INCOME INEQUALITY AND SOCIAL WELL-BEING

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Abstract Deepening inequality has become the subject of intense debates, particularly on growth, poverty, and development. This paper shows that inequality has a bearing on well-being, which comprises a set of capabilities indicating the extent of freedom individuals have in leading their lives. It examines inequality in different dimensions of well-being across Brazilian municipalities and measures the impact of income inequality on well-being. Findings reveal that Brazil has improved outcomes related to material well-being, health, education, living conditions, and labor market activities, and has reduced disparities in these areas. The study finds that income inequality hampers growth in well-being, except for indicators closely associated with education and human capital development. Findings suggest that while the impacts of income inequality differ across various dimensions of well-being, reducing inequality will generally help improve the well-being of a society.

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1. Introduction

That inequality matters is gaining ground in development affairs. Reducing income disparities across the population is on top of the agenda of many governments today. High inequality may imply large concentration of people either at the top or at the bottom of the distribution, thereby hollowing out the middle-income group. This can create social tension in society that may result in political instability and social conflicts.

The widening disparity between the top one percent and the remaining 99% of a population is a persistent topic in recent literature. A number of books dealing with various aspects of inequality have sparked interest in the impacts of uneven distribution of income on growth and development. These include *The Price of Inequality* (2012) by Joseph Stiglitz, *Capital in the Twenty-First Century* (2013) by Thomas Piketty, *Inequality: What Can Be Done?* (2015) by Anthony Atkinson, and *The Globalization of Inequality* (2015) by François Bourguignon.

Inequality comes at the expense of a less stable and less efficient economic system, Stiglitz argues in his book. Piketty's book emphasizes the linkage between inequality in income and wealth while Bourguignon's focuses on globalization and inequality. Atkinson's book sets out concrete policy proposals that could bring about a shift in the distribution of income towards less inequality. These publications underscore that high inequality is undesirable in a society and thus requires appropriate policy actions.

Inequality matters for two reasons: (i) rising inequality slows down poverty reduction; and (ii) high inequality could weaken the basis of growth. Changes in poverty depend on both the growth rates in mean income and inequality in the distribution of benefits from growth. While an increase in mean income reduces poverty, rising inequality exacerbates poverty; hence, the net effect on poverty reduction will be slower with increasing inequality.[2] Higher initial inequality tends to reduce the impact of growth on absolute poverty, as Ravallion (1997) found in a study

[2] Kakwani (2000) developed a decomposition method that explains changes in poverty in terms of growth and inequality effects.

that examined the relationship between initial inequality and the rate of poverty reduction using cross-country data with 41 spells for 23 countries.

The impacts of income inequality on growth have been extensively discussed in the literature, but empirical findings point to different directions. While some suggest that inequality hurts growth, some argue that it actually enhances growth. A recent study by Dabla-Norris, Kochhar, Suphaphiphat, Ricka and Tsounta (2015) suggested a significant linkage between inequality and growth of gross domestic product (GDP). Using cross-country data from 159 advanced and developing economies, the study found that if the Gini index increases by one percentage point, the growth rate of GDP slows down by 0.07 percentage points. The study also found that when the income share of the richest 20% increased by one percentage point, growth in GDP was 0.08 percentage points lower in the following five years, which suggests that that the benefits do not "trickle down". In contrast, Mirrlees (1971) and Lazear and Rosen (1981) found that high inequality may increase growth if it provides incentives for people to work harder, invest, and innovate. Kaldor (1955) and Bourguignon (1981) also found a positive relationship between inequality and growth, as higher inequality encourages aggregate savings and capital accumulation given the rich's lower propensity to consume.

Per capita GDP and related inequality measures are widely used to appraise the economic welfare of different countries. However, these measures have been subject to many criticisms because of their failure to give any indication of how the total output of an economy is distributed among the population.[3] Many researchers in this field, most notably Sen (1984, 1985), have raised concerns whether these income measures adequately reflect the well-being of people. In 2010, Stiglitz, Sen, and Fitoussi identified the limitations of GDP as an indicator of economic performance and social progress. In *Mismeasuring Our Lives: Why GDP Does Not Add Up*, the authors stressed that GDP and its related measures are inappropriate as the sole measures of living standards or well-being. While GDP gives an indication of a society's economic success, it masks inequalities within societies and does not take into account the negative effects of economic progress such as the pollution of the environment. As an alternative to GDP as a measure of well-being, Sen (1985) introduced a conceptual framework for defining

[3] Kakwani (1981, 1986) developed welfare measures that account for the income distribution of the population.

and measuring well-being in terms of functionings and capabilities. This framework will be the basis for measuring well-being in this paper.

There is scant literature pointing to the conclusion that income inequality may impede growth in well-being. For instance, Deaton and Paxson (2001) compared the experiences of U.S. and Britain on the evolution of incomes and income inequality on mortality rates and found no evidence that links income inequality and mortality rates. This paper primarily aims to measure the impact of income inequality on well-being. It will explore whether inequality hurts well-being, and if so, to what extent. This paper argues that the price of income inequality is far higher than predicted in the literature. Findings reveal that income inequality significantly hurts various dimensions of well-being.

Although the debate on inequality is largely dominated by income inequality, non-income disparities also exist. As Sen (1995) pointed out, society should also be concerned with inequality in different dimensions of well-being such as health, education, employment, and living conditions, among others. This paper examines inequality in different dimensions of well-being, with the empirical analysis carried out in the context of Brazil.[4]

This paper uses data from the recently released 2013 Atlas of Human Development in Brazil, which was developed by the Brazilian Research Institute for Applied Economics, the United Nations Development Program, and Fundação João Pinheiro of Minas Gerais. The Atlas provides the human development index for more than 5,000 municipalities in Brazil and over 1,000 socio-economic indicators for these localities based on census data for 1991, 2000, and 2010.[5] Using these data, this paper analyzes levels and distribution in well-being in Brazil, and explores the extent to which inequality affects well-being.

2. What Is Well-being?

[4] Using the idea of equivalent length of life, Silber (1983) developed an inequality measure in the distribution of number of years lived by individuals. This is the most innovative approach, accounting for the distribution of length of life enjoyed by individuals in a society.

[5] The Atlas is available on the site http://www.atlasbrasil.org.br/2013/.

Well-being used to be solely assessed by per capita GDP and related income measures but as dissatisfaction with these measures became widespread in the 1970s, the emphasis shifted to finding alternative measures of development. Social indicators, quality of life, and basic needs were accordingly suggested as new approaches in some of the most influential studies that include those by Hicks and Streeten (1979), Hicks (1979), Drenowski (1974), Morris (1979), Sen (1973), Streeten (1979), Sheehan and Hopkins (1979), and Dasgupta (1990). These approaches were evidently related to the concept of well-being, but lacked a unifying conceptual framework for defining and measuring well-being. Such a framework was formally developed only in the 1980s by Sen (1984, 1985, 1987) who conceptualized well-being in terms of functionings and capabilities. Following Kakwani and Subbarao (1994), this framework is briefly discussed below.

Income is the primary currency by which people consume commodities and services. The higher the income, the greater the command people have over commodities or services, which in turn provide people with the means to lead a better life. Thus, the possession of commodities or opulence is closely related to the quality of life people lead. However, it is merely a means to an end. As Sen (1985) writes, "ultimately, the focus has to be on what life we lead and what we can or cannot do, or can be or cannot be". Using this logic, Sen's ideas of functionings and capabilities were born. While functioning is an achievement, capability is the ability to achieve. Functionings are directly related to what life people actually lead, whereas capabilities are associated with the freedom people have in choosing their lives or functionings that they value. According to Sen's conceptualization, well-being should be evaluated according to the extent of freedom people have to achieve the functionings that they value. Therefore, it is a multidimensional concept defined in terms of a set of capabilities that reflect the extent of freedom people have in leading their lives.

3. Selection of Capabilities

After defining well-being, the next step is to select appropriate capabilities that people value. Ideally, the measurement of well-being should incorporate all capabilities that enhance well-being, but this may not be feasible from an empirical perspective.

The United Nations Research Institute for Social Development (UNRISD) in Geneva has been concerned with the construction of a standard of living index. It initially compiled a set of 100 indicators of well-being but the list was reduced to 73 by eliminating some indicators that had insufficient data or obvious defects. After applying several other selection criteria, the number of indicators was reduced to nine.

One of the criteria used for selection was correlation. Indicators showing relatively low average correlations with the mass of other development indicators were not selected. This uses a purely statistical method of selecting an indicator and has no economic rationale. One can also argue that indicators with high correlation should not be selected because they have little additional information. According to Alkire (2007), one distinct feature of the capability approach is the emphasis it places on identifying freedom that people value. The choice of relevant capabilities requires making a value judgment rather than undertaking a technical exercise. The purely statistical method of selecting the domain of capabilities, therefore, has no link with what freedom people value because this approach is completely devoid of any value judgment.

Using various research and concrete initiatives developed around the globe, Stiglitz, Sen and Fitoussi's 2010 report identifies several key dimensions that should be considered in measuring well-being. These dimensions are: (i) material living standards such as income, consumption, or wealth; (ii) health; (iii) education; (iv) personal activities including work; (v) political voice and governance; (vi) social connections and relationships; (vii) environment, both present and future conditions; and (viii) insecurity of economic as well as physical nature. These represent a comprehensive list of dimensions that shape well-being. Nevertheless, the report does not recommend measurable indicators corresponding to each of these dimensions. The next section discusses indicators of well-being based on this framework. [6]

4. Indicators of Well-being

[6] Deutsch, Musahara, and Silber (2015) have designed questionnaires to develop indicators for different dimensions of well-being.

According to Sen, individual achievements – not the means that individuals possess – should be the focus of the conceptualization of well-being. Variables that reflect results rather than inputs should therefore be selected as indicators. In Sen's view, income is merely a means to an end. But the means cannot be undermined in any evaluation of well-being. If the means is highly unequally distributed, or if a large proportion of the population suffers from income deprivation, the well-being of society would surely be lower. Hence, the indicators of material well-being can be based on income or non-income dimensions. In measuring material well-being, the possession of wealth cannot be ignored because it provides people with means to consume goods and services they value and enhances their living standards. This study does not deal with wealth mainly due to unavailability of information on wealth in the data used for the study.

