported having had a stillborn gave zero as their answer to the number of stillborns they have had (and we kept those zeros) and there were 972 women whose total of stillborns is unknown (they reported having had a stillborn in the past but neglected to give the number of stillborns they have had). We replaced these missing values with the mean number of stillborns in each age group (15-19, 20-24, 25-29, 30-39, 40-49 and 50+).

permanent job contracts, as a result of the existence of more efficient channels for workers to express their voices in job-security related issues (Cardoso, 2002). Unionised workers have also access to more extensive welfare provisions. These results may simply be, of course, a reflection of the fact that trade unionism generally takes place amongst formal sector workers. There is, however, an alternative point of view in that not belonging to a labour union may well be correlated to a large extent with increased levels of economic and social vulnerability. In Brazil, workers join unions to access social, health and legal services. In addition, in recent years, unions have had an important role to play in the defence of environmental issues, provision of urban utilities, access of local communities to education and health services, etc (Cardoso, 2002).

In Brazil, data on political participation of households has been collected in various PNAD since the late 1980s. We have used that information to calculate the ratio of the number of household members that belong to a labour union per household member over the age of 15, where labour union is defined as an association, recognised by the Ministry of Employment and registered by a notary, of individuals with similar or related activities or employment with the objective of studying, defending interests or coordinating economic or professional interests.

3. MONETARY AND NON-MONETARY INEQUALITIES IN BRAZIL

It is a well-documented fact that Brazil has one of the highest levels of income inequality in the world (tables 1 and 2). However, apart from sporadic anecdotal evidence, little is known about the distribution of other welfare variables across the Brazilian population and whether income inequalities reflect equally large inequalities in other aspects of well-being. In this section, we examine the distribution of four separate welfare attributes across a sample of Brazilian household interviewed in 1996: household income, maximum household education, household health status and political representation. Table 3 presents summary measures of inequality – the Gini coefficient and three members of the Generalised Entropy Class of measures (GE(0), GE(1) and GE(2))[15] – applied to the four attributes.

3.1. Income inequality

High income inequality in Brazil has resulted in a significant number of Brazilians living under extreme forms of poverty and destitution, while most of the country's wealth is controlled by a small

[15] Using the members of the GE class of measures allows us to examine the stability of welfare rankings for different weightings. GE(0), for example, places greater weight on the lower tail of the distribution, while GE(2) (equal to half of the squared coefficient of variation) is much more sensitive to the upper tail of the distribution.

minority. The levels of income inequality and poverty in Brazil have, furthermore, changed little since the mid-1980s (table 2), which suggests that these are structural problems rather than short-term transitional effects. Brazil is also a highly segmented society, characterised by racial and regional inequalities, not only in terms of income, but also in the access to important social variables (education, health care and so forth) (Litchfield (2001), Woods and Carvalho (1988)).

Brazil has a very diverse population, with a large group of white individuals (mainly Portuguese descendants), a small African descendant population (mainly descendants from the slave trade), a very large mixed race population and very small groups of indigenous peoples and populations of Asian origin. The percentage of these groups in the total population, in 1996, was, respectively, 54.5%, 7.2%, 37.7%, 0.2% and 0.5% (table 4). Mean incomes by racial group in Brazil vary considerably, with households with African descendant, mixed race or indigenous heads having significantly lower earnings than those households with white or Asian-Brazilian heads (table 4).

Inequalities in Brazil take place not only across different racial groups but also across a regional dimension. Regional inequalities in Brazil are well documented.[16] Table 5 shows that amongst 27 states, only 8 have mean household incomes per capita above the national average, namely, the Distrito Federal (whose per capita household income was almost twice the national average), São Paulo, Rio de Janeiro, Rio Grande do Sul, Paraná, Santa Catarina, Acre and Roraima. The poorest state was Piauí, with an average per capita household income that was about 40% lower than the Brazilian average, and 80% less than that of the richest state. Regional inequalities in Brazil originate from a strong north-south divide. Eight out of the ten poorest states in Brazil were in the Northeast, and two of the four states of the Southeast were among the five richest states in Brazil.

We have further examined the extent of vertical and horizontal inequalities across different population groups and different geographic areas. These results are provided in table 6. The results show, as expected, that income inequality is smallest in the South and Southeast regions and in rural areas. Interestingly, it is also smallest amongst black households. The highest levels of income inequality are registered in the Northeast, urban areas and amongst indigenous households. When allowing for economies of scale within the household, we find that the Black population registers still the lowest levels of income inequality. Income inequality is particularly high amongst the white population. Table 6 shows further that between 9.7% and 13.2% of all income inequality in Brazil in 1996 can be attributed to between-group inequalities.

For a discussion of the properties of these measures see Cowell (1995) and for a fuller analysis of income inequality changes in Brazil between 1981 and 1995 see Litchfield (2001).

3.2. Education, health and political inequalities

A large literature has shown that sustained economic development cannot be achieved without significant investments in human capital, of which education and health are key elements (Mincer (1958), Becker (1981), Lucas (1988), Saint-Paul and Verdier (1992), Perotti (1993), WHO (1999), Ribero and Nuñez (1999), Gakidou, Murray and Frenk (2000)). Access to education and education status are, however, not equally distributed across countries or even across population groups (table 1). Given the impact of human capital on economic development, and assuming abilities to be normally distributed, large dysfunctional inequalities in education and health status represent a loss in aggregate welfare (Thomas, Wang and Fan (2000)). The recognition of this fact has resulted in a recent increased interest in the analysis of the distribution education and health (Ram (1990), Londoño (1996), Basu and Foster (1998), Thomas, Wang and Fan (2000), Checchi (2000)).

Brazil has quite high literacy rates on average, though households of black or indigenous origin and household living in the Northeast have comparatively lower levels of literacy than households in the rest of the country (tables 4 and 5). However, educational outcomes in Brazil are not equally distributed, particularly across different population groups. Table 3 shows that education outcomes are more equally distributed in Brazil than any other welfare attribute, particularly when higher weight is given to the bottom of the distribution. Differences in education levels are, however, quite unevenly distributed across population groups. Table 7 shows that a significant proportion of households of Black, mixed race and indigenous origin have no schooling at all, whereas households of white origin are most likely to have at least one household member who has had between 10 and 12 years of education. In households of black, mixed race or indigenous origin, the maximum years of schooling achieved by any member of the households (above the age of 15) is typically between 1-4 years. Education levels are particularly low amongst indigenous households: 17.4% of those households did not have access to anyone with some level of education. That value is only around 3.4% amongst the white population and 1.8% amongst households of Asian origin (table 7).

Regional educational inequalities are also quite high. While in the North, Centre West and the South East, on average, over 25% of all households had at least one household member with 10-12 years of education (i.e. completed secondary school), in the North East, households are most likely to have only between one to four years of maximum years of schooling. This region has also the highest number of households with no access to an educated person (12.8%) (table 7). Inequalities of education are also marked along the urban/rural divide. While almost 30% of all households in urban areas have access to at least one person with completed secondary education (10-12 years of

[16] See for instance Azzoni, Menezes-Filho, de Menezes and Silveira-Neto (2000).

schooling), that percentage decreases to 9% in rural areas. In these areas, households are most likely to have access to someone with only primary education, while 14% of rural households do not have access to an educated person (table 7).

This pattern is replicated by the distribution of health status and political representation. According to the results in table 8, the distribution of stillborn rates is extremely uneven in Brazil. This results in part from the fact that very few women report having a stillborn in the past. We must not therefore read too much into these results. At present, we are conducting further research on health inequalities in Brazil using more reliable information provided by the 1996 Brazilian DHS. We can observe, however, that the rate of stillborns is higher amongst the Black and indigenous populations. Interestingly, though, this rate is highest amongst the population of Asian origin, who are typically quite well-off in terms of income and educational attributes. Health outcomes are also worse in the North and Northestern regions, as well as in rural areas (table 8). These results may be explained in part by the existence of a two-tiered system of healthcare (Alves and Timmins (2001)), whereby better-off households and individuals whose employers provide health coverage, have access to a private system of healthcare that provides high quality treatment. The rest of the population relies on a system of public clinics and hospitals, characterised by long waiting times and disputable quality. This constitutes effectively a mechanism of social exclusion of the poor, the elderly, the rural population, African descendants and mixed-race Brazilians, which implies that those who are forced to rely on the system spend more time being sick and, subsequently, have a diminished health stock (Alves and Timmins (2001)).

