A dinâmica da pobreza multidimensional no Brasil: uma análise de decomposição para o período 2009-2015

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Resumo: o artigo mensura a pobreza multidimensional no Brasil a partir do método de Alkire-Foster, utilizando dados da PNAD para o período 2009-2015. Uma análise de decoposição é realizada para identificar os níveis de pobreza de acordo com a localidade e os subgrupos que tradicionalmente sofrem privações e, portanto, enfrentam dificuldades para desenvolver suas potencialidades. Os resultados indicam a persistência dos maiores níveis pobreza no Norte e Nordeste do país, assim como nas áreas rurais. Constatou-se aumento da pobreza para a população indígena. Vulnerabilidade e dificuldade de acesso ao trabalho foram os principais determinantes da pobreza para a população feminina, embora os homens tenham apresentado o maior nível de pobreza. Para todas as faixas etárias foi observada diminuição no nível de pobreza, entretanto, idosos e crianças apresentam os maiores índices.
Palavras-chave: Pobreza Multidimensional. Alkire–Foster. Privação. Decomposição.

The dynamics of multidimensional poverty in Brazil: a decomposition analysis for the period 2009-2015

Abstract: This paper focuses on the methodology by Alkire-Foster to measure multidimensional poverty in Brazil, using data from the National Household Sample Survey (PNAD) for the years 2009 to 2015. A decomposition analysis was performed in order to identify poverty levels according to the locality and the groups that traditionally suffer deprivation and therefore face difficulties in developing their potential. The results revealed the persistence of the highest poverty levels in the North and Northeast of the country, as well as in rural regions. There was an increase in poverty for the indigenous population. In addition, vulnerability, and difficulty in accessing work were the main determinants of poverty for the female population, although men presented the highest level of poverty. For all age groups, a decrease in the level of poverty was observed, however, the elderly and children present the highest rates.
Keywords: Multidimensional Poverty. Alkire–Foster. Deprivation. Decomposition.

JEL codes: I31, I32

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A dinâmica da pobreza multidimensional no Brasil: uma análise de decomposição para o período 2009-2015

1. Introduction

The social and economic advances observed in the Brazilian economy since the 1990s have led to poverty reduction in the country in the last decade (Barros, Carvalho, Franco and Mendonça 2010; Osório, Souza, Soares and Oliveira 2011; Kerstenetzky 2017). Some studies on the subject have focused on population income analysis (monetary focus), whose contribution to understanding poverty behaviour in the country is extremely relevant, for example, Rocha (2013). This consolidation under a one-dimensional aspect, over time, stimulated questions related to other variables that would contribute to reducing this index, as seen in Kageyama and Hoffmann (2006), Barros, Carvalho and Franco (2006) and Diniz and Diniz (2009).

Other authors, such as Atkinson and Bourguignon (1982), Bourguignon and Chakravarty (2003), Duclos, Sahn and Younger (2006), Kakwani and Silber (2008), Dewilde (2008), Kwadzo (2015) and, Da Silva, Bruno and Silva (2020) have measured poverty through multidimensional indicators, which include monetary and non-monetary aspects, such as education, access to basic sanitation, etc., factors that together are responsible for the socio-economic development of individuals and, consequently, society. The monetary approach was unable to reveal the extent a country's poverty, being more suitable to analyze this problem by the incidence of multidimensional poverty.

Sen and Anand (1997) and Sen (1999) discuss the contributions from other factors that go beyond income to the measurement of poverty. The author states that poverty exists when there is the deprivation of the individual's potential. This occurs when instrumental freedoms, such as civil and political rights, which would ensure the provision of public goods and the opportunity for decision-making on private goods and social issues, are denied to them and, at the same time, the capabilities of the individual are curtailed, as there are no basic conditions to enable them to develop their skills.

The differences in the capacities, functioning and instruments between societies and their inclusion in the measure of multidimensional poverty lead to divergent values compared to the values observed using the one-dimensional measurement, which is based on deprivation of income. For this reason, multidimensional poverty rates are expected to differ from those associated with one-dimensional poverty, since selecting other variables such as freedoms, political rights, skin colour, gender, etc., is expected to identify a greater possibility of deprivation.

The importance of economic and political freedoms is evident, through which adequate opportunities for health and education, for example, make it possible to exercise the instrument (i.e.: political participation) for the maintenance of their civil rights and, consequently, for overcoming individual deprivations. However, measuring human empowerment, such as civil and political rights, is still a challenge due to its subjectivity and the difficulty in systematizing information. For this reason, there is a tendency to use measures that represent functioning, such as the education index, housing index, life expectancy index, etc., as proxy variables.