There is a distinction to be made between material and non-material well-being. While material well-being includes indicators that are measured in income (or consumption) space, non-material well-being includes indicators in non-income space such as health, education, living conditions, and personal activities including work. However, indicators reflecting certain dimensions are not considered in this study. These are political voice and governance, social connections and relationships, environment, and insecurity of economic as well as physical nature.

Box 1 presents a set of well-being indicators identified in this paper. Our analysis does not incorporate many other social and psychological characteristics suggested by the term "quality of life" such as security, justice, freedom of choice, and human rights. In this context, the analysis may be deemed rather limited, which is mainly due to non-availability of the appropriate data. While the analysis may appear narrow, the paper uses a set of indicators that covers a wide range of important capabilities influencing human well-being.

As noted earlier, this study utilizes Brazil's census data at the municipal level available for 1991, 2000, and 2010. It thus uses the panel data for 5,565 municipalities in the years indicated. For per capita income, this study uses information on the average income of each municipality in the dataset. To calculate per capita income, incomes of all residents are added up by municipality, the sum of which is then divided by the number of people living in the municipality. Population census does not generally contain information on income, but in Brazil there is a sample in the

census population for which income information is collected. Population weights are used to extend this information to the total population of the municipality and that of the entire country. The Gini index and quintile shares are calculated from the sample. The percentage of poor and extremely poor are identified based on the poverty lines of R$140 and R$70 per month at 2010 prices, respectively.

Another indicator of well-being is life expectancy at birth, which indicates the number of years a newborn infant would live if patterns of mortality prevailing for all people at the time of birth were to stay the same throughout his life. It is an index of long life, which can be influenced by several input variables such as nutrition, clean water supply, sanitation, and access to medical services. Those who live longer lives suffer less from morbidity, ill health, and hunger. Hence, life expectancy at birth can be regarded as an indicator of achievement and therefore, becomes eligible as an indicator of well-being.

Calculating life expectancy at birth is complex and involves several phases. Computing life expectancy at the regional level is not an easy task and it is even more challenging at the municipal level. This is partly because of the migration taking place within the country which makes civil records inadequate. To calculate life expectancy at birth per municipality, indirect methods were used to get estimates of mortality. Information is based on self-reported number of live births and the number of living children at the time when the census was conducted. This information was obtained after relevant questions were asked to women in reproductive age from a sample of the population census. From this information, it is possible to calculate the proportion of deaths. Some modeling is required to turn these estimated proportions into likelihood ratios of death. The next step is to apply these odds ratios to life tables, from which the life expectancy at birth is extracted.

Infant and child mortality rates are another indicator of well-being as survival among infants and children is important for the well-being of the society. The infant mortality rate is the number of infants per one thousand live births in a given year who die before reaching their first birthday. Similarly, the child mortality rate is the probability per 1,000 that a child will die before his fifth birthday. Poor sanitation, contaminated drinking water due to susceptibility to water borne

diseases, and poor nutrition are some of the causes of high mortality rates among infants and children. Poor nutrition reduces resistance to infection of infants and children and various infections in turn reduce the absorption capacity of the body. Consequently, a child who is seriously malnourished faces reduced chances of survival. High infant and child mortality rates thus reflect critical aspects of well-being.

Unlike other indicators, infant and child mortality rates are negatively associated with well-being. To be consistent with other positive indicators, the infant and child mortality rates were converted to infant and child survival rates. These indicators now represent the probabilities of survival for infants and children. Although infant or child survival rates are the main determinants of life expectancy at birth, they should be included as separate well-being indicators because they are more sensitive to poor hygienic conditions, susceptibility to water borne diseases, and malnutrition.

Educational attainment is another important factor that affects well-being. Education has long been dubbed as "the great equalizer", given the perception that higher education may enable an individual to get higher paying jobs. Higher paying jobs, of course, raise a person's standard of living. Thus, it is generally believed that highly educated persons have higher standards of living than their poorly educated counterparts.

Among the educational indicators, the adult literacy rate can be considered as the ultimate achievement of a society. Clearly, if a person is literate, he is open to a large number of other capabilities such as communicating more effectively with others, reading and writing, and participating in political processes, to name a few. This study also finds that there is a significant positive correlation between literacy rate and life expectancy at birth. The municipalities with a higher literacy rate have a significantly higher life expectancy at birth, as well as lower infant and mortality rates. This study uses two additional indicators of educational attainment: (i) proportion of people aged 18 years and above who have completed high school and (ii) proportion of people aged 25 years and over who have completed a higher education. In addition, three indicators related to school attendance among children at school-age group are also included in the analysis. Attendance is an important factor in the academic performance of

students. For instance, 22% of students' academic performance in 398 secondary schools in Delta State, Nigeria was influenced by attendance (Oghuvbu 2010).

Living conditions greatly matter in maintaining healthy lives and, ultimately, in achieving well-being. Poor sanitation and contaminated drinking water can cause contraction of many infectious diseases, contributing to poor health. Kakwani and Son (2015) point out that severe malnutrition among children is prevalent in India, but this may not be solely because of food deprivation. As rightly stated in The Economist (July 2015), "one reason Indians are less well-nourished than Africans is that more Indians defecate outdoors so more contract diarrhea and other diseases that makes it harder for children specially, to absorb the nutrients they consume". A population deprived of piped water, toilet, and adequate sanitation is highly susceptible to infectious diseases, resulting in lower well-being.

Well-being is also influenced by income generated through employment in the labor market. As discussed, income serves as a means to improve well-being by allowing people to consume goods and services that enable them to lead better lives. Those unemployed are likely to have lower standards of living compared to their employed counterparts. Moreover, employment itself has an intrinsic value. Besides material reward, jobs provide people with satisfaction in life. Unemployed people express lower happiness and life satisfaction than employed individuals (World Bank 2013). In improving well-being, the quality of jobs should also be noted. For instance, those employed in the informal sector work long hours under poor working conditions, but with subsistence level of earnings. In developing countries, about 60% of workers are engaged in some form of activities in the informal sector (International Labor Organization and World Trade Organization 2009). For instance, nearly one-fourth of the labor force in Brazil is employed in the informal economy, more than 50% in Sri Lanka, and almost 75% in the Philippines (ILO 2012a). As such, this study includes the proportion of those employed in a formal sector or with a formal contract as an indicator of well-being.

Box 1: Indicators of Well-being

A. Material well-being
   (i) Per capita income
   (ii) Gini index of per capita income
   (iii) Income share of 1st quintile
   (iv) Income share of 2nd quintile
   (v) Income share of 3rd quintile
   (vi) Income share of 4th quintile
   (vii) Income share of 5th quintile
   (viii) Percentage of poor
   (ix) Percentage of extremely poor

B. Health
   (i) Life expectancy at birth
   (ii) Infant survival rate
   (iii) Child survival rate

C. Education
   (i) Adult literacy rate among people ages 15 and above
   (ii) Expected number of years of schooling for 18 year-olds
   (iii) Proportion of people ages 18 and above who completed high school
   (iv) Proportion of people ages 25 and above who completed higher education
   (v) Proportion of children ages 11-14 attending school
   (vi) Proportion of children ages 15-17 attending school
   (vii) Proportion of youth ages 18-24 attending school

D. Living Conditions
   (i) Proportion of population living in households with piped water
   (ii) Proportion of population living in households with toilet
   (iii) Proportion of population living in households with garbage collection
   (iv) Proportion of population living in households with electricity
   (v) Proportion of population living in households with adequate sanitation

E. Labor Market Activities
   (i) Employment rate among people ages 18 and above
   (ii) Employment rate among people ages 18 and above with formal contracts
   (vi) Employment rate among people ages 18 and above with at least one minimum wage
   (vii) Labor force participation rate among people ages 18 and above

Similarly, the rate of productive employment is included as an indicator of well-being in this study. The productive employment rate is defined as the proportion of those employed who are earning at least one minimum wage. Productive employment ensures that a worker and his dependents have a consumption level above the poverty line (ILO 2012b). As such, productive employment generation is an integral component of inclusive growth efforts, as put forward by

organizations like the International Labor Organization and the World Bank. Although productive employment generation has been widely discussed among governments, international organizations, and other stakeholders in recent years, policies to create productive employment have yet to be clearly articulated. For instance, Brazil has a system of minimum wage that helps workers escape from poverty. Those earning less than the minimum wage may be deemed low paid workers who are likely to suffer from relative or even absolute deprivation.

Finally, participation in the labor market is an important source of freedom people ought to have. Labor force participation shapes well-being given the returns from work—in terms of wages and accumulation of human capital—that increase labor productivity. Labor force participation is particularly an important indicator of women's well-being for several reasons. First, the number of female-headed families and single-woman households is on the rise which means that the segment of the female population whose economic well-being greatly hinges on work and earnings is also becoming larger. Second, women's work and earnings in married-couple families are likely to affect the distribution of resources and the processes of household decision making. Third, participation increases the level of labor market experience of women, which is an important determinant of the gender pay gap (Spain and Bianchi 1996). Thus, this study also includes the labor participation rate as an indicator of well-being.

This study does not attempt to aggregate different dimensions of well-being into a single index, although several attempts have been made toward that direction (Morris 1979, United Nations Development Programme 1990, UNRISD 1972). While a single index of well-being allows us to rank countries, constructing the index has many pitfalls. Major drawbacks of arriving at such an index stem from a method of aggregating different dimensions of well-being and resulting weights that should be given to different dimensions of well-being in the aggregation. Morris (1979) constructed a single index by taking a simple average of three dimensions: life expectancy at birth, infant mortality rate, and literacy rate. While his index is simple to construct, it is too arbitrary because there is no economic rationale for assigning different dimensions of well-being to an equal weight.

An alternative approach suggested in the literature is to use a method of principal components in which weights of indicators are determined as proportional to the leading principal components of the correlation matrix. The rationale behind this approach is that the data determine the "optimal" weights that capture the largest variation in indicators. There is also no economic justification for maximizing the variation in the component indicators. Weighing different dimensions of well-being requires making a normative judgment about the relative importance of different dimensions. For example, is health more important than education or vice versa? The weights determined by purely statistical techniques do not reflect our relative valuation of different dimensions.