In terms of political representation, households of Asian and white origins and households in the South and South East regions have a larger participation in labour unions than other households (table 9). These households also have the highest number of household members with union representation. Interestingly, there are hardly any differences in terms of union representation between households living in urban or rural areas.

We have also decomposed non-monetary inequalities into vertical and horizontal inequalities, using known decomposition techniques proposed by Shorrocks (1984), Jenkins (1995) and Cowell and Jenkins (1995). The results of this exercise are presented in tables 10-13. Table 6 showed that between 9.7% and 13.2% of all income inequality in Brazil in 1996 can be attributed to between-group inequality. However, between-group inequality is only responsible for 1.3% and 3.3% of inequality in education, 0-0.4% of health inequalities and 0-0.6% of inequalities in political representation (table 10). In addition, while the importance of between-group income inequality decreases for GE(1) and GE(2), it increases significantly in the case of non-income inequalities. In other words, the larger the weight given to the bottom of the various distributions of non-income attributes, the larger the

importance of horizontal (between-group) inequalities. This conclusion may have a significant policy impact as it sheds lights on a central aspect of persistent poverty and inequality amongst particular population groups.

Unlike income inequalities, education inequalities are lowest amongst white households and households of Asian origin. Similarly, however, to income inequality, they are also lower amongst households living in the South East and in urban areas. It is highest amongst indigenous and mixed race populations, those living in the Northeast and those in rural areas. On the other hand, health inequalities are highest amongst the white and Asian population, in the North and Northeast regions and in rural areas. They are lowest amongst indigenous households, in the South and South East regions and urban areas. Inequality in political representation is lowest amongst Asian and white households, in the South region and in urban areas. It is highest amongst the Black population, in the Centre West region and in rural areas (tables 11, 12 and 13).

4. MULTIDIMENSIONAL INEQUALITY IN BRAZIL

In the previous section, we examined the extent of inequality in Brazil in 1996 along four separate dimensions. The results showed quite similar patterns of vertical and horizontal inequalities amongst all four welfare attributes, except for the fact that non-monetary horizontal inequalities are less pronounced than income horizontal inequalities. In this section, we explore the nature of multidimensional inequality. Section 4.1. examines the joint distribution of the various attributes, by estimating summary inequality measures and Lorenz rankings for pair-wise distributions, and section 4.2. analyses the determinants of income and non-income dimensions of welfare.

4.1. Joint distributions

Although most theoretical analyses of multidimensional inequality have been developed for the case of *n* attributes, such analysis becomes extremely cumbersome at the empirical level. One way in which the issue can be addressed is to examine pair-wise distributions of attributes, when one attribute is a discrete variable. In this section, we compare the various pair-wise distributions across income per capita, income per adult equivalent and education quintiles and across households which have had a stillborn in the past (or not) and household with union representation (or not). The results for this analysis are presented in tables 14 and 15.

These tables show that the mean maximum years of schooling and union representation increase monotonically with the level of income (both per capita and per adult equivalent), while the rate of stillborns decreases with income levels after the second quintile (table 14). In addition, per capita and

per adult equivalent income and union representation increase monotonically with the level of education, whereas the rate of stillborns decreases with the level of education (table 14). Households with higher levels of income and households with higher education levels are less likely to have a stillborn. However, households with higher union representation are more likely to have a stillborn (table 15). There seems thus to be an inverse relationship between health and political inequalities. Households with higher income and higher levels of education are more likely to have at least one member belonging to a union (table 15).

We have also analysed directly the extent of pair-wise inequality (rather than the analysis of the respective distributions), measured by the Gini coefficient and the GE(α) family of inequality measures. The results are provided in tables 16 to 20. Table 16 shows that the education Gini coefficient decreases across income quintiles, while health inequalities increase and political inequalities decrease across income quintiles, independently on whether we consider per capita or per adult equivalent household income. This confirms the results discussed in the previous paragraph. The picture starts, however, to become more complex if we take income as the continuous variable and education as the discrete variable (table 18). The results in table 18 suggest that income inequality is quite high amongst households with lower education levels, decreases in the middle of the distribution and increases again for households with high education levels. In addition, table 19 shows that income is more equally distributed amongst households with non-zero stillborn rates (i.e. households that are worse-off in terms of health status), while education outcomes are less equally distributed amongst those households. These results imply the existence of significant differences in the rankings of households across the distributions of the four welfare attributes.

In order to explore these relationships further, we have drawn various Lorenz curves. As an example, we present in this paper the Lorenz curves for the joint distribution of per capita household income and maximum education of the household, when each of the two attributes is considered first as a discrete (continuous) variable (figure 1) and then as a continuous (discrete) variable (figure 2).[17] Figure 1 shows a clear dominance of the fifth quintile over all other income quintiles, indicating that income inequality is lower amongst households with higher levels of education. Figure 2, however, shows no clear stochastic dominance pattern. These curves illustrate how complex the analysis of inequality becomes when various dimensions are taken simultaneously into consideration. The results suggest that income inequality is not sufficient to characterise adequately the extent of socio-economic inequality in Brazil.

[17] Other Lorenz curves for the pair-wise joint distribution of all other welfare variables can be obtained upon request. We did not include these figures in the paper in order to save space.

This is confirmed further by the Spearman rank correlation coefficients calculated in table 21. The results show very little correlation between the distribution of health and the distribution of political outcomes and the remaining welfare attributes. The coefficients of correlation between the distribution of income and education outcomes are higher, but not as high as we expected given the quintile analysis discussed above.

Given these results, we examined all pair-wise combination of distributions along population quintiles (table 22). This table highlights some important points. Although over 50% of all households in the first quintile of both income distributions are also in the first quintile of the education distribution, a significant number of households (12.2% and 7.7%, respectively) at the very bottom of the income distribution are in quintiles 3 and 4 of the education distribution. Moreover, while 47.5% of all households in the top income quintile are also in the top education quintile, around 11% of those households are on the bottom education quintiles. This result challenges in part one well-established fact in development economics, namely, that education opportunities determine income mobility and inequality. This preposition does not seem to hold across the whole income distribution in Brazil, where around 20% of the very poor are quite well educated, while around 20% of the very rich are in the lowest education quintiles.

The relationship between income inequality and inequalities in political representation is also not strong. In fact, the data shows that households at the bottom of the income distributions are more likely to have at least one member belonging to a labour union than households at the top end of the income distributions. This result seems to suggest that political participation may not be a strong determinant of income inequalities in Brazil. The correlation between health inequalities (as measured by the rate of stillborns per pregnancy) and income inequality is closer: households in the bottom three income quintiles are more likely to have at least one stillborn per pregnancy, while households at the higher end of the income distributions are more likely to have no stillborn babies.

4.2. Determinants of income and non-income welfare

One common assumption in distributional and welfare analyses is that income inequality is closely related to other forms of inequality and can thus be used as a proxy for the level and evolution of aggregate inequality in any given society. The results discussed above suggest that this may not be entirely accurate. One simple explanation is that there is no reason to expect different dimensions of inequality to be determined by the same factors. For instance, while income distribution may be related to employment composition, labour legislation, social security provision and so forth, educational choices may depend on different factors such as the public provision of schools, legislation regarding child labour and opportunities available in labour markets (Jensen and Skyt

Nielsen (1997), Checchi (2000)). Furthermore, it is not clear that income distributions will be sufficient to characterise the level of aggregate inequality in different societies across time as it does not fully reflect all benefits that people receive (particularly, those that cannot be priced as they are non-tradable such as education, health, etc), their true needs or their abilities (Maasoumi (1986)). We have analysed the impact of the four welfare attributes on both the levels of the various welfare attributes and directly on inequality in incomes and education. Due to the shortcomings of the other two variables and their essentially binary nature, we decided to exclude the continuous analysis of health and political inequalities at this stage. The results of the 'level' regressions are presented in table 23, while table 24 reports the impact of the various welfare correlates described above on household inequality, where household inequality is defined as the standardised distance from the mean of each household's endowment of the four welfare attribute (i.e. household z-scores).