The measurement and analysis of poverty, deprivation and vulnerability are essential for several reasons. First, for economic and social reasons, it is important to understand the situation of poverty in Brazil, that is, who are the poor and where they are located; second, for analytical reasons, it is useful to understand the underlying factors contributing to poverty; third, for the purpose of formulating public policies, it is important to measure and analyse the situation to support interventions whose objective is to improve the quality of life of individuals and families affected by poverty; finally, for monitoring and evaluation purposes, measurement

and analysis are necessary to assess the effectiveness of the policies chosen in the eradication of poverty.

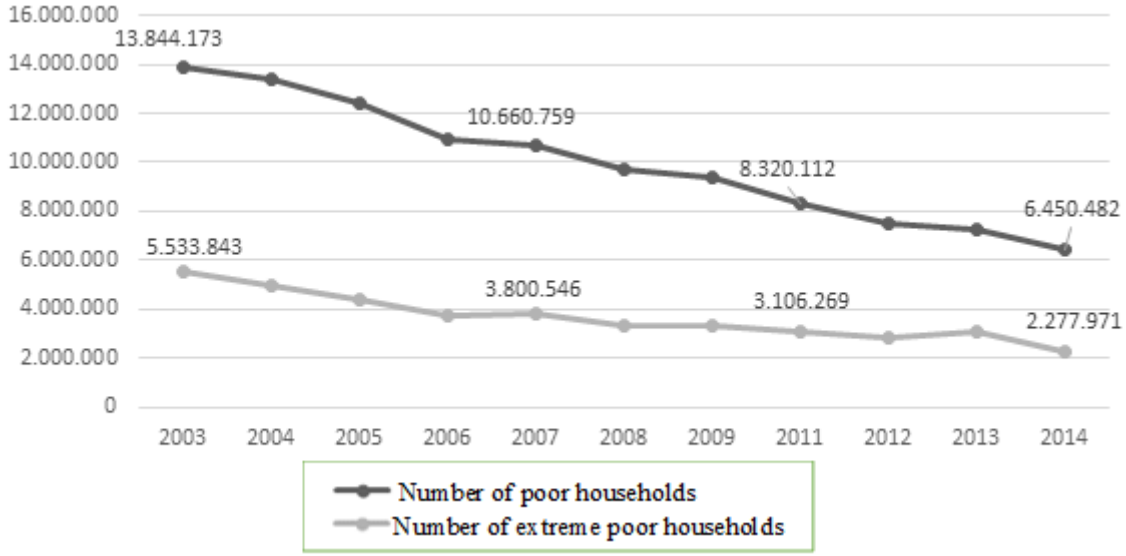
In this sense, the objective of the paper is to measure multidimensional poverty for Brazilian states in the period 2009 to 2015, with specific analyses based on gender, skin colour, age group of individuals, as well as on the location of households, rural/urban areas and located in the North, Northeast, South, Southeast or Midwest. The choice of the time horizon is mainly due to the most recent analysis of poverty in Brazil. The choice of categories is based on: (i) the possibility of representing groups that have non-productive characteristics traditionally discriminated against in the labour markets (Soares 2000; Ulyssea 2007), whose segmentation hinders the development of their potentialities, and (ii) in the different levels of poverty observed in rural and urban areas, due to the constraints of individual access to various types of goods and services as well the economics and social differences between regions in Brazil.

This paper is organized as follows: Sect. 2 presents the Literature review on poverty underlying the development of the Brazilian MPI, Sect. 3 describes the methodology, discusses data sources and data limitations, and presents the selected dimensions, indicators, and weights used to construct the MPI, as well as robustness tests. Finally, Sect. 4 discusses the main results, and Sect. 5 concludes.

2. Literature review on poverty: Brazilian context on poverty

The favourable economic environment after 2003 made it appropriate to redistribute public resources for social programmes, such as income transfer (Bolsa Família), investments in education and boosting the labour market (Barros et al. 2010). In view of this scenario, it was possible to increase the opportunity of the Brazilian population to combat deprivation in reaching its full potential. The Figure 1 shows the behaviour of poverty and extreme poverty in Brazil's households between 2003 and 2014.

Figure 1 - Poverty and Extreme Poverty in Brazil - Number of households (2003-2014)



Source: Author´s elaboration using data from PNAD 2003-2014.

It is possible to notice in Figure 1 that both categories (poverty and extreme poverty) revealed a decline over time, although poverty showed a higher percentage of decline, about 53%, than extreme poverty, which fell by approximately 49.8%. The economic growth achieved (post-2000) has somehow enabled the redistribution of resources in order to mitigate

poverty and absolute extreme poverty, by combating some of the deprivations that the majority of the population suffered, such as deprivation of adequate food and access to education through, for example, the creation and expansion of social programmes (Barros et al. 2010).