In this regard, Sen (1989) has argued that it is not necessary to convert a vector of capabilities into one index reflected by one real number. According to Sen, well-being is inherently plural and should not be seen as a one-dimensional measure like that of weight or height. Thus, this study adopts a partial ordering approach in which the overall well-being is evaluated according to each of the capabilities. This approach is applied in assessing the well-being of Brazil as discussed in the next section.

5. Levels and Performance of Well-being in Brazil

Brazil is the largest and most populous country in Latin America with some 190 million people. It led Latin America in growth from the 1960s to the early 1980s. However, growth was accompanied by rising inequality and deteriorating social development. As economic growth slowed in the mid-1980s to mid-1990s, the 1980s and 1990s have been described as the *lost decades* of development (Todaro and Smith 2003). Brazil's economy rebounded in the 2000s, with growth picking up, inequality starting to decline, and poverty falling sharply. Health, education, and living conditions have also improved markedly. Table 1 depicts overall well-being in Brazil in 1991, 2000, and 2010 based on the indicators derived from 5,565 municipalities.

Per capita household income in the local currency was converted to U.S. dollars at 2011 purchasing power parity (PPP). The average per capita income in 1991 was $10.75 per day,

which increased to $14.21 per day in 2000 and further to $19.05 per day in 2010. Thus, the average standard of living per person increased by $3.46 daily in 1991–2000, and further by $5.24 daily in 2000–2010. The absolute increase in the average standard of living was higher in 2000–2010 than in 1991–2000. In relative terms, per capita income increased by 3.10% annually in 1991–2000 and 3.25% annually in 2000–2010.

Inequality, as measured by the Gini index, increased from 54.61% in 1991 to 56.77% in 2000, but dropped to 53.23% in 2010. Thus, the Gini index increased at an annual rate of 0.24 percentage points in 1991–2000, but then decreased sharply at an annual rate of 0.35 percentage points in 2000–2010. This study's estimates using Brazilian national household surveys (PNADs) show that inequality continued to decline monotonically in 2001–2012.

Inequality can also be assessed by the income shares of the poorest and richest quintiles. The income share of the poorest quintile declined from 3.55% in 1991 to 2.96% in 2000, but then increased to 3.52% in 2010. Meanwhile, the income share of the richest quintile rose from 59.57% in 1991 to 61.19% in 2000, but then fell sharply to 57.98% in 2010. The changes in income shares of the poorest and richest quintiles suggest that inequality worsened in 1991–2000 but improved during 2000–2010.

The incidence of poverty has decreased from 1991 to 2000 and through 2010, albeit its decline was sharper during 2000–2010. Brazil implemented the conditional cash transfer program known as *Bolsa Familia* in 2003 and the program is deemed to have contributed to poverty reduction during the 2000–2010 period. *Bolsa Familia* contributed a 12% reduction in poverty based on the poverty gap measure and 19% when the poverty severity measure is used (Zepeda 2006).

Brazil's case offers an example of a country having growth without development (Todaro and Smith 2003). In the 1980s and early 1990s, its human development lagged behind many other middle-income countries. For instance, Brazil's life expectancy at birth was 69.55 years in 1991, which was of similar magnitude as in many low-income developing countries like Sri Lanka. But there has been a marked improvement in the next two decades. The life expectancy at birth

increased to 74.39 years in 2010, although it still compares unfavorably with 79 years in South Korea.

The infant and child survival rates have improved markedly during the past two decades. These rates exceeded 98% in 2010, while their corresponding rates are lower in countries like South Korea (over 99%). In education, Brazil's adult literacy rate was 79.48% in 1991, increased to 86.47% in 2000, and further to 90.04% in 2010. While the literacy rate in Brazil has improved remarkably over the two decades, it still lags behind countries at similar income level such as Costa Rica (96%).

This paper explores the impact of income inequality on human development in Brazil. The findings demonstrate that Brazil's stubbornly high inequality in the 1980s and 1990s might have been the main cause of sluggish human development the country experienced at the time.

Table 1 presents the well-being indicators selected for this study. Marked improvement in education, health, living conditions, employment, and poverty reduction during the past two decades in Brazil can be observed. Even though growth has slowed in recent years, Brazil can no longer be considered as a country without development. Since 2001, inequality in Brazil has been sharply falling. This decline in inequality has in turn improved the country's growth prospect in the long run. According to a study by the International Monetary Fund (IMF) in 2015, a reduction of one percentage point in the Gini index leads to an increase of 0.07 percentage points in the growth rate of GDP.

Table 1. Average Well-being Indicators

Indicators	Actual values			Annual change	
	1991	2000	2010	1991-2000	2000-10
Material well-being					
Per capita income in 2011 PPP	10.75	14.21	19.05	0.38	0.52
Income share of 1st quintile (%)	3.55	2.96	3.52	-0.07	0.06
Income share of 2nd quintile (%)	7.15	6.65	7.56	-0.05	0.09
Income share of 3rd quintile (%)	11.25	10.88	11.93	-0.04	0.11
Income share of 4th quintile (%)	18.48	18.31	19.01	-0.02	0.07
Income share of 5th quintile (%)	59.57	61.19	57.98	0.18	-0.32
Average Gini index (%)	54.61	56.77	53.23	0.24	-0.35

% of poor	38.11	27.87	15.19	-1.14	-1.27
% of extremely poor	18.63	12.45	6.62	-0.69	-0.58
Health					
Life expectancy at birth (years)	65.55	69.95	74.39	0.49	0.44
Infant survival rate (%)	95.89	97.22	98.35	0.15	0.11
Child survival rate (%)	94.92	96.69	98.17	0.20	0.15
Education					
Adult literacy rate (% of people ages 15 and above)	79.48	86.47	90.04	0.78	0.36
Expected years of schooling for 18 year-olds	8.26	8.97	9.63	0.08	0.07
High school completion (% of people ages 18 and above)	17.06	23.86	37.24	0.76	1.34
Higher education completion (% of people ages 25 and above)	5.28	6.34	10.83	0.12	0.45
Children 11-14 years old attending school (%)	79.54	94.44	96.24	1.66	0.18
Children 15-17 years old attending school (%)	55.21	77.79	83.58	2.51	0.58
Youth 18-24 years old attending school (%)	19.68	31.03	30.62	1.26	-0.04
Living conditions					
Population with piped water (%)	71.38	79.60	92.06	0.91	1.25
Population with toilet (%)	67.05	76.73	87.17	1.08	1.04
Population with garbage collection (%)	70.85	88.19	96.17	1.93	0.80
Population with electricity (%)	84.89	93.45	98.58	0.95	0.51
Population with adequate sanitation (%)	89.67	91.08	93.88	0.16	0.28
Labor market activities					
Employment rate (% of people ages 18 and above)		56.48	61.45		0.50
Employment rate with formal contracts (% of people ages 18 and above)		28.46	35.88		0.74
Productive employment rate (% of people ages 18 and above)		30.83	47.40		1.66
Labor force participation rate (% of people ages 18 and above)		65.48	66.32		0.08

Source: Authors' calculations.

6. Inequality of Well-being

In the previous section, we have assessed the levels and performance of well-being in Brazil based on aggregate indicators. Ideally, we should be concerned with well-being indicators at individual or group level rather than aggregate, particularly whether there is an uneven distribution of well-being across social and economic groups. Dasgupta (1990) correctly points out that we should be interested in the distribution of well-being across gender, caste, race, and

income, among others. This section discusses the study's framework for measuring inequality of well-being.

Inequality measured in income space is derived from a social welfare function. Once the social welfare function is specified, an inequality measure is precisely known. A social welfare function in income space can be defined as

$$W = W(x_1, x_{2,\ldots\ldots\ldots\ldots,} x_n)$$

where n is the total number of persons in society. Following Atkinson (1970), the relationship between social welfare function and inequality is given by

$$W = \mu(1 - I) \tag{1}$$

where μ is the mean income and I is the inequality measure that is interpreted as the percentage loss of social welfare because of inequality.

Assuming that x is a random variable with density function $f(x)$, then Sen's (1974) social welfare function is defined as

$$S = 2\int_0^{\infty}[1 - F(x)]xf(x)dx \tag{2}$$

which is the weighted average of individual incomes, where weights on income x depend on the percentage of individuals in the society who are richer than the person with income x. Sen's social welfare function is thus written as

$$S = \mu(1 - G) \tag{3}$$

where G is the Gini index. Sen's social welfare function is also referred to as the Gini social welfare function.

To measure inequality of well-being, we need to extend the idea of social welfare function to social well-being function. As discussed in the previous section, well-being is a multidimensional concept and there is no economic rationale to combine all dimensions into a single index. Given this, we define a social well-being function for each dimension separately:

$$SWF = SWF(y(x_1), y(x_2) \ldots \ldots \ldots \ldots y(x_n)) \quad (4)$$

where $y(x_i)$ is the well-being of an ith individual with income x_i.

Similar to Sen's social welfare function, we can have a social well-being function:

$$SWF(\tilde{y}) = 2\int_0^{\infty} y(x)\left[1 - F\left(y(x)\right)\right]f(x)dx \quad (5)$$

where $F(y(x))$ is the probability distribution function of $y(x)$ when individuals are arranged in ascending order of their well-being. The social well-being function in (5) is the weighted average of individual well-being, where weights on well-being $y(x)$ depend on the proportion of people in society who have a higher well-being than the person with well-being $y(x)$. In this formulation, the person with the lowest well-being is the most deprived in the society and thus given the highest weight; weights decrease as well-being increases. This social well-being function can be written as

$$SWF(\tilde{y}) = \mu_y(1 - G_y) \quad (6)$$

where μ_y is the average well-being of the society and G_y is the Gini index of well-being.

G_y in (6) can be interpreted as the percentage loss of social well-being due to the unequal distribution of well-being in society. Like the Gini index of income, G_y takes the value 0 when everyone in the society enjoys the same degree of well-being and 1 when there is extreme inequality in well-being. The larger the value of G_y, the greater the disparity in well-being in society is. Inequality in the literature has largely concentrated on income inequality. But Sen

(1995) has emphasized that society should also be concerned with inequality in non-income dimensions of well-being such as health, education, employment, and living conditions. While the Gini index G in (3) measures inequality of means, G_y measures inequality of ends. Both means and ends are important in assessing social disparities.