Table 23 shows the percentage impact of a 1% change in the various explanatory variables on the level of three of the welfare attributes we have discussed in this paper: income per capita, income per adult equivalent and maximum education level of any member of the household above the age of 15. The table includes also the results of ordered probit regressions, which show the probabilities of any given household being in an upper quintile of the income per capita, income per adult equivalent and education distributions. The last two columns show, respectively, probit models that illustrate the probabilities of any household having a positive non-zero stillborn rate or having at least one member represented by a labour union. Explanatory variables added to the various models include household size, urban versus rural location, region, racial group of the head of the household, age and gender of the household head, type of family (couple without children, couple with children, single parents and all other arrangements), whether the person has always lived in the state, whether the head of the household contributes towards the social security system (which captures formal employment), the main occupation and position in that occupation of the head of the household, education level of the head of the household and his/her parents, household income per capita, labour union participation, stillborn rates, property ownership and whether the dwelling has a toilet, television, fridge, washing machine, access to public water, electricity and telephone.

The results in table 23 confirm that determinants of income and non-income welfare dimensions vary as different variables yield different returns to the various distributions. One important difference is illustrated by the impact of household size, which, as expected, is negatively related to household income. However, it is positively related to the level of household education, possibly because larger families are more likely to have a higher number of children of all ages in school, and to political representation, i.e. larger households are more likely to have larger political representation even when this variable is already expressed in per capita terms. While some variables such as the age and occupation of the head of the household, education of the head of the household and his/her parents

and some infrastructure variables have similar effects on all dimensions of inequality, other variables have also different impacts on the various dimensions of inequality in Brazil. Unexpectedly, though urban households are more likely to have higher incomes and higher education status, they are more likely to have a stillborn and less likely to be represented by a labour union. This is a curious result given that urban workers are usually expected to be better organised than rural workers. The results for the regional variables are also quite puzzling. Although households that live in any region other than the North are more likely to have higher incomes, they have significantly lower levels of education. This result is not surprising if we observe table 7. This table shows that the North region has quite large proportion of households that have at least one member with 7-12 years of education, despite this region being the second poorest region in Brazil. This result merits further research. Examples of other variables with different impacts across all dimensions of inequality being considered include the type of household, migration status of the household, housing ownership and some infrastructure variables. This is true independently of us considering the level of the various welfare attributes or the actual z-scores, as illustrated in table 24. The conclusions yielded by the results presented in table 24 do not differ much from those in table 23: different dimensions of inequality appear to be correlated in different ways with various explanatory variables. There is thus no reason to assume, at least from Brazil, that income inequality will be a good proxy for other socio-political variables.

5. HOUSEHOLD ECONOMIC PERFORMANCE AND INEQUALITY IN BRAZIL

Economists believed for a long-time in the existence of an inverse-U shaped relationship between inequality and growth, whereby high level of inequality tend to be associated with increases in initial growth (Kuznets, 1955; Adelman and Morris, 1973). Recent studies have, however, shown that high levels of persistent income inequality may hinder prospects for economic growth and socio-economic development via several economic, social and political mechanisms, which can be broadly divided into four categories: savings mechanisms, political economy effects, credit-market imperfections and social instability and social unrest (Bénabou, 1996; Barro, 2000). Empirical evidence on the relationship between inequality and growth is, however, quite sketchy and a consensus is yet not in sight.[18]

In this section, we analyse the relationship between income and education inequalities and household economic performance in Brazil in 1996. We examine the impact of income and education inequalities on the logarithmic function of the mean household income in Brazil in 1996. The regressions include also the same controls used in tables 23 and 24: location variables (region and urban/rural location),

[18] Bénabou (1996) and Barro (2000) provide extensive reviews of the most significant empirical studies available. See also Bruno, Ravallion and Squire (1995) and Deininger and Squire (1998).

household composition variables (age and gender of head of household, type of family and race), whether the household has migrated from other regions, education variables (literacy status of household head and spouse and maximum level of education achieved by any one member of the household above the age of 15), employment variables (main occupation of the head of the household in the reference week,[19] position of the head in that occupation, contribution to social security system and membership of labour unions), health status variable (stillborn rate), housing information (property ownership status and type of dwelling) and household access to key infrastructure (public water supply, toilet, electricity, telephone, colour TV, fridge and washing machine). We have included also health status and labour union membership as binary variables, as well as the household z-scores for income and education. In order to allow for possible non-linearities in the inequality variables, we have also added the squared values of the z-scores.

The results for this analysis are provided in table 25. The most interesting result is the presence of Kuznet-type effects at the household level for both income and education variables. The table shows that both income and education inequalities are associated in a similar fashion with household income: income and education inequalities are higher at the bottom of the income distribution that amongst top incomes. This result has been found in cross-sectional analyses of income inequality (Ahluwalia (1976), Taylor and Bacha (1976), Greenwood and Jovanovic (1990), Anand and Kanbur (1993)) and education inequality (Ram (1990), Londoño (1996), Checchi (2000)), but we have not been able to find any micro level study of inequality that confirms (or not) our results.

6. CONCLUSIONS

In this paper we demonstrated the use of two empirical approaches to the measurement of multidimensional inequality in Brazil using household survey data collected in 1996. The first approach was based on the individual analysis of the distribution of four monetary and non-monetary welfare attributes: income (per capita and per adult equivalent), education outcomes, health status and political representation. The second approach considers pair-wise joint distributions of those four attributes, which allowed us to consider not only differences in the various distributions, but also possible correlations between the four welfare attributes. Our results showed that although the independent analysis of the various welfare attributes suggests that income may be a good proxy for all other types of socio-political inequalities in Brazil, this conclusion does not hold once possible correlations between the various indicators of welfare are taken into consideration. This suggests that economic analyses of inequality in Brazil will not portray the full extent of social, economic and

[19] Occupational groups include: technicians, scientists, artists and similar occupations; administration; agriculture; manufacturing; sales; transportation and communication; services; and other activities.

political inequalities in Brazil. In fact, traditional analysis of inequality in Brazil may overestimate the level of inequalities in Brazil as education and other non-monetary welfare attributes appear to be more equally distributed in Brazil than income. This in turn may explain why Brazil has sustained relatively high levels of income and political stability (in comparison with other Latin America countries where political violence and civil unrest have reached unsustainable extremes) despite harbouring some of the highest levels of inequality in the world.

TABLE 1. DIFFERENT ASPECTS OF INEQUALITY

	GNPpc $US 1999	Income Gini 1995	Land Gini 1981-1991	Access to health services 1985-1995 (%)		Education Gini 1995
				Urban	Rural	
	(1)	(2)	(3)	(4)	(5)	(6)
Latin America	3840	0.56	0.78	84	54	0.43
Brazil	**4420**	**0.59**	**0.85**	**-**	**-**	**-**
OECD	25730	0.37	0.59	-	-	0.24
Asia	840	0.34	0.54	92	71	0.50
Sub-Saharan Africa	500	0.45	0.62	84	50	0.75

Source: (1) and (2) World Bank (2001). (3), (4) and (5) IFAD (2001). (6) Checchi (2000).

TABLE 2. POVERTY AND INEQUALITY IN BRAZIL, 1985-1997

	Headcount index	Poverty gap	Squared poverty gap	Income Gini
1985	15.8	4.7	1.8	0.60
1988	18.6	6.8	3.2	0.63
1989	20.8	7.3	3.3	0.63
1993	18.8	8.4	5.0	0.62
1995	14.0	3.9	1.5	0.60
1996	14.9	4.6	1.9	0.60

Source: World Bank, *Global Poverty Monitoring*, http://www.worldbank.org/research/povmonitor/index.htm
Note: The headcount index indicates the percentage of individuals below the poverty line of US$1 per day.

TABLE 3. SUMMARY MEASURES OF INEQUALITY

	Per capita income	Per adult equiv. income	Max. years of schooling	Stillborn rate	Ratio of union members to hh size
Mean	222.82	450.06	7.580	0.021	0.073
Median	112.50	241.83	8.000	0.000	0.000
Gini	0.586	0.565	0.306	0.947	0.811
GE (0)	0.650	0.592	0.694	8.900	7.992
GE (1)	0.683	0.625	0.172	2.691	1.478
GE (2)	1.554	1.322	0.145	8.603	1.987

Note: For the above calculations, zero maximum years of schooling were replaced by 0.0001 and zero stillborn rates and union ratios were replaced by 0.000001.
Source: Authors' calculations from PNAD 1996.