In this context, gender and ethnicity are reflected in a difference in income in the Brazilian population which brings the importance of evaluating the measurement of poverty in Brazil from the perspective of gender and ethnic groups. In line with this perspective, Georges and Maia (2017) analysis the evolution of the Gini index, women's remuneration in relation to men and black pay compared to whites', from 1995 to 2015, and put out that there is a bias towards wage equalization when observing the rising trends for black/white women/men and income and the decreasing line of the Gini index. Despite this, inequality remains when it is found that women's incomes represent only 62% of men's incomes and, in parallel, the income of Brazilian blacks represents only 57% of the income of Brazilian whites.

When it comes to the income of men and women, it is possible to perceive progress in recent years, however inequality persists. Most of the female population have low incomes (76% of women receive up to 2 times the minimum wage); the number of men receiving more than 10 times the minimum wage is twice the number of women. Comparing the income of whites and blacks in Brazil, inequalities are even more evident. Most black people in the population, about 78%, have incomes of up to 2 times the minimum wage.

Using different approaches, authors have studied the poverty in Brazil in the last decades. Rocha (2006), analysing the 2004 PNAD data, sought results related to poverty, as well as on the behaviour of absolute poverty. In her research, the importance of using several dimensions that seek to represent the set of conditions that make up the well-being of the individual, Rocha (2006) chose to analyse only the insufficiency of income as a determining factor for individual poverty and absolute poverty. Thus, the so-called poverty line was established, in which individuals located below this line have per capita family income lower than sufficient income to meet basic needs such as food, housing, education, etc.

To adapt the indicators of income insufficiency to different Brazilian regions and between urban and rural areas, considering their respective living costs, the author establishes 23 lines of poverty and 23 lines of absolute poverty. The main results of the study indicate, for 2004, a positive relationship between gross domestic product (GDP) growth and the expansion of the labour market and the income of Brazilian families, a positive contribution to the promotion of public policies, such as income transfers (whose objective is to eliminate extreme poverty), to reduce poverty and poverty rates compared to the previous year, as well as the fall in income inequality, which indicates that poverty reduction occurred not only in terms of income gains, but also in terms of distribution. In a regional perspective, Rocha (2006) shows that there was a reduction in the number of poor and absolutely poor families, however, in areas such as the metropolitan region of São Paulo there was an increase in this number. Despite these particularities, the Northeast region continued to present the highest volume of poor families at the national level.

In a study on the multidimensional poverty index, Barros, Carvalho and Franco (2006) built an indicator scale from various dimensions, through the microdata of the National Sample and Household Survey (PNAD), provided by IBGE, with the objective of dynamically evaluating the evolution of poverty in Brazil. Dynamism is present in the possibility of identifying poverty between different geographical regions in a specific period, i.e. in the construction of a profile of regional poverty from local characteristics, such as the degree of access to health, education, housing, etc.

The Multidimensional Poverty Indices estimated by Barros, Carvalho and Franco (2006) demonstrate the degree of poverty among minority groups, referred to by the authors as "particularly vulnerable groups", as well as population profiles for, among other aspects, age, sex, ethnicity and schooling. In addition, the authors also analyse the behaviour of poverty

between 1993 and 2003to identify spatial disparities. It was possible to observe, for example, that the rural population had the highest degree of poverty, with 39% of people in precarious situations. The elderly, children and blacks followed with the second-highest percentage of poverty (30%), higher than the national average (25%), which evidences their vulnerability.

Through the multidimensional scale index, the authors identify which indicators contribute to the poverty situation of the individual inserted in a specific group. For example, the factors that contributed to the percentage of 39% poverty for the rural population were housing in precarious conditions, lack of resources, difficult access to work and low growth rate of the child population.

With regard to black groups and families headed by women, the following results were obtained: in the first group, the lack of resources and also a low rate of development of the child population were identified; in the second group it was emphasized that although it has the lowest degree of poverty, it is more vulnerable than black families. It is clarified, then, that the degree of poverty stipulated first also depends on the dimension chosen as a greater determinant of poverty.

The profile of poverty analysed by the authors, considering "individual age, individual sex, individual colour, schooling of the head of the household, occupational situation of the head of the household, region where the domicile and urban location are located or rural home" (Barros, Carvalho and Franco 2006, p. 28), the group identified as in greater poverty was composed of families from the rural Northeast, headed by black people with up to four years of study. In the case of the dimensions analysed, it is still possible to say that families led by women are more numerous than families headed by men. The characterization of the most typical poor group observed by the authors is as follows: families living in the rural area of the northeast region, headed by black women, who are not inserted in the labour market, that is, economically unoccupied, with a low level of education. On the other hand, the group considered richer is more typically composed of families living in the urban region, in another region of the country other than the northeast region, headed by white men, inserted in the labour market in the formal sector, with an average level of education, at least.