The social well-being function in (4) is defined in terms of individuals' achievement or attainment therefore our social objective will be to maximize this function. Since well-being is measured by bounded indicators such as health status, educational attainment, or nutritional intake, one can focus on attainments or shortfalls of attainments from the maximum possible level of attainment (Sen 1992). The shortfall is a negative indicator of well-being. For instance, infant survival rate is an indicator of attainment whereas the infant mortality rate is an indicator of shortfall. Like social well-being defined over the space of attainment, we can define a social ill-being function in the space of shortfall. Our social objective then is to minimize the social ill-being function. If the upper bound of attainment is the same for all individuals, then a society will achieve the same objective either by maximizing a social well-being function or minimizing a social ill-being function. Thus, social well-being and ill-being functions are a mirror image of each other; as the social well-being function ranks attainment distributions, the social ill-being function ranks shortfall distributions. This requirement will be called rank consistency:

Rank consistency: Suppose $\tilde{y}$ and $\tilde{y}^*$ are any two distributions of attainment, and $(a - \tilde{y}\ )$ and $(a - \tilde{y}^*)$ are the corresponding distributions of shortfall, respectively. Given this, we can write

$$SWF(\tilde{y}) \geq SWF(\tilde{y}^*) \quad if\ and\ only\ if \quad SIF(a - \tilde{y}) \leq SIF(a - \tilde{y}^*) \tag{7}$$

where a is the maximum possible attainment assumed to be the same for all individuals, $SWF(\tilde{y})$ is the social well-being function defined over the distribution of attainments, and the $SIF(a - \tilde{y}\ )$ is the social ill-being function defined over the distribution of shortfalls.

In the derivation of *SWF* in (5), a person with the lowest attainment was given the highest weight, where weights decrease monotonically as individuals' attainments increase. But in deriving *SIF*, a person with the lowest shortfall receives the lowest weight, where weights

increase monotonically as individuals' shortfalls increase. Therefore, the social ill-being function can be defined as

$$SIF(a-\tilde{y}) = 2\int_0^{\infty}\big(a-y(x)\big)F\big(a-y(x)\big)f(x)dx \tag{8}$$

where $F\big(a-y(x)\big)$ is the probability distribution function of shortfalls when individuals are arranged in ascending order of their shortfalls. Integrating (8) by parts, we obtain

$$SIF(a-\tilde{y}\,) = \mu_{a-y}(1+G_{a-y}) \tag{9}$$

where μ_{a-y} is the average shortfall of the society and G_{a-y} is the Gini index of shortfalls, which from (9) can be interpreted as the proportional gain in social ill-being. It is easy to verify that

$$\mu_y G_y = \mu_{a-y} G_{a-y}. \tag{10}$$

Substituting (10) into (6) and (9) and using $\mu_{a-y} = a - \mu_y$, we obtain

$$SWF(\tilde{y}) + SIF(a-\tilde{y}) = a. \tag{11}$$

If the upper bound of attainment is the same for all individuals, this equation (11) demonstrates that the social well-being function will rank distributions in the same way as the social ill-being function. Thus, the social well-being and ill-being functions both satisfy the rank consistency requirement, as stated in equation (7).

It is noted from (10) that the Gini index of attainments is not equal to the Gini index of shortfalls. Moreover, the two Gini indices will not rank any distributions in the same way unless the means for the distributions of attainments and shortfalls are equal. The divergence in rankings by the two Gini indices has attracted much attention in the literature. Studies by Lambert and Zheng (2011), Bosmans (2013), Erreygers (2009), Vega and Aristondo (2012), and Permanyer (2015) have explored if there exists any reasonable measure of relative inequality that can rank

distributions consistently. A consensus emerging from the literature is that all relative measures of inequality fail to provide consistent rankings. Attainment inequality and shortfall inequality do not necessarily mirror one another. This is expected because the Gini index of attainments has a different interpretation from the Gini index of shortfalls. The Gini index of attainments is interpreted as the proportional loss of social well-being, whereas the Gini index of shortfalls refers to the proportional gain in social ill-being. Although the two social functions rank all distributions consistently, their implicit Gini indices are not rank-consistent.

Attainment inequality and shortfall inequality are two sides of the same issue and thus both should be examined. If the two inequalities result in different rankings, a question arises as to which one should be selected in assessing inequality in well-being. Considering inequality of shortfalls, our concern would be about people's sufferings; accordingly, the social objective would be to equalize sufferings. But it makes sense to equalize people's attainments or achievements rather than sufferings. Given this, this study focuses on inequality in achievements.

7. Linkage between Ends and Means

An alternative social well-being function can be derived by combining both means and ends. In deriving the social well-being function defined in (5), an individual's deprivation is captured by weighing the well-being of the individual by the percentage of individuals who have a higher well-being than his. Instead of capturing deprivation in well-being space, we can also define deprivation in income space. Suppose $F(x)$ is the probability distribution function of x when individuals are arranged in ascending order of their income, then the following social well-being function can be proposed:

$$SWF(X) = 2\int_0^\infty y(x)[1 - F(x)]f(x)dx. \qquad (12)$$

This social well-being function differs from the one defined in (5) in terms of weights given to individual well-being $y(x)$.

The linkage between means and ends can be operationalized using concentration indices. Following Kakwani (1980), the concentration index of well-being $y(x)$ can be written as

$$C_y = 2\int_0^{\infty} y(x)\left[F(x) - \frac{1}{2}\right] f(x)dx, \tag{13}$$

which when substituted into (12) gives

$$SWF(X) = \mu_y(1 - C_y) \tag{14}$$

which shows that the concentration index C_y is the percentage loss of social well-being as defined in (12).

Both G_y and C_y measure the percentage loss of well-being based on social well-being functions (5) and (12), respectively. They both measure inequality in well-being but answer different questions. The relationship between the two can be given by

$$C_y = \frac{R[y(x), r(x)]}{R[y(x), r(y(x))]} G_y \tag{15}$$

where R(a, b) is the coefficient of correlation between a and b, $r(x)$ stands for rank of x, and $r(y(x))$ is the rank of $y(x)$. If income and well-being have the same ranking in their distributions, $C_y = G_y$. But if they have completely opposite rankings, $C_y = -G_y$. This implies that $-G_y \leq C_y \leq G_y$.

$R[y(x), r(y(x))]$ will always be positive, but $R[y(x), r(x)]$ can either be negative or positive. The negative value means that well-being decreases as income increases; that is, the poorer the person, the greater the well-being is. Similarly, the positive value implies that the richer the person, the greater the well-being is. Since G_y is always positive, it follows from (15) that the negative (positive) value of the concentration index implies the greater (smaller) well-being for the poor (non-poor). Thus, the concentration index measures equity (or inequity) in well-being;

the smaller (larger) its value, the greater the concentration of well-being among the poor (non-poor).

Thus, G_y measures the overall disparity of well-being in the population while C_y measures the disparity of well-being across income groups. Both of these inequalities are important in understanding disparity of well-being in society. The concentration index is particularly useful in assessing the extent to which individual incomes matter for individual well-being.

8. Magnitude of Inequality in Well-being in Brazil

While income inequality in Brazil has declined since early 2000s, the Gini index of per capita household income still remains high by global standards at 53% in 2010. Table 2 presents the Gini indices for various well-being indicators. The results show that inequalities in well-being indicators are quite small. For instance, the Gini index of life expectancy at birth was only 3.59% in 1991, declined to 2.78% in 2000, and further declined to 1.74% in 2010. A similar finding emerges for the infant and child survival rates. Not only has Brazil made impressive progress in health outcomes over time, but it has also succeeded in reducing inequality in those outcome indicators.

Inequality in educational well-being is much higher than that in health well-being. The Gini index of adult literacy rate was 10.55% in 1991, which declined to 6.66% in 2000 and further to 4.98% in 2010. Our findings reveal that inequality in educational well-being has continued to decline as a greater proportion of population becomes increasingly more educated. In the past two decades, Brazil has experienced a rapid expansion of educational opportunities among the population that translated to the reduction of inequality in school attendance over time.

Brazil's education finance equalization programs and a conditional cash transfer scheme have contributed to such expansion in educational opportunities. For instance, the Fund for Maintenance and Development of the Fundamental Education and Valorization of Teaching was created in 1996 to finance sub-national spending on primary and lower secondary education. The fund entails a per student spending floor for the whole country. The federal government is

required to make up for spending in those states and municipalities that fail to meet the national spending floor. Transfers from the fund were found to have a positive effect on actual enrolment rates (Mello and Hoppe 2005). Brazil's conditional cash transfer to students, called *Bolsa Escola*, also had a positive impact on school attendance. Implemented in 2001-2003, *Bolsa Escola* gave local authorities at the municipal level the tasks to identify and select beneficiaries and to implement the program. The program had a notable impact on continuity in school attendance, inducing a 7.8 percentage points decline in school drop-out rate (Janvry, Finan, and Sadoulet 2006).

Along with education and health, the overall living conditions in Brazil have improved markedly over time. Furthermore, disparities in living conditions across the population have declined, as the Gini indices of various indicators pertaining to living conditions indicate in Table 2. Such gains in living conditions may be accounted for by government initiatives. In water and sanitation, for instance, Brazil implemented technical and financial innovations to improve access to water and sanitation among poor households. The government introduced the Programa Despoluição de Bacias Hidrográficas or Basin Restoration Program in 2001, under which the federal government pays water and sanitation companies, mostly public, for treating wastewater based on certified outputs. Brazil has also pioneered the use of low cost appropriate technology such as condominial sewers to enhance the access of poor urban households to water and sanitation. In electricity, the government's grid extension efforts mainly contributed to increased electrification rate. As of 2012, 99.5% of households in Brazil have access to electricity (World Bank 2015).

All labor market indicators have also shown substantial improvements. Both formal and productive employment rates have improved. More importantly, their inequalities are also on the decline, suggesting that working conditions in the labor market in Brazil are improving overall. A number of factors contributed to such gains in the labor market. Formal employment opportunities in Brazil expanded. The share of formal jobs (as a percentage of the workforce) has increased by more than 13 percentage points since 2002. The share of poor individuals who secured formal employment increased from 10.5% in 2008 to 16% in 2011 (considering only the beneficiaries of Brazil's *Bolsa Família*). Moreover, structural transformation paved the way for

shifts in sectoral employment. Since 2002, retail and construction output has increased, but agriculture and manufacturing output has decreased. Labor productivity also improved, with the workforce becoming more skilled. Between 1995 and 2010, the average educational level of the labor force increased by more than 50%, given the rapid expansion of secondary education (Silva, Almeida, and Strokova 2015).