TABLE 4. RACIAL DIVERSIFICATION (%)

	Percentage	Per capita income	Per adult equiv. income	Piped water[1]	Electric lighting[1]	Telephone[1]	Literacy rate
Sample mean	100.00	240.54	464.46	82.13	92.43	23.62	96.46
White	54.51	323.73	611.75	91.06	96.13	32.30	98.16
Black	7.19	135.70	278.12	76.50	89.82	10.56	93.83
Asian	0.45	580.62	1104.25	93.24	98.20	70.89	98.70
Mixed	37.68	136.53	280.00	70.23	87.60	13.01	94.50
Indigenous	0.16	153.32	301.43	62.08	67.54	14.61	91.24

Note: 1. Figures show the percentage of households whose house has piped water, electric lighting or telephone. Information is missing for 97 households who live in a private temporary and 79 households who live in shared accommodation respectively. Those households have been excluded from the tabulations.
Source: Authors' calculations from PNAD 1996.

TABLE 5. REGIONAL DIVERSIFICATION (%)

	Share	Per capita income	Per adult equiv. income	Piped water[1]	Electric lighting[1]	Phone[1]	Literacy rate
Sample mean	100.00	240.54	464.46	82.13	92.43	23.62	96.46
Urban	79.71	277.49	533.31	91.53	98.89	28.56	98.00
Rural	20.29	95.38	193.93	45.25	67.04	4.21	90.40
North	**4.83**	**180.20**	**377.65**	**70.71**	**95.21**	**20.30**	**98.50**
Rodônia	0.56	216.53	426.79	82.82	96.76	22.11	98.86
Acre	0.21	270.30	524.84	60.97	98.21	32.17	95.26
Amazonas	1.19	191.77	418.08	86.17	98.89	26.75	99.03
Roraima	0.12	289.23	569.97	98.31	100.00	33.13	99.58
Pará	1.98	156.66	332.40	61.03	95.94	15.05	98.57
Amapá	0.19	206.72	455.93	75.37	99.86	30.62	99.18
Tocantins	0.59	139.59	286.27	57.06	80.39	13.04	97.59
Northeast	**29.07**	**130.22**	**265.51**	**58.77**	**81.69**	**13.01**	**91.19**
Maranhão	3.51	105.71	223.72	38.32	72.34	8.85	87.73
Piauí	1.77	99.55	209.65	47.44	71.07	13.39	87.93
Ceará	4.49	125.59	254.30	51.74	74.03	14.60	91.00
Rio Grande do Norte	1.76	148.28	305.56	65.06	92.19	12.55	92.67
Paraíba	2.26	133.08	267.90	67.22	91.61	16.08	91.43
Pernambuco	4.61	139.96	280.02	67.90	90.76	10.71	92.29
Alagoas	1.78	137.39	287.77	64.12	88.49	12.97	85.33
Sergipe	1.03	150.88	310.10	74.54	93.46	15.83	92.31
Bahia	7.86	135.81	274.12	62.00	79.01	14.10	93.70
Southeast	**43.87**	**309.24**	**589.05**	**94.45**	**97.59**	**29.84**	**98.71**
Minas Gerais	10.88	202.71	397.02	87.68	91.91	23.95	97.91
Espírito Santo	1.85	210.41	409.00	92.65	97.61	20.95	97.80
Rio de Janeiro	8.74	336.17	617.70	93.59	99.32	25.47	99.07
São Paulo	22.41	358.59	685.93	98.21	99.67	35.13	99.03
South	**15.39**	**268.19**	**503.35**	**93.59**	**96.66**	**24.54**	**98.61**
Paraná	5.82	251.46	477.66	92.06	96.38	26.78	98.11
Santa Catarina	3.21	262.42	503.12	95.94	96.58	24.71	99.00
Rio Grande do Sul	6.36	286.42	526.98	93.80	96.96	22.41	98.88
Central West	**6.83**	**249.25**	**484.72**	**84.75**	**93.47**	**29.06**	**98.15**
Mato Grosso do Sul	1.26	224.47	442.60	88.74	95.30	25.02	98.19
Mato Grosso	1.57	205.20	410.33	72.61	85.77	18.56	98.41
Goiás	2.87	213.46	409.80	85.30	94.60	23.90	97.55
Distrito Federal	1.13	428.12	823.69	95.76	99.25	61.07	99.27

Note: 1. Figures show the percentage of households whose house has piped water, electric lighting or telephone. Information is missing for 97 households who live in a private temporary and 79 households who live in shared accommodation respectively. Those households have been excluded from the tabulations.
Source: Authors' calculations from PNAD 1996.

TABLE 6. WITHIN AND BETWEEN-GROUP INCOME INEQUALITIES

	Pop. %	Mean	GE(0)	GE(1)	GE(2)	Gini
			Within-group inequality			
Income per capita						
White	54.26	299.05	0.602	0.624	1.311	0.566
Black	7.15	125.57	0.426	0.423	0.660	0.484
Yellow	0.43	541.27	0.508	0.452	0.624	0.507
Mixed	38.00	129.02	0.535	0.573	1.290	0.540
Indigenous	0.16	131.50	0.697	0.661	1.098	0.593
Inc per adult equiv						
White	54.26	278.18	0.560	0.580	1.142	0.550
Black	7.15	592.11	0.386	0.381	0.556	0.464
Yellow	0.43	269.97	0.510	0.453	0.628	0.507
Mixed	38.00	1082.94	0.487	0.523	1.082	0.519
Indigenous	0.16	274.65	0.628	0.589	0.881	0.570
Income per capita						
North	4.90	168.72	0.571	0.636	1.322	0.564
North East	29.31	121.12	0.683	0.814	2.297	0.609
Centre West	6.83	232.81	0.607	0.691	1.646	0.580
South East	43.60	286.44	0.539	0.577	1.226	0.543
South	15.36	249.08	0.540	0.588	1.359	0.544
Inc per adult equiv						
North	4.90	368.71	0.512	0.566	1.107	0.537
North East	29.31	258.08	0.621	0.747	2.036	0.586
Centre West	6.83	473.98	0.575	0.652	1.471	0.568
South East	43.60	571.22	0.495	0.528	1.037	0.524
South	15.36	484.78	0.500	0.543	1.141	0.527
Income per capita						
Urban	79.52	257.07	0.589	0.628	1.376	0.565
Rural	20.48	89.80	0.531	0.604	1.540	0.540
Inc per adult equiv						
Urban	79.52	517.01	0.540	0.576	1.175	0.545
Rural	20.48	189.97	0.471	0.542	1.273	0.514

	Share of between-group inequality			
	Race	**State**	**Region**	**Urban/Rural**
GE(0)				
Income per capita	13.2	12.3	9.7	11.1
Income pae	12.2	11.7	9.0	11.1
GE(1)				
Income per capita	11.7	11.0	8.2	8.2
Income pae	10.9	10.4	7.7	8.3
GE(2)				
Income per capita	5.0	4.7	3.3	3.0
Income pae	5.0	4.8	3.3	3.3

Source: Authors' calculations from PNAD 1996.

TABLE 7. MAXIMUM YEARS OF SCHOOLING BY SOCIO-ECONOMIC GROUP (%)

	0	1-4	5-6	7-9	10-12	13+
Sample	**5.82**	**22.05**	**13.50**	**22.52**	**24.76**	**11.34**
White	3.41	17.62	11.92	22.38	28.09	16.58
Black	9.97	24.91	16.67	24.83	19.22	4.40
Yellow	1.79	10.13	4.87	14.01	29.29	39.92
Mixed	8.52	28.05	15.28	22.41	20.96	4.78
Indigenous	17.39	27.47	10.99	16.61	22.44	5.10
Urban	3.72	16.42	13.09	24.24	28.76	13.77
Rural	14.08	44.18	15.10	15.76	9.06	1.82
North	4.48	16.86	14.47	25.09	31.06	8.03
North East	12.83	30.98	12.57	17.26	20.04	6.31
Centre West	4.11	19.96	15.57	23.50	25.44	11.41
South East	2.69	17.82	12.38	24.83	27.47	14.81
South	2.70	19.82	17.21	24.63	23.69	11.95

Note: The table refers to the maximum years of schooling attended among household members aged 15 or above.
Source: Authors' calculations from PNAD 1996.