Likewise, Costa, Machado and Amaral (2018) pointed out that poverty and extreme poverty rates in Brazil declined since the 1990s, for example, the extremely poor population represented 20% of the total population in the 1990s and in 2012 this percentage fell to 5.3%. The focus of this study was based on temporal analysis, assuming that a change in the social class of the population after a certain time may occur, and it is therefore necessary to evaluate the causalities of entry, permanence and exit from the state of deprivation. One of the dimensions used to evaluate this phenomenon is vulnerability, as Barros, Carvalho, and Franco (2006) point out, a concept linked to the ability to deal with unexpected external events. In the case of studies on poverty, vulnerability relates to the possibility of income loss and social well-being. According to Costa, Machado and Amaral (2018), the choice for vulnerability is justified by the possibility of preventing the advance of the incidence of poverty and extreme poverty, since its measurement can identify a priori causes for the loss of economic and social conditions of the population. This identification is essential to promote public policies that prevent the entry of this "vulnerable" group into a situation of deprivation.

In general, the authors show that the factors that determine the reduction in vulnerability to municipal poverty are education, longevity, gross added per capita value of industry, entrepreneurship rate and the service sector. Finally, the results of the analysis indicate that the North and Northeast regions continue to present the highest concentrations of poverty. The percentage of municipalities vulnerable to poverty in Brazil decreased by approximately 12.32% between 2000 and 2010, the most favourable results being observed in the Southeast and South regions (less significant levels of deprivation of potentialities of individuals).

Kabeer and Santos (2017) explored the probable relations between economic and social policy in force in Brazil between 2002 and 2013 and the behaviour of poverty and inequality. Data analysis allowed to identify whether the poverty reduction observed in the period also implied a drop in intersecting inequality. Thus, there is an interest in analysing the evolution of poverty in Brazil in the period 2009-2015, in order to draw up a profile and identify what causes the spread of poverty and its constraints (such as gender, race, age group and/or region). From this perspective, there needs to be a redirection of the debate about poverty, and in Brazil, the starting point for this is multidimensional analyses. The study concluded that both poverty and income inequality decreased in Brazil between 2002 and 2013. In addition, it was also possible to affirm that there was a reduction in inequality at the intersection, that is, social groups normally excluded from participation in national economic progress were able to overcome obstacles to improve their conditions socioeconomically.

In the same way, Da Silva, Bruno and Silva (2020) studied the multidimensional poverty in Brazil using 2004 to 2015 PNAD data and applying the method developed by Alkire and Santos (2013). According to the authors, there was a reduction of 37% in the multidimensional poverty in Brazil and the population in severe poverty showed a decresce of 53% in the period studied. However, the population vulnerable to poverty presented a small increase. Their study was possible to observe an inverse dynamic between the incidence of multidimensional poverty (including severe poverty) and the population vulnerable to multidimensional poverty. In a regional level, it has become evident a reduction in the incidence of poverty in the whole country, and notably in the North and Northeast regions.

In this context, to determine the poverty dimensions in the Brazilian multidimensional poverty index, it is adopted a conceptual framework harmonised with both the capabilities and the basic needs approaches. As presented by Ervin, Gayoso de Ervin, Molinas Vega and Sacco (2018, p. 1038), the decision to mix these approaches ease up the construction of multidimensional poverty index for Brazil that incorporates the development goals from the United Nations`s 17 sustainable development goals (SDGs) to transform our world. Therefore, the Brazilian multidimensional poverty index can be used to not only to evaluate the multidimensional poverty in the country, but it helps to identify which niche society is most in need of public policies that promote social programmes and focus on national and international development priorities.

3. Methodology

The MPI for Brazil is constructed using the dual-cut-off methodology proposed by Alkire and Foster (2011). It is based on the adjusted headcount ratio, the M_0 measure of multidimensional poverty, which combines measures of both multidimensional poverty incidence and multidimensional poverty intensity. The aggregation method for the MPI is briefly described in this section. We note that the MPI can be constructed in different, but equivalent measures. For further details on constructing an MPI and on additional measures in the Alkire–Foster class of poverty measures, we direct the reader to Alkire et al. (2015). In each *M_0* measure there are common factors, such as the poverty incidence rate (H) and the poverty intensity rate (A). According to Alkire et al. (2015), the difference and relevance of measure M_0 is in the fact that it can be measured through ordinal data.