Table 2. Gini Index of Well-being Indicators

Indicators	Actual value			Annual change	
	1991	2000	2010	1991-2000	2000-10
Health					
Life expectancy at birth (years)	3.59	2.78	1.74	-0.09	-0.10
Infant survival rate (%)	1.13	0.69	0.30	-0.05	-0.04
Child survival rate (%)	1.54	0.89	0.31	-0.07	-0.06
Education					
Adult literacy rate (% of people ages 15 and above)	10.55	6.66	4.98	-0.43	-0.17
Expected years of schooling for 18 year-olds	11.90	9.34	4.83	-0.28	-0.45
High school completion (% of people ages 18 and above)	35.52	29.08	20.11	-0.72	-0.90
Higher education completion (% of people ages 25 and above)	49.42	46.10	35.85	-0.37	-1.03
Children 11-14 years old attending school (%)	8.17	1.90	0.94	-0.70	-0.10
Children 15-17 years old attending school (%)	14.22	5.62	2.95	-0.96	-0.27
Youth 18-24 years old attending school (%)	20.75	12.26	12.63	-0.94	0.04
Living conditions					
Population with piped water (%)	21.77	15.52	5.57	-0.69	-0.99
Population with toilet (%)	23.86	17.73	9.23	-0.68	-0.85
Population with garbage collection (%)	21.64	8.91	2.83	-1.42	-0.61
Population with electricity (%)	12.43	5.52	1.21	-0.77	-0.43
Population with adequate sanitation (%)	8.62	6.54	4.77	-0.23	-0.18
Labor market activities					
Employment rate (% of people ages 18 and above)		5.78	6.27		0.05
Employment rate with formal contracts (% of people ages 18 and above)		22.23	20.90		-0.13
Productive employment rate (% of people ages 18 and above)		26.55	17.22		-0.93
Labor force participation rate (% of people ages 18 and above)		4.80	5.34		0.05

Source: Authors' calculations.

Table 3 presents the concentration indices of well-being indicators. The concentration index captures inequity in well-being of a particular indicator across income. The index indicates the extent to which income contributes to the particular dimension of well-being. Given the case of Brazil, this index will help answer the question as to whether better-off municipalities have higher or lower well-being. As the values of concentration indices are mostly positive, better-off municipalities are likely to enjoy higher well-being than their worse-off counterparts. Moreover, the magnitude of concentration index suggests that the degree of disparity in well-being across poor and non-poor municipalities is rather small.

As shown in Table 3, the concentration index has declined mostly for all indicators of well-being except for those relating to living conditions. It is interesting to note that the concentration indices for health indicators are rather small, suggesting that income differences among municipalities matter less in achieving health outcomes relative to other dimensions of well-being. Compared to health, living conditions are more directly influenced by income. A number of studies reveal that a household's access to basic infrastructure–such as piped water, electricity, and sanitation, among others–is highly and significantly correlated with a lower probability of being poor.

Inequity in educational attainment is relatively high, particularly at higher level of education. However, the trend shows that this inequity is on the decline. Similarly, the formal and productive employment rates also have high inequities, but their inequities are declining over time. This suggests that working conditions in poorer municipalities are improving at a faster rate than their non-poor counterparts.

Table 3. Concentration Index of Well-being Indicators

Indicators	Actual value			Growth rate	
	1991	2000	2010	1991-2000	2000-10
Health					
Life expectancy at birth (years)	2.98	2.19	1.46	-0.09	-0.07
Infant survival rate (%)	0.92	0.54	0.25	-0.37	-0.03
Child survival rate (%)	1.26	0.70	0.26	-0.56	-0.04
Education					
Adult literacy rate	9.83	6.24	-0.06	-3.60	-0.63

(% of people ages 15 and above)					
Expected years of schooling for 18 year-olds	9.61	7.71	0.18	-1.90	-0.75
High school completion (% people ages 18 and above)	31.57	26.83	18.12	-4.74	-0.87
Higher education completion (% people ages 25 and above)	45.38	43.32	34.23	-2.05	-0.91
Children 11-14 years old attending school (%)	6.89	1.25	0.20	-5.64	-0.11
Children 15-17 years old attending school (%)	9.80	3.37	1.30	-6.43	-0.21
Youth 18-24 years old attending school (%)	11.95	2.97	6.66	-8.98	0.37
Living conditions					
Population with piped water (%)	-0.06	0.46	4.73	0.52	0.43
Population with toilet (%)	-0.30	0.68	8.07	0.98	0.74
Population with garbage collection (%)	-0.06	0.23	2.33	0.29	0.21
Population with electricity (%)	-0.05	0.08	1.04	0.13	0.10
Population with adequate sanitation (%)	-0.13	0.27	4.14	0.40	0.39
Labor market activities					
Employment rate (% of people ages 18 and above)		2.14	4.00		0.19
Employment rate with formal contracts (% of people ages 18 and above)		19.76	18.26		-0.15
Productive employment rate (% of people ages 18 and above)		24.55	15.43		-0.91
Labor force participation rate (% of people ages 18 and above)		2.96	3.62		0.07

Source: Authors' calculations.

9. Income Inequality Elasticity of Well-being

Income provides people with means to lead a better life, but it varies across households and individuals. Deprivation in a society arises when there are differences in incomes across the population. The Gini index is equal to the average relative deprivation suffered by the society (Kakwani 1977). This study postulates that average income and inequality are the two main determinants of well-being. Well-being increases with average income, but at a decreasing rate. Moreover, the impact of inequality on well-being can be either negative or positive. With this in mind, we estimated income inequality elasticities of well-being using three regression models: one is based on the Gini index, second on the income share of the poorest 40%, and third on the richest 60% of the population.

Well-being indicators, such as life expectancy at birth, infant survival rate, child survival rate, literacy rate, and completed years of schooling, have lower and upper limits reflecting physical and biological maxima. This means that like income, they cannot go on increasing indefinitely. Moreover, as well-being reaches progressively higher limits, incremental improvement would represent much higher levels of achievement than similar incremental improvements from a lower base. For instance, an increase in longevity from 70 to 75 years will be much harder to achieve than an increase from 50 to 55 years. It becomes increasingly more difficult to increase life expectancy as life expectancy rises.

Given the nature of well-being indicators, estimating elasticities using a linear regression model will be inadequate. The dependent variable varies in a narrow range, which implies a limited variation in the error term giving rise to perverse econometric problems (Kmenta 1990). To this end, a non-linear specification may be more appropriate. A popular approach used in the literature is the logistic curve that corresponds to what is known as the logit model. Suppose *wel* denotes a well-being indicator with lower and upper bounds as *m* and *M,* respectively, then a transformed variable given by

$$\pi = \frac{wel-m}{M-wel} \tag{16}$$

lies in the range between 0 and 1. Following this, we can then introduce the idea of an achievement function:

$$\varphi = \frac{\pi}{(1-\pi)} = \frac{wel-m}{M-wel} \tag{17}$$

which varies from 0 to ∞. Differentiating this equation twice, we obtain

$$\frac{\partial \varphi}{\partial wel} = \frac{M-m}{(M-wel)^2} > 0$$

and

$\frac{\partial^2 \varphi}{\partial wel^2} = \frac{2(M-m)}{(M-wel)^2} > 0.$

These equations imply that the achievement function increases with *wel* but at an increasing rate. As well-being reaches progressively a higher limit, an incremental improvement reflects a higher level of achievement than a similar incremental improvement from a lower base. To account for the non-linear characteristic of well-being, achievement is used as a dependent variable rather than well-being itself. While achievement is not restricted to a finite range, well-being is restricted.

The regression model based on the Gini index is defined as:

Model 1: $ln(\varphi) = \alpha_0 + \alpha_1\, ln(x) + \alpha_2 ln(Gini) + u_1$

where *x* is the average per capita income of a municipality and *Gini* is the municipality Gini index. Note that α_1 is positive and α_2 can either be positive or negative. The error term u_1 is the aggregate impact of all the omitted variables, which is assumed to be distributed randomly with zero mean and constant variance.

The second regression model based on the income share of the poorest 40% of the population is given by:

Model 2: $ln(\varphi) = \beta_0 + \beta_1\, ln(x) + \beta_2 ln(share1) + u_2$

where *share*1 is the income share of the poorest 40%. While β_1 is positive, β_2 can either be positive or negative. If the income share of the poorest 40% increases by one percent, the achievement function changes by β_2 percent. Again, the error term u_2 is the aggregate impact of all the omitted variables, assumed to be distributed randomly with zero mean and constant variance.

The third regression model based on the income share of the richest 60% of the population is given by:

Model 3: $ln(\varphi) = \gamma_0 + \gamma_1 ln(x) + \gamma_2 ln(share2) + u_3$

where *share*2 is the income share of the richest 60%.

Differentiating the three models, we obtain inequality elasticities of well-being:

$$e(Gini) = \frac{dln(wel)}{dln(Gini)} = \frac{\alpha_2(wel-m)(M-wel)}{(wel)(M-m)} \quad (18)$$

$$e(share1) = \frac{dln(wel)}{dln(share1)} = \frac{\beta_2(wel-m)(M-wel)}{(wel)(M-m)} \quad (19)$$

$$e(share2) = \frac{dln(wel)}{dln(share2)} = \frac{\gamma_2(wel-m)(M-wel)}{(wel)(M-m)} \quad (20)$$

These three elasticities measure the percentage change in well-being with respect to the change in inequality by one percent. If *e*(*Gini*) is negative and statistically significant, then the increase in inequality reduces well-being. Similarly, the increase in the share of the poorest 40% implies that inequality is reducing, and the increase in the share of the richest 60% indicates a rise in inequality.

In the two regression models, average income and inequality are the means, whereas well-being indicators are the ends. The means can be assumed to be exogenous variables, but the ends are endogenous variables. There are 19 well-being indicators. Models 1, 2, and 3 were estimated for each of the 19 indicators based on municipal panel data for 1991, 2000, and 2010. Hence, 155 regressions were estimated in total, with each regression based on 5,565 observations. The estimated regressions are presented in Tables A.1–A.19 in the Appendix; each table provides estimated coefficients along with respective *t* values and R^2. Given the size of the sample, the estimated *R*-squares are quite high, ranging from 0.40 to 0.90. This indicates that the unexplained variations in regressions are relatively small.