TABLE 8. STILLBORN RATE BY SOCIO-ECONOMIC GROUP (%)

	0	0.1-0.3	0.4-0.6	0.7-0.9	1
Sample	**91.24**	**7.31**	**1.16**	**0.17**	**0.12**
White	92.98	5.70	1.05	0.16	0.10
Black	88.12	10.22	1.39	0.11	0.16
Yellow	93.55	5.18	0.70	0.37	0.20
Mixed	89.33	9.07	1.29	0.18	0.13
Indigenous	87.80	11.41	0.79	-	-
Urban	91.62	6.89	1.20	0.16	0.12
Rural	89.75	8.94	1.03	0.18	0.09
North	87.63	10.76	1.36	0.16	0.08
North East	88.61	9.90	1.24	0.14	0.11
Centre West	91.51	7.16	1.09	0.17	0.07
South East	92.50	5.99	1.18	0.19	0.14
South	93.71	5.11	0.94	0.14	0.09

Note: The rate is the mean stillborn rate of the household. There are 11,446 households for which stillborn rates are missing because in these households there were no women who became pregnant in the past. Also note that out of 6,302 women who said they had a stillborn in the past, the total number of stillborns is 0 for 80 individuals. Given that we do not know which answer is correct, we assume 0 stillborn for those women. However, there are 972 women whose total number of stillborns is unknown. Hence we replace the missing by the mean number of each age group (15-19, 20-24, 25-29, 30-39, 40-49, 50+).
Source: Authors' calculations from PNAD 1996.

TABLE 9. RATIO OF UNION MEMBERS BY SOCIO-ECONOMIC GROUP (%)

	% at least one member	0	0.1-0.3	0.4-0.6	0.7-0.9	1
Sample	**25.70**	**74.30**	**19.98**	**4.87**	**0.17**	**0.68**
White	28.25	71.75	20.95	6.20	0.23	0.87
Black	22.20	77.80	18.53	3.11	0.10	0.47
Yellow	35.01	64.99	23.00	10.57	0.36	1.08
Mixed	22.57	77.43	18.81	3.23	0.11	0.43
Indigenous	22.18	77.82	19.16	2.93	-	0.09
Urban	25.65	74.35	20.00	4.85	0.15	0.66
Rural	25.87	74.13	19.88	4.95	0.27	0.76
North	21.64	78.36	18.67	2.65	0.03	0.29
North East	23.41	76.59	19.55	3.28	0.08	0.50
Centre West	21.14	78.86	16.39	4.13	0.12	0.50
South East	26.31	73.69	20.47	4.96	0.16	0.71
South	31.58	68.42	21.36	8.66	0.45	1.11

Note: Note: Information on union membership is only available for those who had worked for the last 365 days. We assume that those with no information are not a union member. Source: Authors' calculations from PNAD 1996.

TABLE 10. SHARE OF BETWEEN-GROUP NON-MONETARY INEQUALITIES IN TOTAL INEQUALITY

	Race	State	Region	Urban/rural
GE(0)				
Education	1.4	1.7	1.3	3.3
Health	0.2	0.4	0.1	0.0
Political representation	0.2	0.6	0.3	0.0
GE(1)				
Education	5.8	7.0	5.2	11.6
Health	0.5	1.3	0.3	0.0
Political representation	1.3	3.0	1.6	0.0
GE(2)				
Education	6.9	7.6	6.2	12.4
Health	0.2	0.4	0.1	0.0
Political representation	1.0	2.4	1.2	0.0

Note: The difference between the values in this table and 100% corresponds to the share of the within-group inequalities.
Source: Authors' calculations from PNAD 1996.

TABLE 11. VERTICAL NON-MONETARY INEQUALITIES BY RACE

	Pop. %	Mean	GE(0)	GE(1)	GE(2)	Gini
Education						
White	54.26	8.500	0.446	0.132	0.112	0.269
Black	7.15	6.418	1.058	0.213	0.173	0.334
Yellow	0.43	10.957	0.249	0.081	0.065	0.197
Mixed	38.00	6.454	0.955	0.212	0.177	0.339
Indigenous	0.16	5.870	1.770	0.339	0.281	0.426
Stillborn rate						
White	54.26	0.018	8.950	2.897	10.540	0.957
Black	7.15	0.027	8.763	2.390	6.342	0.928
Yellow	0.43	0.021	9.137	2.959	11.077	0.959
Mixed	38.00	0.025	8.821	2.504	7.126	0.936
Indigenous	0.16	0.019	8.433	2.300	5.510	0.915
Representation						
White	54.26	0.085	7.813	1.376	1.729	0.790
Black	7.15	0.057	8.196	1.623	2.390	0.837
Yellow	0.43	0.111	7.147	1.117	1.158	0.726
Mixed	38.00	0.057	8.168	1.610	2.363	0.835
Indigenous	0.16	0.048	8.006	1.585	2.231	0.830

Source: Authors' calculations from PNAD 1996.

TABLE 12. VERTICAL NON-MONETARY INEQUALITIES BY REGION

	Pop. %	Mean	GE(0)	GE(1)	GE(2)	Gini
Education						
North	4.90	7.860	0.544	0.136	0.112	0.267
North East	29.31	6.076	1.399	0.287	0.242	0.395
Centre West	6.83	7.819	0.496	0.144	0.124	0.283
South East	43.60	8.432	0.361	0.120	0.105	0.260
South	15.36	7.835	0.368	0.128	0.115	0.272
Stillborn rate						
North	4.90	0.026	8.676	2.382	6.277	0.929
North East	29.31	0.025	8.742	2.438	6.682	0.932
Centre West	6.83	0.021	8.928	2.684	8.260	0.946
South East	43.60	0.020	8.994	2.835	9.890	0.954
South	15.36	0.016	8.933	2.989	11.545	0.960
Representation						
North	4.90	0.052	8.182	1.652	2.483	0.842
North East	29.31	0.059	8.089	1.581	2.312	0.831
Centre West	6.83	0.060	8.362	1.656	2.423	0.840
South East	43.60	0.075	7.948	1.441	1.862	0.802
South	15.36	0.105	7.566	1.266	1.499	0.767

Source: Authors' calculations from PNAD 1996.

TABLE 13. VERTICAL NON-MONETARY INEQUALITIES BY URBAN/RURAL AREAS

	Pop. %	Mean	GE(0)	GE(1)	GE(2)	Gini
Education						
Urban	79.52	8.315	0.474	0.132	0.111	0.267
Rural	20.48	4.725	1.436	0.291	0.255	0.395
Stillborn rate						
Urban	79.52	0.021	8.932	2.733	8.920	0.949
Rural	20.48	0.022	8.776	2.536	7.484	0.938
Representation						
Urban	79.52	0.072	7.996	1.470	1.937	0.809
Rural	20.48	0.074	7.975	1.508	2.169	0.821

Source: Authors' calculations from PNAD 1996.

TABLE 14. MEAN MAX YEARS OF SCHOOLING, STILLBORN RATE, NO. OF UNION MEMBERS PER POPULATION QUINTILE

	1	2	3	4	5
			Per capita income		
Max. years of schooling	4.377	5.945	7.202	8.864	11.579
Stillborn rate	0.023	0.023	0.023	0.020	0.017
Ratio union members in hh	0.033	0.043	0.061	0.090	0.137
			Per adult equivalent income		
Max. years of schooling	4.258	5.668	7.307	8.930	11.741
Stillborn rate	0.024	0.024	0.022	0.019	0.017
No. of union members in hh	0.035	0.045	0.061	0.087	0.136
			Education quintiles		
Per capita income	85.765	110.607	155.621	243.523	690.424
Per adult equiv. Income	163.846	230.001	322.509	503.596	1371.142
Stillborn rate	0.027	0.022	0.020	0.018	0.017
No. of union members in hh	0.047	0.050	0.061	0.085	0.137

Source: Authors' calculations from PNAD 1996.

TABLE 15. DISTRIBUTIONS ACROSS HEALTH AND POLITICAL REPRESENTATION OUTCOMES

	Zero stillborn rate	Non-zero stillborn rate	Zero union member	Non-zero union member
Per capita income	228.787	160.638	189.437	319.110
Per adult equiv. income	460.774	338.506	379.354	654.037
Max. years of schooling	7.667	6.665	7.079	9.025
Stillborn rate			0.022	0.020
No. of union members in hh	0.073	0.066		

Source: Authors' calculations from PNAD 1996.