Following the same line of reasoning, the minimum standard required to consider the poor household in the global Multidimensional Poverty Index (*M_0*) is conceived: if the deprivation score is greater than 1/3, the family is designated poor. From then on, poverty incidence (*H*) is called:

$$H = \frac{q}{n} \quad (1)$$

At the same time that the deprivation score determines whether a person or family is poor, it is also possible to point out how poor they are, that is, it is possible to verify the intensity of this poverty (*A*), which is called from the equation (2).

$$A = \frac{1}{q} \sum_{i=1}^{q} c_i(k) \quad (2)$$

The Multidimensional Poverty Index is, therefore, a vector that indicates the average deprivation score. From the product between the intensity of poverty (*A*) (verified in equation 2) and the incidence of poverty (*H*) it is possible to obtain the $M\_0 = H \times A$. The global Multidimensional Poverty Index is given by the sum of the product between *A* and *H* of the two areas, as described in (3).

$$MPI = \frac{1}{n} \sum_{i=1}^{n} c_i(k) \quad (3)$$

Finally, since data from National Household Sample Survey - PNAD is surveyed, on an ongoing basis, general characteristics of the population, education, labor, income and housing, and, according to the information needs for the country, having he household as its unit of survey, and also designed by states and urban/rural stratification, we calculate all multidimensional poverty statistics and confidence intervals incorporating sample weights and survey design. The data set will be presented in the next section.

3.1 Data base

In this section, it is discussed the data that are available in Brazil to build an MPI and the limitations of the data. The construction of the database was carried out using 74 variables from the National Sample and Home Survey (PNAD). Rocha (2006) emphasizes the benefit of the information obtained by PNAD due to its periodic character. In addition, the PNAD sample is composed of data from approximately 140 thousand households, with detailed questionnaires that cover different topics, thus providing statistical consistency to the assessment. Periodic monitoring of families is relevant because it allows spatial and temporal comparisons on topics such as economics, demography, and social development.

All survey rounds are representative for the twenty-six states and the Federal District for the period 2009-2015, except for the year 2010, since this year was Census period. This permitted to cover different regions and dimensions to measure poverty in Brazil under the multidimensional spectrum. Based on Ervin et al. (2018), all indicators included in the MPI are defined at the household level and assume equal distribution and externalities within the household. In this way, the unit of identification for the MPI is the household and all members of the same household are considered poor if the household has been identified as multidimensionally poor. A household is defined as ‘‘the single person or groups of persons, whether or not they are relatives, who habitually reside in a particular dwelling, occupy it totally or partially and who attend to their food needs in common’’.

After defining the data structure, 14 indicators grouped into 5 dimensions were selected for the Brazilian MPI as presented: i) Education, related to the ability to lead a life with adequate learning and skill conditions; ii) Vulnerability, displaying the possibility of lead a healthy life condition; iii) Standard of Living, related to lead a life with dignified housing conditions; iv) Work Condition, related to the possibility of deploy owns labour force adequately and, v) Scarcity of Resources, related to the ability of lead a life with adequate income level. The

definitions of dimensions and deprivation indicators for the Brazilian MPI are presented in Table 1.

Table 1 – Dimension, deprivation indicators and weights (Brazil, 2009-2015)

Dimension	Deprivation indicator: individual is deprived if…	Weight
Education		0.20
Schooling achievement	Household has at least one adult member that did not complete mandatory schooling	0.10
Child enrollment	Household has at least one member of mandatory schooling age (6–14 years old), who is not currently enrolled in school	0.10
Vunerability		0.20
Presence of the mother	Household has the mother living together with the family	0.10
Infant Mortality	Household has at least one child who was born death	0.10
Standard of Living		0.20
Housing materials	Household uses dirt, cardboard, straw, mud or other precarious materials for the roof and wall	0.033
Water source and supply	Household does not have access to piped drinking water inside the house or on the property and, Household does not receive drinking water from public utilities, a community or private network, or artesian well	0.033
Sanitation	Household does not have a toilette connected to sewage system, septic tank or well	0.033
Electricity	Household does not have electricity	0.033
Kitchen goods	Household does not have kitchen goods as gas stove	0.033
Durable goods	Household does not own a car and does not own two or more of the following goods: motorcycle, washing machine, or refrigerator	0.033
Access to work		0.20
Working time	Household head or spouse (partner) who works less than 3 (three) months in the main activity	0.067
Salary	Household head or spouse (partner) works 40 h or more a week, but earns less than the minimum wage	0.067
Occupational condition	Household head or spouse (partner) did contribute to Social Security and Household head or spouse (partner) has a work position in the informal sector	0.067
Scarcity of Resources		0.20
Lack of income	Household average monthly income is less than the minimum wage.	0.20

Source: Author´s elaboration using data from PNAD 2009-2015.