The study's hypothesis to be tested is whether changes in income inequality would impede growth in well-being. The inequality elasticities of well-being calculated from the regressions

models provide the answer to this hypothesis. Tables 4, 5, and 6 present the estimated inequality elasticities of well-being, along with their *t* values from the regressions.

The significance of a coefficient is normally assessed at the 5% level of significance. Assuming that the error in the regression model is normally distributed with zero mean, the regression coefficient is significant at the 5% level of significance if its *t* value is greater than 1.96. All *t* values reported are greater than 2.34, most ranging between 5 and 21.89. Therefore, we can conclude that the relationship between inequality and well-being is highly significant.

In 16 out of 19 indicators from Table 4, the Gini elasticity of well-being is negative. For instance, if the Gini index were to be increased by one percent, the life expectancy at birth would be 0.07 percent lower in 2010. The *t* value for this coefficient is -14.27, which is highly significant, suggesting that a higher Gini index is associated with a significantly lower life expectancy at birth. Thus, a higher Gini index lowers overall well-being.

There are three indicators suggesting that a higher Gini index is associated with a higher well-being. These are: (i) percentage of youth aged 18–24 years attending school, (ii) percentage of population 18 years and over who completed high school, and (iii) percentage of population 25 years and over who completed a higher education. These indicators relate to educational attainment and are closely associated with human capital development. Thus, a higher Gini index is likely to be associated with a higher human capital.

One conjecture is that if human capital is an engine of growth, higher inequality may be good for growth. As the growth process is highly complex, it is difficult to disentangle the extent to which human capital accumulation enhances growth.

Table 4. Elasticity of Well-being with Respect to Gini Index

Indicators	1991		2000		2010	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Health						
Life expectancy at birth (years)	-0.08	-7.35	-0.13	-9.71	-0.07	-14.27
Infant survival rate (%)	-0.04	-8.84	-0.04	-13.17	-0.01	-18.23

Child survival rate (%)	-0.05	-9.35	-0.05	-12.58	-0.01	-7.17
Education						
Adult literacy rate (% of people ages 15 and above)	-0.18	-7.66	-0.20	-10.62	-0.12	-9.14
Expected years of schooling for 18 year-olds	-0.27	-7.47	-0.38	-12.35	-0.20	-8.32
High school completion (% people ages 18 and above)	1.21	11.53	0.40	3.90	0.23	2.77
Higher education completion (% people ages 25 and above)	1.87	15.20	1.20	8.83	0.97	12.02
Children 11-14 years old attending school (%)	-0.04	-1.75	-0.06	-8.08	-0.05	-8.04
Children 15-17 years old attending school (%)	-0.15	-2.89	-0.20	-6.95	-0.24	-8.34
Youth 18-24 years old attending school (%)	0.98	10.62	0.87	11.53	0.91	20.11
Living conditions						
Population with piped water (%)	-0.98	-15.22	-1.02	-17.92	-0.15	-5.26
Population with toilet (%)	-0.84	-12.78	-1.21	-22.50	-0.68	-21.60
Population with garbage collection (%)	-0.69	-6.55	-0.43	-10.36	-0.15	-8.20
Population with electricity (%)	-0.65	-7.99	-0.32	-9.89	-0.05	-10.62
Population with adequate sanitation (%)	-0.38	-9.65	-0.42	-11.05	-0.32	-15.17
Labor market activities						
Employment rate (% of people ages 18 and above)			-0.20	-6.31	-0.32	-11.29
Employment rate with formal contracts (% of people ages 18 and above)			-1.18	-15.61	-1.27	-20.88
Productive employment rate (% of people ages 18 and above)			-1.15	-18.18	-0.94	-17.64
Labor force participation rate (% of people ages 18 and above)			-0.15	-5.81	-0.24	-8.26

Note: no data available for labor market activities in 1991.
Source: Authors' calculations.

Model 2 is built upon the World Bank's idea of shared prosperity which focuses on the welfare of the bottom 40% in the population. As discussed earlier, this model examines how the income share of the bottom 40% matters in well-being. Table 5 presents the coefficients for the variable of the income share in Model 2. The positive coefficient implies that an increase in the share of the poorest 40% is associated with an increase in well-being. For instance, if the income share of the bottom 40% had increased by one percent, the life expectancy at birth would have been 0.03

percent higher in 2010. The *t* value for this coefficient, 10.62, indicates that increased shared prosperity is significantly associated with a higher life expectancy at birth.

Of the 19 well-being indicators, 16 have positive coefficients (all of which are highly significant) for all three years. The results suggest that the overall well-being in Brazil would have been significantly higher if the income share of the poorest 40% had increased. Only in three indicators relating to human capital, would well-being have been lower. Thus, improving the welfare of the poorest 40% will significantly increase overall well-being in Brazil. Moreover, the findings also provide evidence that widening income disparities matter for well-being. This paper has demonstrated that income disparities impede well-being. As such, inequality needs to be addressed to improve overall well-being of society.

Table 5. Elasticity of Well-being with Respect to the Share of Poorest 40%

Indicators	1991		2000		2010	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Health						
Life expectancy at birth (years)	0.04	7.11	0.04	7.42	0.03	10.62
Infant survival rate (%)	0.02	8.77	0.01	9.25	0.01	17.48
Child survival rate (%)	0.03	9.30	0.02	9.20	0.00	7.06
Education						
Adult literacy rate (% of people ages 15 and above)	0.07	5.37	0.05	7.22	0.05	7.98
Expected years of schooling for 18 year-olds	0.15	7.83	0.13	9.89	0.10	9.07
High school completion (% people ages 18 and above)	-0.62	-11.85	-0.13	-3.78	-0.09	-2.31
Higher education completion (% people ages 25 and above)	-0.90	-13.96	-0.33	-5.95	-0.42	-10.16
Children 11-14 years old attending school (%)	0.00	-0.06	0.01	5.01	0.02	8.74
Children 15-17 years old attending school (%)	0.09	3.55	0.07	6.21	0.11	7.48
Youth 18-24 years old attending school (%)	-0.51	-10.85	-0.32	-9.91	-0.42	-18.48
Living conditions						
Population with piped water (%)	0.52	15.44	0.33	11.63	0.07	5.11
Population with toilet (%)	0.46	12.67	0.40	13.17	0.32	24.77
Population with garbage collection (%)	0.39	7.40	0.13	9.07	0.07	7.98
Population with electricity (%)	0.27	5.44	0.08	6.73	0.02	9.49
Population with adequate sanitation	0.21	10.35	0.11	6.54	0.13	14.17

(%)				
Labor market activities				
Employment rate (% of people ages 18 and above)	0.08	6.39	0.15	10.32
Employment rate with formal contracts (% of people ages 18 and above)	0.41	11.39	0.61	23.28
Productive employment rate (% of people ages 18 and above)	0.37	10.40	0.46	19.85
Labor force participation rate (% of people ages 18 and above)	0.05	5.05	0.12	7.95

Note: no data available for labor market activities in 1991.
Source: Authors' calculations.

Table 6 presents the percentage change in well-being in response to the percentage change in the income share of the richest 60% of the population. Out of 19 indicators, 16 have negative elasticities. This means that keeping other things constant, making the rich richer will lower overall well-being for society.

Table 6. Elasticity of Well-being with Respect to the Share of the Richest 60%

Indicators	1991		2000		2010	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Health						
Life expectancy at birth (years)	-0.36	-7.18	-0.51	-8.58	-0.26	-12.43
Infant survival rate (%)	-0.16	-8.75	-0.14	-11.23	-0.05	-19.13
Child survival rate (%)	-0.24	-9.34	-0.18	-11.11	-0.04	-7.62
Education						
Adult literacy rate (% of people ages 15 and above)	-0.61	-5.68	-0.65	-8.87	-0.44	-9.42
Expected years of schooling for 18 year-olds	-1.21	-7.43	-1.41	-9.51	-0.76	-8.35
High school completion (% people ages 18 and above)	5.69	13.50	1.82	4.91	0.88	2.62
Higher education completion (% people ages 25 and above)	8.42	16.44	4.52	8.34	3.69	10.60
Children 11-14 years old attending school (%)	0.01	0.11	-0.16	-5.52	-0.17	-7.82
Children 15-17 years old attending school (%)	-0.73	-3.26	-0.82	-6.32	-0.94	-7.98
Youth 18-24 years old attending school (%)	4.61	11.77	3.83	11.79	3.51	18.79
Living conditions						
Population with piped water (%)	-4.51	-15.55	-3.94	-13.25	-0.56	-5.17
Population with toilet (%)	-3.91	-12.78	-4.71	-15.05	-2.65	-25.79

Population with garbage collection (%)	-3.36	-7.50	-1.57	-9.78	-0.56	-7.87
Population with electricity (%)	-2.56	-6.73	-1.03	-7.52	-0.20	-9.62
Population with adequate sanitation (%)	-1.78	-10.19	-1.43	-8.63	-1.16	-15.49
Labor market activities						
Employment rate (% of people ages 18 and above)			-0.88	-6.52	-1.30	-11.70
Employment rate with formal contracts (% of people ages 18 and above)			-4.73	-11.96	-5.09	-24.94
Productive employment rate (% of people ages 18 and above)			-4.44	-12.75	-3.88	-21.65
Labor force participation rate (% of people ages 18 and above)			-0.61	-5.05	-0.98	-8.81

Note: no data available for labor market activities in 1991.
Source: Authors' calculations.

10. Conclusions

Inequality is one of today's foremost development challenges. While the literature has extensively examined the impact of income disparities on growth and poverty, the relationship between inequality and well-being has yet to be comprehensively explored. This study provides evidence that inequality matters for well-being.

This paper defines well-being through a set of capabilities that indicate an individual's freedom to lead their lives. It examines income and non-income dimensions of well-being through indicators in the areas of material well-being, health, education, living conditions, and labor market activities.

Like income inequality, it is also important to be concerned with inequality in different dimensions of well-being such as health, education, employment, and living conditions, among others. This paper examined inequality in different dimensions of well-being, with the empirical analysis carried out in the context of Brazil. To measure inequality in well-being, the idea of social welfare function was extended to a social well-being function. The Gini index of well-being is then derived as the percentage loss of social well-being. The study also used a concentration index to measure disparities in well-being across income.