TABLE 16: INEQUALITY MEASURES ACROSS PER CAPITA INCOME QUINTILES

	1	2	3	4	5
Max. years of schooling					
Gini	0.387	0.302	0.263	0.205	0.155
GE (0)	1.465	0.756	0.602	0.257	0.105
GE (1)	0.283	0.170	0.135	0.082	0.049
GE (2)	0.240	0.142	0.109	0.069	0.041
Stillborn rate					
Gini	0.930	0.937	0.945	0.954	0.965
GE (0)	8.663	8.822	8.893	9.002	9.097
GE (1)	2.423	2.520	2.649	2.839	3.126
GE (2)	6.574	7.122	8.405	9.825	12.777
Ratio of union members					
Gini	0.879	0.869	0.833	0.765	0.689
GE (0)	8.440	8.479	8.209	7.513	6.642
GE (1)	1.934	1.845	1.606	1.268	0.988
GE (2)	3.458	3.120	2.361	1.487	0.988

Source: Authors' calculations from PNAD 1996.

TABLE 17: INEQUALITY MEASURES ACROSS PER ADULT EQUIVALENCE INCOME QUINTILES

	1	2	3	4	5
Max. years of schooling					
Gini	0.398	0.322	0.246	0.192	0.144
GE (0)	1.599	0.940	0.388	0.166	0.070
GE (1)	0.301	0.196	0.112	0.069	0.041
GE (2)	0.254	0.162	0.095	0.060	0.035
Stillborn rate					
Gini	0.933	0.936	0.946	0.954	0.964
GE (0)	8.778	8.832	8.868	8.954	9.021
GE (1)	2.468	2.504	2.672	2.832	3.082
GE (2)	6.892	7.022	8.678	9.870	12.313
Ratio of union members					
Gini	0.890	0.875	0.832	0.772	0.680
GE (0)	8.614	8.552	8.192	7.558	6.446
GE (1)	2.021	1.882	1.600	1.293	0.954
GE (2)	3.864	3.322	2.336	1.549	0.943

Source: Authors' calculations from PNAD 1996.

TABLE 18: INEQUALITY MEASURES ACROSS EDUCATION QUINTILES

	1	2	3	4	5
Per capita income					
Gini	0.500	0.450	0.453	0.453	0.465
GE (0)	0.451	0.361	0.371	0.366	0.390
GE (1)	0.488	0.409	0.390	0.380	0.397
GE (2)	0.994	1.349	0.717	0.643	0.673
Per adult equiv. income					
Gini	0.446	0.412	0.424	0.428	0.446
GE (0)	0.352	0.300	0.323	0.324	0.357
GE (1)	0.376	0.329	0.333	0.333	0.360
GE (2)	0.655	0.935	0.555	0.522	0.572
Stillborn rate					
Gini	0.933	0.939	0.950	0.955	0.963
GE (0)	8.841	8.780	8.910	8.906	9.016
GE (1)	2.457	2.561	2.743	2.854	3.058
GE (2)	6.833	7.629	9.031	10.068	12.035
Ratio of union members					
Gini	0.883	0.863	0.831	0.771	0.655
GE (0)	8.667	8.462	8.201	7.524	6.146
GE (1)	1.940	1.791	1.593	1.288	0.883
GE (2)	3.626	2.973	2.271	1.535	0.836

Source: Authors' calculations from PNAD 1996.

TABLE 19: INEQUALITY MEASURES PER ZERO/NON-ZERO STILLBORN RATE

	Zero stillborn rate	Non-zero stillborn rate
Per capita income		
Gini	0.585	0.566
GE (0)	0.650	0.593
GE (1)	0.681	0.640
GE (2)	1.549	1.307
Per adult equiv. income		
Gini	0.565	0.542
GE (0)	0.594	0.532
GE (1)	0.625	0.575
GE (2)	1.323	1.094
Max. years of schooling		
Gini	0.302	0.341
GE (0)	0.669	0.947
GE (1)	0.168	0.213
GE (2)	0.141	0.180
Ratio of union members		
Gini	0.810	0.828
GE (0)	7.987	8.039
GE (1)	1.471	1.552
GE (2)	1.961	2.284

Source: Authors' calculations from PNAD 1996.

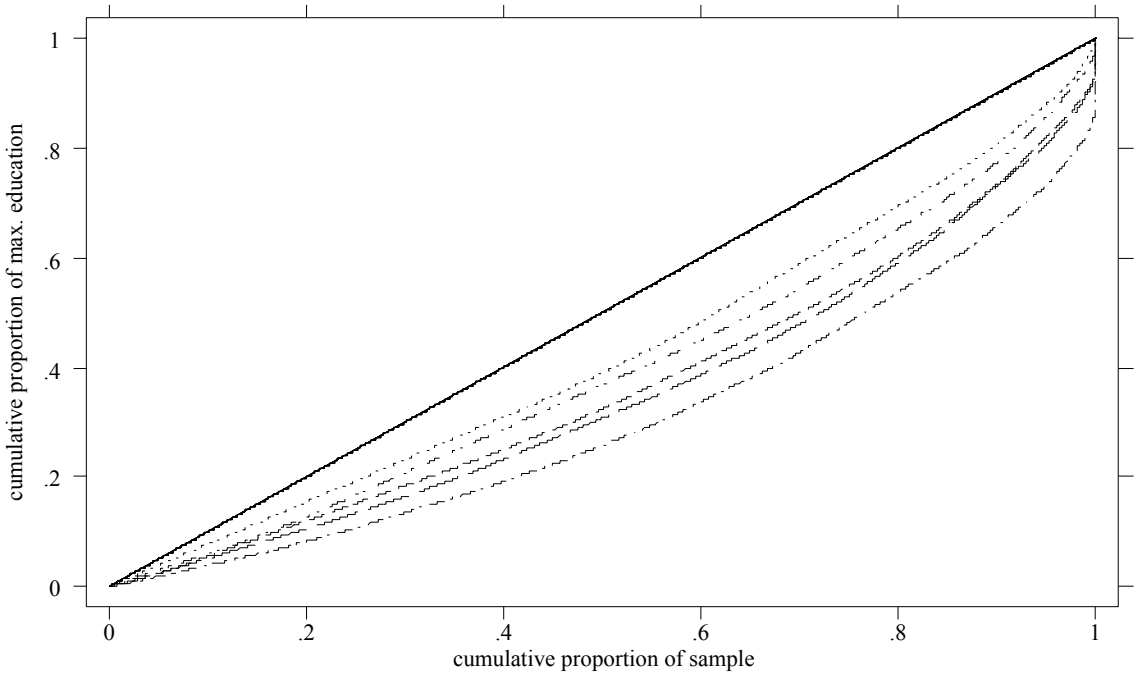
TABLE 20: INEQUALITY MEASURES PER ZERO/NON-ZERO RATIO OF UNION MEMBERS TO HOUSEHOLD SIZE

	Zero union member	Non-zero union member
Per capita income		
Gini	0.577	0.568
GE (0)	0.620	0.626
GE (1)	0.673	0.618
GE (2)	1.609	1.245
Per adult equiv. income		
Gini	0.554	0.546
GE (0)	0.559	0.567
GE (1)	0.611	0.562
GE (2)	1.374	1.033
Max. years of schooling		
Gini	0.316	0.259
GE (0)	0.774	0.439
GE (1)	0.184	0.126
GE (2)	0.155	0.104
Stillborn rate		
Gini	0.946	0.949
GE (0)	8.905	8.885
GE (1)	2.679	2.724
GE (2)	8.508	8.883

Source: Authors' calculations from PNAD 1996.