The territorial scale of analysis refers to the Federation Units of Brazil (State Brazilian and Federal District), with specific controls for urban and rural locations of households. These variables were also used to identify family members according to sex, age group, skin colour (demographic control), that is, it will be about demographic characteristics of the population and statistical identification.

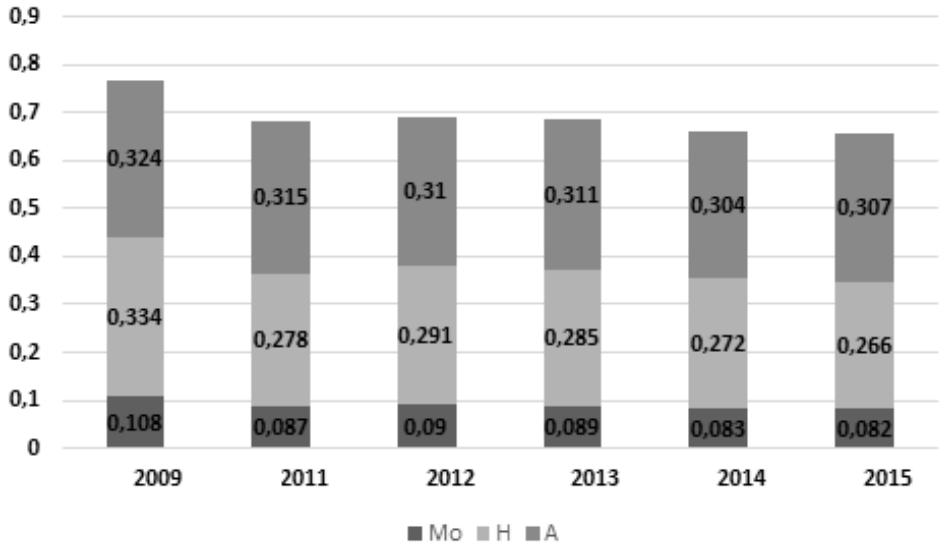
4. Results and discussion

This section will present the results from the estimates of the multidimensional unadjusted (H) and adjusted (*M_0*) poverty made for each year, from 2009 to 2015. In Figure 2, it is possible to verify that the multidimensional poverty index decreased between 2009 and 2015, from 0.108 to 0.082, respectively. This analysis corroborates the information presented in Figure 1, in which, according to IBGE (2018), poverty and extreme poverty numbers declined during the period 2003 to 2014. Poverty reduction and extreme poverty can be the

result, as indicated by Osório et al. (2011), of the increase in real income per capita and the reduction in inequality that occurred in the period 2004 to 2009. This scenario is probably related to the economic growth observed at the time that led to the generation of formal jobs and also largely to the implementation of income transfer programmes, such as the BPF (Bolsa Família Programme) and the BPC (Benefit of Continued Performance) (Osório et al. 2011; Kerstenetzky, 2017).

In addition, Figure 2 allows us to infer that from 2009 to 2015 there was a reduction in both the incidence of poverty (*H*), and its intensity (*A*). However, from 2011, the deprivations suffered by people increased with an increase in the number of people considered poor.

Figure 2 – Evolution of Multidimensional Poverty Index in Brazil (2009-2015)

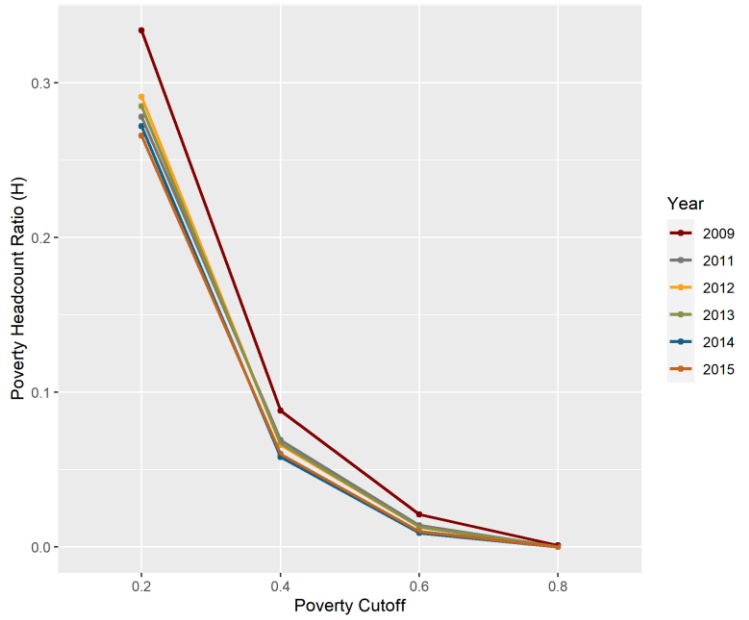


Source: Author´s elaboration using data from PNAD 2009-2015.