The findings revealed that inequalities in well-being indicators are small. For instance, Brazil improved health outcomes and reduced the inequality in outcome indicators, including life expectancy at birth and infant and child survival rates. The Gini index of life expectancy at birth, for example, decreased from 3.59% in 1991 to 1.74% in 2010. Disparities in education well-being have also been reduced, albeit they remain higher than inequalities in health well-being. For instance, the Gini index of adult literacy rate dropped from 10.55% in 1991 to 4.98% in 2010. Similarly, disparities in living conditions and labor market activities were also noted.

In Brazil, better-off municipalities are likely to have higher well-being than their worse-off counterparts, with the concentration index declining for all indicators except for those dealing with living conditions.

Do changes in income inequality impede growth in well-being? An answer to this question was sought through estimating inequality elasticities of 19 well-being indicators. This study found that a higher Gini index is associated with lower overall well-being. Negative elasticities of well-being were found for 16 of the 19 indicators examined. For instance, a one percent increase in the Gini index would lower life expectancy at birth by 0.07 percent in 2010. For three indicators, all closely associated with education and human capital development, a higher Gini index increases well-being. While this may indicate that high inequality is good for human capital development, it is difficult to prove such conjecture. The findings also revealed that increasing the income share of the poorest 40% is linked with a rise in well-being, while a corresponding increase in the share of the richest 60% is associated with a drop in well-being.

This study shows that various dimensions of well-being are affected adversely by inequality. The evidence presented in this study suggests that inequality should be addressed to improve a society's well-being. To enable people to lead better lives, policies need to help those at the bottom of the distribution and improve their access to economic opportunities such as education, health, and basic infrastructure.

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APPENDIX: REGRESSION ESTIMATES

Table A.1: Dependent variable = Achievement in life expectancy at birth

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	0.71	22.59	0.63	19.95	0.76	41.23
log(Gini)	-0.71	-7.35	-1.34	-9.71	-1.12	-14.27
constant	-4.55	-26.45	-3.96	-27.13	-4.10	-39.22
R-square	0.66		0.68		0.73	
Model 2						
log(per capita income)	0.72	22.65	0.59	17.19	0.70	33.40
log(share of poorest 40%)	0.37	7.11	0.44	7.42	0.48	10.62
constant	-3.30	-15.56	-1.90	-6.07	-1.91	-9.25
R-square	0.68		0.71		0.77	
Model 3						
log(per capita income)	0.72	23.68	0.61	19.30	0.70	33.85
log(share of richest 60%)	-3.19	-7.18	-5.31	-8.58	-4.17	-12.43
constant	-4.52	-27.54	-3.57	-25.38	-3.50	-32.45
R-square	0.68		0.71		0.77	

Source: Authors' calculations.

Table A.2: Dependent variable = Achievement in infant survival rate

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	0.53	26.67	0.51	31.99	0.45	43.76
log(Gini)	-0.88	-8.84	-1.33	-13.17	-0.81	-18.23
Constant	-0.37	-3.32	-0.25	-3.02	0.67	11.65
R-square	0.63		0.71		0.72	
Model 2						
log(per capita income)	0.53	26.98	0.47	26.37	0.41	39.12
log(share of poorest 40%)	0.46	8.77	0.42	9.25	0.36	17.48
constant	1.17	7.27	1.76	9.69	2.29	23.69
R-square	0.66		0.70		0.74	
Model 3						
log(per capita income)	0.53	28.88	0.48	31.30	0.41	40.49
log(share of richest 60%)	-3.88	-8.75	-5.06	-11.23	-3.08	-19.13
constant	-0.32	-3.01	0.16	2.30	1.09	20.04
R-square	0.67		0.71		0.74	

Source: Authors' calculations.

Table A.3: Dependent variable = Achievement in child survival rate

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	0.59	31.79	0.55	35.19	0.42	31.14
log(Gini)	-1.07	-9.35	-1.45	-12.58	-0.55	-7.17
constant	-1.07	-9.54	-0.72	-8.48	0.93	13.35
R-square	0.67		0.71		0.74	
Model 2						
log(per capita income)	0.60	32.08	0.50	28.59	0.39	25.67
log(share of poorest 40%)	0.56	9.30	0.46	9.20	0.25	7.06
constant	0.80	4.78	1.47	7.75	2.04	12.70
R-square	0.66		0.70		0.74	
Model 3						
log(per capita income)	0.60	34.88	0.52	34.60	0.39	26.36
log(share of richest 60%)	-4.70	-9.34	-5.54	-11.11	-2.16	-7.62
constant	-1.00	-9.60	-0.28	-3.98	1.21	17.42
R-square	0.69		0.69		0.70	

Source: Authors' calculations.

Table A.4: Dependent variable = Achievement in adult literacy rate among people ages 15 and above

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	1.21	24.86	1.23	72.34	1.44	79.53
log(Gini)	-0.89	-7.66	-1.51	-10.62	-1.23	-9.14
constant	-6.05	-21.96	-6.31	-57.94	-7.61	-59.52
R-square	0.85		0.88		0.86	
Model 2						
log(per capita income)	1.21	24.08	1.19	55.14	1.37	63.48
log(share of poorest 40%)	0.34	5.37	0.38	7.22	0.49	7.98
constant	-4.71	-16.64	-4.30	-20.28	-5.30	-22.15
R-square	0.84		0.86		0.85	
Model 3						
log(per capita income)	1.21	25.01	1.20	63.89	1.37	68.52
log(share of richest 60%)	-2.96	-5.68	-4.79	-8.87	-4.39	-9.42
constant	-5.83	-21.72	-5.75	-60.46	-6.93	-67.10
R-square	0.85		0.84		0.87	

Source: Authors' calculations.

Table A.5: Dependent variable = Achievement in expected years of schooling for 18 year-olds

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	0.56	20.65	0.53	28.09	0.26	17.39
log(Gini)	-0.60	-7.47	-0.94	-12.35	-0.55	-8.32
constant	-3.45	-23.22	-3.41	-38.79	-1.45	-18.72
R-square	0.64		0.71		0.48	
Model 2						
log(per capita income)	0.57	20.52	0.50	25.00	0.23	14.58
log(share of poorest 40%)	0.34	7.83	0.31	9.89	0.28	9.07
constant	-2.35	-13.42	-1.94	-11.07	-0.27	-1.80
R-square	0.65		0.73		0.48	
Model 3						
log(per capita income)	0.57	21.43	0.51	27.47	0.23	13.90
log(share of richest 60%)	-2.70	-7.43	-3.50	-9.51	-2.12	-8.35
constant	-3.42	-23.83	-3.11	-36.03	-1.16	-13.86
R-square	0.85		0.84		0.87	

Source: Authors' calculations.

Table A.6: Dependent variable = Achievement in percentage of population ages 18 and above who completed high school

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	1.09	26.10	1.08	46.61	0.91	31.29
log(Gini)	1.46	11.53	0.52	3.90	0.37	2.77
constant	-7.34	-30.30	-7.69	-63.60	-6.30	-49.97
R-square	0.80		0.84		0.81	
Model 2						
log(per capita income)	1.08	27.26	1.09	43.69	0.94	27.08
log(share of poorest 40%)	-0.74	-11.85	-0.17	-3.78	-0.14	-2.31
constant	-9.86	-42.92	-8.49	-38.02	-6.99	-20.74
R-square	0.81		0.83		0.82	
Model 3						
log(per capita income)	1.07	26.15	1.09	42.59	0.93	26.42
log(share of richest 60%)	6.86	13.50	2.39	4.91	1.41	2.62
constant	-7.36	-31.43	-7.81	-64.23	-6.50	-40.19
R-square	0.83		0.80		0.84	

Source: Authors' calculations.

Table A.7: Dependent variable = Achievement in percentage of population ages 25 and above who completed higher education

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	1.59	34.18	1.64	54.36	1.22	56.58
log(Gini)	1.97	15.20	1.28	8.83	1.08	12.02
constant	-11.58	-42.11	-12.59	-79.80	-9.59	-92.04
R-square	0.84		0.85		0.87	
Model 2						
log(per capita income)	1.57	35.80	1.67	55.17	1.28	49.81
log(share of poorest 40%)	-0.95	-13.96	-0.35	-5.95	-0.47	-10.16
constant	-14.85	-60.19	-14.37	-52.95	-11.72	-47.35
R-square	0.85		0.86		0.89	
Model 3						
log(per capita income)	1.56	33.80	1.66	51.45	1.27	48.05
log(share of richest 60%)	8.89	16.44	4.83	8.34	4.14	10.60
constant	-11.65	-43.07	-12.97	-79.66	-10.16	-79.31
R-square	0.82		0.85		0.89	

Source: Authors' calculations.

Table A.8: Dependent variable = Achievement in percentage of children ages 11-14 attending school

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	0.81	23.25	0.53	19.57	0.15	4.40
log(Gini)	-0.18	-1.75	-1.00	-8.08	-1.20	-8.04
constant	-3.34	-16.88	-0.84	-6.06	1.62	10.11
R-square	0.72		0.62		0.51	
Model 2						
log(per capita income)	0.80	23.11	0.50	16.01	0.08	2.12
log(share of poorest 40%)	0.00	-0.06	0.24	5.01	0.60	8.74
constant	-3.20	-15.18	0.48	1.81	4.16	11.40
R-square	0.71		0.60		0.53	
Model 3						
log(per capita income)	0.80	23.42	0.51	17.26	0.08	2.23
log(share of richest 60%)	0.05	0.11	-2.86	-5.52	-4.56	-7.82
constant	-3.18	-16.61	-0.44	-3.03	2.25	12.25
R-square	0.75		0.65		0.58	

Source: Authors' calculations.

Table A.9: Dependent variable = Achievement in percentage of children ages 15-17 attending school

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	0.36	16.55	0.54	17.93	0.42	9.75
log(Gini)	-0.33	-2.89	-0.88	-6.95	-1.48	-8.34
constant	-2.21	-15.07	-3.43	-24.23	-2.68	-15.48
R-square	0.64		0.60		0.50	
Model 2						
log(per capita income)	0.37	16.48	0.52	16.27	0.33	6.88
log(share of poorest 40%)	0.21	3.55	0.32	6.21	0.68	7.48
constant	-1.57	-9.12	-2.00	-7.05	0.32	0.66
R-square	0.68		0.61		0.51	
Model 3						
log(per capita income)	0.37	16.85	0.53	17.49	0.34	6.72
log(share of richest 60%)	-1.63	-3.26	-3.68	-6.32	-5.75	-7.98
constant	-2.22	-15.66	-3.20	-22.91	-1.90	-8.21
R-square	0.69		0.60		0.55	

Source: Authors' calculations.