FIGURE 1: LORENZ CURVES BASED ON MAX. YEARS OF SCHOOLING FOR PER CAPITA INCOME QUINTILES

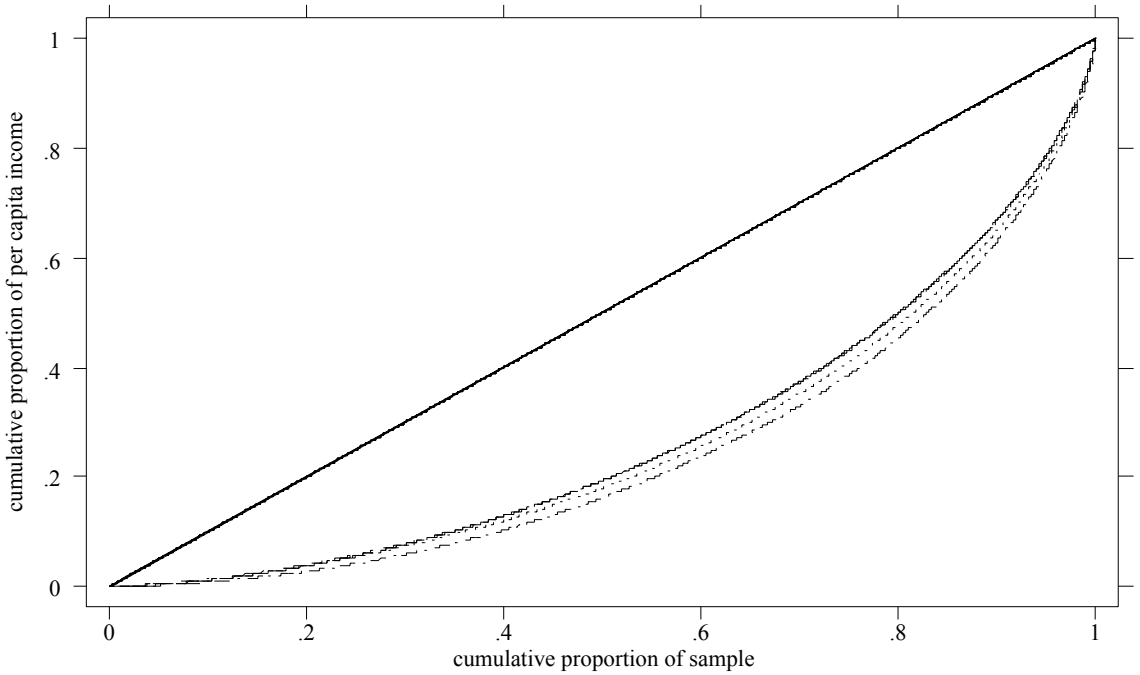
– · – · 1st quintile (poorest) — — 2nd quintile – – – 3rd quintile – ·· – 4th quintile ····· 5th quintile



Source: Authors' calculations from PNAD 1996.

FIGURE 2: LORENZ CURVES BASED ON PER CAPITA INCOME FOR EDUCATION QUINTILES

– · – · 1st quintile (poorest) — — 2nd quintile – – – 3rd quintile – ·· – 4th quintile ····· 5th quintile



Source: Authors' calculations from PNAD 1996.

TABLE 21. SPEARMAN RANK CORRELATION COEFFICIENT

	Per capita income	Per adult equiv. income	Max. years of schooling	Stillborn rate	No. union members in hh
Per capita income	1.000	0.972	0.571	-0.061	0.238
Per adult equiv. Income		1.000	0.628	-0.063	0.255
Max. years of schooling			1.000	-0.073	0.234
Stillborn rate				1.000	-0.018
No. union members in hh					1.000

Note: The null hypothesis of independence of two variables is rejected for all the cases.
Source: Authors' calculations from PNAD 1996.

TABLE 22. INEQUALITY MATRICES

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
			Income per capita		
Education quintile 1	52.03	31.87	20.62	11.51	4.97
Education quintile 2	27.37	30.55	25.42	16.37	5.84
Education quintile 3	12.18	19.79	22.85	21.91	10.37
Education quintile 4	7.69	16.15	26.79	36.80	31.30
Education quintile 5	0.73	1.65	4.32	13.41	47.52
Stillborn rate = 0	20.45	20.25	19.84	20.14	19.31
Stillborn rate = 1	27.29	23.97	21.47	15.88	11.39
Representation = 1	22.57	22.11	20.84	18.62	15.86
Representation = 0	12.61	13.97	17.49	24.10	31.83
			Income per adult equivalent		
Education quintile 1	53.02	36.23	20.00	9.91	3.43
Education quintile 2	26.86	29.49	26.95	17.37	5.11
Education quintile 3	11.99	18.48	22.58	23.02	10.66
Education quintile 4	7.32	14.37	26.19	37.27	32.58
Education quintile 5	0.81	1.43	4.27	12.42	48.23
Stillborn rate = 0	20.09	19.69	20.09	20.12	20.01
Stillborn rate = 1	25.74	23.69	21.12	16.98	12.48
Representation = 1	22.92	22.23	20.86	18.63	15.36
Representation = 0	11.57	13.53	17.58	23.92	33.40
			Maximum years of schooling		
Stillborn rate = 0	23.09	20.76	17.71	24.30	14.15
Stillborn rate = 1	30.04	24.23	16.12	20.45	9.16
Representation = 1	26.67	22.78	17.79	22.29	10.47
Representation = 0	15.39	14.99	16.18	28.69	24.74

Source: Authors' calculations from PNAD 1996.

TABLE 23. DETERMINANTS OF INCOME AND NON-INCOME INEQUALITY IN BRAZIL

	Elasticities of income per capita	Elasticities of income pae	Elasticities of educ distribution	Ordered probit: Income pc	Ordered probit: Income pae	Ordered probit: Education distribution	Probit: Stillborn rate	Probit: union membership
Welfare dimensions								
Hh income			0.037***			0.0002***	-0.000***	0.00003***
Max educ	0.497***	0.502***		0.104***	0.106***		-0.008***	0.051***
No union	0.060***	0.051***	0.017***	0.986***	0.963***	0.588***	0.142***	
Stillborn rate	-0.001	-0.001	-0.0003	0.053***	0.002*	-0.054***		0.123***
Location variables								
(Rural)								
Urban	0.061***	0.054***	0.030***	0.108***	0.100***	0.173***	0.101***	-0.231***
(North)								
Northeast	0.012*	0.010	-0.011***	-0.231***	-0.230***	-0.056***	-0.096***	0.097***
Centre West	0.006***	0.007***	-0.003***	0.075***	0.065***	-0.116***	-0.127***	-0.124***
Southeast	0.075***	0.071***	-0.029***	0.216***	0.218***	-0.213***	-0.160***	-0.044***
South	0.004	0.004	-0.016***	0.071***	0.070***	-0.277***	-0.231***	0.150***
Ethnicity variables								
(Indigenous)								
White	0.054	0.053	0.026	0.128***	0.027***	0.027***	0.058***	0.068***
Black	-0.0001	-0.001	0.0003	-0.001	-0.085***	-0.034***	0.178***	0.116***
Asian	0.001	0.001	0.001**	0.190***	0.082***	0.207***	-0.136***	0.099***
Mixed race	-0.002	-0.003	0.004	-0.014***	-0.108***	-0.067***	0.122***	0.090***
Hh composition								
Hh size	-0.409***	-0.109***	0.055***	-0.183***	-0.023***	0.022***	0.060***	0.011***
(Male)								
Female	-0.010	-0.001	-0.002	0.161***	0.078***	-0.017***	0.348***	0.154***
Age household head	0.511***	0.498***	0.062***	0.017***	0.018***	0.005***	0.013***	0.011***
(Other hh type)								
Couple wo chd	0.013***	0.009***	-0.007***	0.143***	0.129***	-0.446***	0.434***	0.054***
Couple w/ chd	-0.005	0.102***	0.041***	-0.174***	-0.057***	0.127***	0.339***	0.049***
Single mother	-0.024***	-0.010**	0.009***	-0.488***	-0.344***	0.204***	0.132***	-0.180***
(Non-migrant)								
Migrant	0.017***	0.019***	-0.006***	0.133***	0.142***	-0.064***	0.058***	0.005***
Employment vars								
(Ss cont = 0)								
Social security	-0.007	-0.002	0.013***	0.049***	0.063***	0.069***	-0.039***	0.518***
(Other)								
Industry	0.045***	0.043***	0.015	0.450***	0.458***	0.874***	0.037***	0.148***
Administration	0.082***	0.080***	0.016	0.508***	0.474***	0.301***	-0.033***	0.036***
Agriculture	0.003	0.001	-0.021***	-0.177***	-0.209***	-0.231***	0.043***	0.396***
Manufacturing	0.006*	0.006**	-0.009***	0.187***	0.167***	-0.112***	0.010***	0.033***
Trade	0.009***	0.009***	0.005***	0.208***	0.178***	0.097***	-0.0002	-0.248***
Transportation	0.002	0.002	-0.001*	0.247***	0.236***	-0.070***	0.006***	0.194***
Other services	0.004***	0.005***	-0.003***	0.021***	0.011***	-0.185***	0.041***	-0.301***
Parents' education								
Educ of father	0.200***	0.188***	0.041***	0.036***	0.038***	0.070***	-0.015***	0.009***
Educ of mother	0.153***	0.139***	0.052***	0.042***	0.042***	0.093***	-0.018***	0.012***
Wealth variables								
(Other ownership)								
Own house	0.030	0.046	0.047***	0.107***	0.149***	0.226***	-0.124***	0.090***
Mortgaged	-0.003	-0.001	0.009***	0.133***	0.173***	0.410***	-0.113***	0.238***
Rented	0.012*	0.015**	0.013***	0.330***	0.369***	0.331***	-0.192***	0.078***
Given by employer	0.0003	0.001	-0.001	-0.010***	0.033***	-0.008***	-0.123***	-0.307***
Given by other	-0.006*	-0.004	0.005***	-0.044***	0.001	0.279***	-0.115***	0.062***
Toilet	-0.088***	-0.079***	0.087***	0.111***	0.116***	0.254***	-0.028***	0.029***
Television	-0.010	-0.0002	0.103***	0.410***	0.421***	0.370***	-0.077***	0.110***
Fridge	-0.087***	-0.068***	0.120***	0.350***	0.340***	0.436***	-0.092***	0.137***
Washing machine	0.118***	0.117***	0.033***	0.422***	0.436***	0.271***	0.027***	0.085***
Public water	-0.080***	-0.057***	0.063***	0.104***	0.100***	0.199***	0.013***	-0.133***
Electricity	-0.010	-0.012	0.004	-0.168***	-0.154***	0.067***	0.025***	-0.105***
Telephone	0.179***	-0.178***	0.047***	0.677***	0.686***	0.508***	-0.062***	0.072***
Constant							-2.370***	-2.048***
Cut 1				0.490	1.391	1.453		
Cut 2				1.566	2.374	2.020		
Cut 3				2.500	3.296	2.910		
Cut 4				3.620	4.373	4.129		
F-statistic/Wald- statistic	342.52***	367.56***	1408.86***	***	***	***	***	***
R-squared	0.345	0.362	0.565	0.326	0.302		0.055	0.096