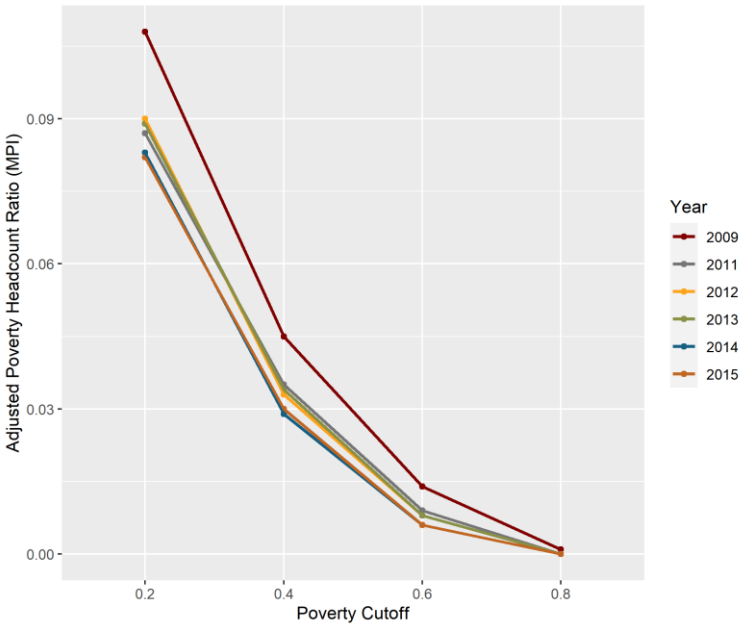
It is also necessary to verify the robustness of the results found. In this sense, both the incidence (*H*) and the Multidimensional Poverty Index (*M_0*) in relation to the definition of poverty (cut-off) were considered to evaluate the robustness of the estimates obtained. To evaluate robustness, it is necessary to remember the relationship between the concepts *c_i* and *k*. A person is considered poor only if the *c_i* (the deprivation score) is higher than the *k* (poverty cut-off), thus it is expected that when establishing high values for *k*, fewer people are considered poor. Similarly, when you reduce *k*, deprivation scores will more easily exceed *k* values and thus more people will be considered poor.

Figures 3a and 3b demonstrate the robustness test and it is possible to see that each year, the higher the *k* values, the lower the poverty rates *M_0* and its incidence *H*, which tended to zero. These results corroborate that the values of *M_0* and *H* are robust for the different *k* values between the period from 2009 to 2015.

Figure 3 – Robustness of (a) Poverty Incidence and (b) Multidimensional Poverty Index, according to different cut-off (Brazil, 2009-2015)



(a)



(b)

Source: Author´s elaboration using data from PNAD 2009-2015.

Between 2009 and 2015, the dimensions that most contributed to the determination of the poverty rate were vulnerability and access to work. The vulnerability was composed of 32.2% of MPI in 2014 and access to work corresponded to about 32.7% of MPI in 2015. Regarding to the contribution of each dimension to the Multidimensional Poverty Index (MPI) generated for the period 2009 to 2015, Table 1 is presented.

Table 2 – Decomposition of MPI by dimension (Brazil, 2009-2015)

Dimension	2009	2011	2012	2013	2014	2015
General Indicator (M0)	0.108	0.087	0.090	0.089	0.083	0.082
Education	0.107	0.107	0.093	0.091	0.088	0.082
Vulnerability	0.292	0.311	0.313	0.315	0.322	0.317
Standard of Living	0.150	0.155	0.145	0.146	0.143	0.142
Access to Work	0.313	0.286	0.324	0.319	0.326	0.327
Scarcity of resources	0.138	0.141	0.125	0.128	0.120	0.133

Source: Author´s calculation using data from PNAD 2009-2015.

The high percentage of vulnerability in the composition of MPI highlights the relevance of maternal care in combating poverty and extreme poverty as pointed out by Barros, Carvalho and Franco (2006), since in this period of time, infant mortality was high (IBGE 2018). Fulmer (1995) stresses the role of mothers, especially in low-income families. According to the author, good maternal performance allows mothers to care for and supervise their children in the family up to the pre-adolescent age group. In this sense, it shows that the mother has an important role in the family even to avoid poverty conditions in the household structure.