Table A.10: Dependent variable = Achievement in percentage of youth ages 18-24 attending school

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	0.34	24.40	0.07	3.32	0.19	12.34
log(Gini)	1.22	10.62	1.26	11.53	1.31	20.11
constant	-2.74	-25.90	-0.52	-5.29	-1.22	-13.89
R-square	0.60		0.52		0.60	
Model 2						
log(per capita income)	0.33	27.95	0.11	5.08	0.26	14.91
log(share of poorest 40%)	-0.63	-10.85	-0.46	-9.91	-0.60	-18.48
constant	-4.87	-35.66	-2.58	-12.74	-3.87	-23.89
R-square	0.62		0.57		0.68	
Model 3						
log(per capita income)	0.33	25.91	0.09	4.39	0.25	14.14
log(share of richest 60%)	5.74	11.77	5.56	11.79	5.06	18.79
constant	-2.76	-28.71	-0.83	-8.46	-1.90	-20.45
R-square	0.63		0.60		0.65	

Source: Authors' calculations.

Table A.11: Dependent variable = Achievement in percentage of population with access to piped water

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	2.46	62.15	2.35	49.10	2.24	31.88
log(Gini)	-3.42	-15.22	-5.00	-17.92	-1.89	-5.26
constant	-15.05	-67.69	-15.27	-56.66	-12.42	-31.06
R-square	0.79		0.78		0.59	
Model 2						
log(per capita income)	2.48	71.40	2.20	48.10	2.13	27.41
log(share of poorest 40%)	1.83	15.44	1.62	11.63	0.84	5.11
constant	-8.96	-24.59	-7.65	-15.36	-8.66	-11.21
R-square	0.79		0.80		0.59	
Model 3						
log(per capita income)	2.49	70.55	2.25	52.68	2.14	27.01
log(share of richest 60%)	-15.75	-15.55	-19.29	-13.25	-7.10	-5.17
constant	-14.95	-78.45	-13.77	-62.14	-11.41	-29.25
R-square	0.82		0.80		0.85	

Source: Authors' calculations.

Table A.12: Dependent variable = Achievement in percentage of population with access to sanitary toilet

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	2.22	42.50	2.38	57.03	2.22	49.57
log(Gini)	-2.54	-12.78	-5.21	-22.50	-5.27	-21.60
constant	-13.57	-47.41	-15.89	-66.08	-15.12	-59.22
R-square	0.81		0.81		0.74	
Model 2						
log(per capita income)	2.24	40.92	2.23	58.19	1.93	42.97
log(share of poorest 40%)	1.39	12.67	1.71	13.17	2.48	24.77
constant	-8.99	-21.74	-7.88	-18.37	-4.31	-9.73
R-square	0.81		0.83		0.77	
Model 3						
log(per capita income)	2.24	44.35	2.28	67.09	1.94	47.33
log(share of richest 60%)	-11.85	-12.78	-20.26	-15.05	-20.67	-25.79
constant	-13.52	-50.81	-14.34	-74.30	-12.40	-58.77
R-square	0.83		0.85		0.80	

Source: Authors' calculations.

Table A.13: Dependent variable = Achievement in percentage of population with access to garbage collection

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	2.05	22.47	2.10	36.02	2.14	21.87
log(Gini)	-2.35	-6.55	-3.60	-10.36	-3.88	-8.20
constant	-12.00	-22.64	-12.06	-34.62	-12.08	-24.95
R-square	0.61		0.50		0.43	
Model 2						
log(per capita income)	2.08	24.13	2.00	34.68	1.93	17.60
log(share of poorest 40%)	1.33	7.40	1.08	9.07	1.73	7.98
constant	-7.73	-12.63	-6.79	-13.27	-4.35	-4.03
R-square	0.61		0.51		0.45	
Model 3						
log(per capita income)	2.08	23.30	2.03	34.12	1.94	17.03
log(share of richest 60%)	-11.52	-7.50	-13.32	-9.78	-14.51	-7.87
constant	-12.08	-23.61	-10.92	-34.74	-10.00	-18.48
R-square	0.71		0.61		0.50	

Source: Authors' calculations.

Table A.14: Dependent variable = Achievement in percentage of population with access to electricity

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	3.17	32.44	2.93	39.98	2.67	33.94
log(Gini)	-4.27	-7.99	-4.83	-9.89	-3.85	-10.62
constant	-17.84	-31.15	-16.24	-42.91	-13.76	-33.63
R-square	0.66		0.53		0.43	
Model 2						
log(per capita income)	3.16	33.59	2.79	34.87	2.46	27.58
log(share of poorest 40%)	1.82	5.44	1.25	6.73	1.65	9.49
constant	-11.07	-11.51	-9.69	-11.96	-6.23	-7.12
R-square	0.66		0.55		0.44	
Model 3						
log(per capita income)	3.18	32.95	2.83	36.17	2.47	27.77
log(share of richest 60%)	-16.93	-6.73	-15.77	-7.52	-13.92	-9.62
constant	-17.24	-32.16	-14.50	-41.08	-11.64	-26.74
R-square	0.70		0.65		0.56	

Source: Authors' calculations.

Table A.15: Dependent variable = Achievement in percentage of population with access to adequate sanitation

	1991		2000		2010	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Model 1						
log(per capita income)	2.35	31.83	2.11	22.77	2.73	44.40
log(Gini)	-3.64	-9.65	-4.72	-11.05	-5.17	-15.17
constant	-12.39	-28.14	-12.31	-27.42	-17.00	-43.62
R-square	0.51		0.47		0.58	
Model 2						
log(per capita income)	2.38	32.51	1.98	21.65	2.45	35.31
log(share of poorest 40%)	2.04	10.35	1.19	6.54	2.17	14.17
constant	-5.76	-9.61	-6.00	-7.15	-7.00	-10.43
R-square	0.51		0.46		0.59	
Model 3						
log(per capita income)	2.39	34.51	2.02	21.13	2.47	37.80
log(share of richest 60%)	-17.27	-10.19	-16.01	-8.63	-19.02	-15.49
constant	-12.36	-30.49	-10.67	-23.50	-14.19	-41.16
R-square	0.60		0.62		0.60	

Source: Authors' calculations.

Table A.16: Dependent variable = Achievement in employment rate among people ages 18 and above

	2000		2010	
	Coefficient	t-value	Coefficient	t-value
Model 1				
log(per capita income)	0.13	9.67	0.36	21.13
log(Gini)	-0.47	-6.31	-0.84	-11.29
constant	-0.83	-11.35	-2.42	-29.95
R-square	0.46		0.52	
Model 2				
log(per capita income)	0.12	8.08	0.31	16.54
log(share of poorest 40%)	0.18	6.39	0.39	10.32
constant	-0.05	-0.39	-0.7	-3.63
R-square	0.47		0.54	
Model 3				
log(per capita income)	0.12	9.01	0.32	16.64
log(share of richest 60%)	-2.01	-6.52	-3.36	-11.7
constant	-0.71	-10.71	-1.99	-21.71
R-square	0.42		0.45	

Note: no data available for 1991.
Source: Authors' calculations.

Table A.17: Dependent variable = Achievement in employment rate with formal contracts among people ages 18 and above

	2000		2010	
	Coefficient	t-value	Coefficient	t-value
Model 1				
log(per capita income)	0.94	32.84	1.17	53.56
log(Gini)	-1.65	-15.61	-1.98	-20.88
constant	-7.76	-59.66	-9.57	-92.81
R-square	0.85		0.88	
Model 2				
log(per capita income)	0.89	29.2	1.06	52.57
log(share of poorest 40%)	0.57	11.39	0.95	23.28
Constant	-5.15	-19.67	-5.47	-27.39
R-square	0.85		0.89	
Model 3				
log(per capita income)	0.9	33.65	1.07	51.25
log(share of richest 60%)	-6.62	-11.96	-7.95	-24.94
constant	-7.29	-57.16	-8.57	-84.58
R-square	0.83		0.85	

Note: no data available for 1991.
Source: Authors' calculations.

Table A.18: Dependent variable = Achievement in productive employment rate among people ages 18 and above

	2000		2010	
	Coefficient	t-value	Coefficient	t-value
Model 1				
log(per capita income)	1.18	52.64	1.13	46.61
log(Gini)	-1.66	-18.18	-1.79	-17.64
constant	-9.16	-85.8	-8.65	-78.13
R-square	0.91		0.89	
Model 2				
log(per capita income)	1.13	49.49	1.03	44.93
log(share of poorest 40%)	0.53	10.4	0.87	19.85
constant	-6.64	-30.49	-4.91	-21.87
R-square	0.90		0.91	
Model 3				
log(per capita income)	1.14	55.51	1.04	44.79
log(share of richest 60%)	-6.42	-12.75	-7.37	-21.65
constant	-8.66	-88.61	-7.77	-69.74
R-square	0.89		0.90	

Note: no data available for 1991.
Source: Authors' calculations.

Table A.19: Dependent variable = Achievement in labor force participation rate among people ages 18 and above

	2000		2010	
	Coefficient	t-value	Coefficient	t-value
Model 1				
log(per capita income)	0.23	12.95	0.36	18.36
log(Gini)	-0.45	-5.81	-0.70	-8.26
constant	-1.02	-12.59	-2.12	-24.77
R-square	0.41		0.55	
Model 2				
log(per capita income)	0.22	11.23	0.32	14.68
log(share of poorest 40%)	0.16	5.05	0.35	7.95
constant	-0.31	-1.78	-0.65	-2.89
R-square	0.41		0.56	
Model 3				
log(per capita income)	0.22	12.15	0.33	14.72
log(share of richest 60%)	-1.78	-5.05	-2.89	-8.81
constant	-0.90	-11.16	-1.78	-17.25
R-square	0.43		0.54	

Note: no data available for 1991.
Source: Authors' calculations.