Notes: *** significant at 1% level of significance, ** significant at 5%, * significant at 10%.
Source: Authors' calculations from PNAD 1996.

TABLE 24. DETERMINANTS OF INCOME AND NON-INCOME INEQUALITY IN BRAZIL

	Income per capita z-scores	Income pae z-scores	Education z-scores
Welfare dimensions			
Hh income			0.00007***
Max educ	0.027***	0.037***	
No union	0.310***	0.354***	0.377***
Stillborn rate	-0.019	-0.021	-0.029
Location variables			
(Rural)			
Urban	0.034***	0.040***	0.071***
(North)			
Northeast	0.017*	0.020	-0.068***
Centre West	0.037***	0.058***	-0.071***
Southeast	0.074***	0.095***	-0.121***
South	0.010	0.012	-0.169***
Ethnicity variables			
(Indigenous)			
White	0.041	0.055	0.083
Black	-0.001	-0.005	0.011
Asian	0.106	0.146	0.207**
Mixed race	-0.002	-0.004	0.019
Household composition			
Hh size	-0.034***	-0.012***	0.020***
(Male)			
Female	0.036	-0.004	-0.026
Age hh head	0.005***	0.007***	0.003***
(Other)			
Couple wo chd	0.119***	0.119***	-0.280***
Couple w/ chd	-0.002	0.069***	0.088***
Single mother	-0.113***	-0.066**	0.138***
(Non-migrant)			
Migrant	0.030***	0.045***	-0.044***
Employment variables			
(Ss cont = 0)			
Social security	-0.006	-0.002	0.047***
(Other)			
Industry	0.343***	0.454***	0.492***
Administration	0.267***	0.356***	0.217***
Agriculture	0.004	0.003	-0.160***
Manufacturing	0.010*	0.015**	-0.071***
Trade	0.035***	0.050***	0.084***
Transportation	0.011	0.016	-0.028*
Other services	0.031***	0.063***	-0.124***
Parents' education			
Educ of father	0.045***	0.058***	0.039***
Educ of mother	0.036***	0.045***	0.052***
Wealth variables			
(Other ownership type)			
Own house	0.018	0.039	0.124***
Mortgaged	-0.017	-0.009	0.238***
Rented	0.040*	0.070**	0.190***
Given by employer	0.002	0.010	-0.025
Given by other	-0.037*	-0.033	0.138***
Toilet	-0.042***	-0.051***	0.177***
Television	-0.006	-0.0001	0.269***
Fridge	-0.047***	-0.050***	0.279***
Washing machine	0.161***	0.219***	0.191***
Public water	-0.041***	-0.040***	0.139***
Electricity	-0.004	-0.007	0.008
Telephone	0.318***	0.432***	0.359***
Constant	-0.705***	-1.096***	-1.492***
F-statistic	342.52***	367.56***	1408.86***
R-squared	0.345	0.362	0.565

Source: Authors' calculations from PNAD 1996.

TABLE 25. DETERMINANTS OF INCOME AND EDUCATION INEQUALITY IN BRAZIL

	Log income pc	Log income pae	Education levels
Z-scores			
Income pc z-scores	0.839***		0.016***
Sq incpc z-scores	-0.026***		-0.0004***
Income pae z-scores		0.828***	
Sq incpae z-scores		-0.026***	
Education z-scores	0.178***	0.183***	0.688***
Sq educ z-scores	-0.017***	-0.017***	-0.202***
Other welfare dimensions			
No union	0.308***	0.288***	0.001
Stillborn rate	0.031	0.015	0.004
Location variables			
(Rural)			
Urban	0.052***	0.050***	-0.006***
(North)			
Northeast	-0.138***	-0.134***	-0.002
Centre West	0.025*	0.031**	0.009***
Southeast	0.059***	0.063***	0.009***
South	0.024*	0.026**	0.015***
Ethnicity variables			
(Indigenous)			
White	0.025	0.017	0.008
Black	-0.010	-0.019	0.007
Asian	0.002	-0.003	0.015
Mixed race	-0.023	-0.030	0.008
Household composition			
Hh size	-0.080***	0.008***	0.0002
(Male)			
Female	0.058***	0.015	-0.002
Age hh head	0.007***	0.007***	-0.0001**
(Other)			
Couple wo chd	0.023	0.010	-0.001
Couple w/ chd	-0.092***	-0.023	-0.001
Single mother	-0.194***	-0.117***	-0.003
(Non-migrant)			
Migrant	0.051***	0.052***	-0.002**
Employment variables			
(Ss cont = 0)			
Social security	0.051***	0.054***	-0.002**
(Other)			
Industry	0.049***	0.052***	0.026***
Administration	0.130***	0.130***	-0.004**
Agriculture	-0.132***	-0.133***	-0.001
Manufacturing	0.079***	0.078***	-0.002
Trade	0.077***	0.076***	-0.008***
Transportation	0.116***	0.117***	-0.006***
Other services	-0.031**	-0.028*	-0.0002
Literacy and parents' education			
(No literate)			
Literate	-0.077***	-0.065**	0.283***
Educ of father	0.001	0.001	0.001***
Educ of mother	0.006***	0.005**	0.001***
Wealth variables			
(Other)			
Own house	0.049	0.049	-0.008
Mortgaged	0.072*	0.073*	-0.012*
Rented	0.152***	0.148***	-0.011*
Given by employer	0.041	0.039	-0.004
Given by other	-0.004	-0.010	-0.008
Toilet	0.113***	0.111***	0.011***
Television	0.228***	0.228***	-0.009***
Fridge	0.218***	0.218***	-0.005**
Washing machine	0.135***	0.138***	-0.007***
Public water	0.090***	0.093***	0.001
Electricity	-0.052***	-0.053***	0.023***
Telephone	0.188***	0.192***	-0.001
Constant	4.428***	4.695***	1.733***
F-statistic	2506.06***	2390.26***	27634.58***
R-squared	0.802	0.782	0.980

Source: Authors' calculations from PNAD 1996.

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