As a component of access to work, the indicator of occupation in the informal sector is evidenced, which for both Ulyssea (2007) and Osório et al. (2011) is responsible for explaining much of the total inequality caused by changes in poverty levels. The results obtained in the present study corroborate this analysis, as it is observed that in 2015 the occupation of the worker, whether employed or not and the employment situation, formal or informal, began to explain the multidimensional poverty index more than in 2009. It is important to highlight that both the increase in informality and the rise in the unemployment rate are preventing poverty and extreme poverty rates from continuing to decline significantly (Ulyssea 2007).

The scarcity of resources, which declined as a percentage share of the overall indicator between 2011 and 2014, grew again in 2015, which may be related to the reduction in the real minimum wage, since much of the income of Brazilians is derived from work, as evidenced by Barros et al. (2010) and Osório et al. (2011). On the other hand, the education dimension showed a decrease in the percentage contribution in all years, which suggests improving educational levels and a possible reduction in the difference in remuneration linked to the level of education, as already indicated by Barros et al. (2010) in previous years.

The standard of living presented similar behaviour to that of the education dimension, starting with 15% of the total general indicator in 2009 and 14.2% in 2015. This result infers improvements, although modest, in relation to housing, access to basic sanitation, electricity, drinking water and household goods for the Brazilian population. This result corroborates the trend of improvement of housing conditions found by Barros, Carvalho and Franco (2006) between 1993 and 2003, around 11 percentage points. However, it is worth noting that the reduction in the contribution of the standard of living to reducing poverty is occurring more slowly over time.

Thus, it can be summarized that over the period analysed there has been progress, although slow, in the dimensions of education, standard of living and scarcity of resources and setbacks in the dimensions of vulnerability and access to work.

From Table 3, it is possible to note that, in general in the intervals addressed, both multidimensional poverty and its incidence decreased throughout the period 2009-2015. Poverty intensity is higher among adults aged 25 to 44 years and increased between 2009 and 2015 from 0.565 to 0.578, respectively. However, the highest poverty rate, for all the years

observed, is observed for children aged 10 to 14 years, followed by elderly people over 65 years of age. In addition, added to the two age groups mentioned above (10-14 and 65+), the intervals between 15-17 and 45-64 years, also present greater poverty than the national average in all years.

Table 3 – The Dynamics of Multidimensional poverty by group age (Brazil, 2009-2015)

Group age	2009		2011		2012		2013		2014		2015	
	Mo	H	Mo	H	Mo	H	Mo	H	Mo	H	Mo	H
10—14	0.244	0.610	0.234	0.594	0.225	0.583	0.223	0.581	0.206	0.555	0.193	0.515
15—17	0.144	0.415	0.123	0.358	0.126	0.376	0.119	0.358	0.115	0.356	0.117	0.344
18—24	0.089	0.284	0.070	0.228	0.077	0.257	0.074	0.246	0.068	0.234	0.069	0.231
25—44	0.105	0.327	0.084	0.269	0.087	0.283	0.086	0.277	0.080	0.263	0.079	0.258
45—64	0.114	0.358	0.097	0.312	0.096	0.312	0.098	0.313	0.090	0.298	0.089	0.290
65+	0.202	0.616	0.155	0.486	0.169	0.525	0.145	0.458	0.156	0.500	0.139	0.446

Source: Author´s calculation using data from PNAD 2009-2015.

Silva, Araújo, Justo and Campos (2017) obtained similar results for the period 2006-2012, noting that the elderly and children are usually among the poorest because they usually do not have a source of income from work. Barros, Carvalho and Franco (2006), in turn, indicated that the presence of children and the elderly in households increases the vulnerability of the family, since their presence triggers the need for higher per capita income to supply essential goods. Still evaluating Table 3, it can be noted that for elderly people over 65 years of age, there are two moments when MPI rose again, the first from 2011 to 2012 and the second from 2013 to 2014. The data show that, at the first moment, the increase in *M_0* is caused by the increase in vulnerability for this age group. In the second moment, the increase in poverty is caused by the loss of income and access to work.

The next estimate was decomposed by the subgroup "gender" and is addressed in Table 4, in which it is possible to analyse the female and male participation in the dynamics of multidimensional poverty in Brazil, as shown below.

Table 4 – The Dynamics of Multidimensional poverty by gender (Brazil, 2009-2015)

Gender	Male		Female	
	H	Mo	H	Mo
2009	0.344	0.111	0.320	0.103
2011	0.292	0.092	0.258	0.081
2012	0.306	0.095	0.272	0.084
2013	0.301	0.094	0.264	0.081
2014	0.286	0.087	0.255	0.077
2015	0.280	0.086	0.246	0.075

Source: Author´s calculation using data from PNAD 2009-2015.

The *M_0* of the male population is above the national poverty average for each year, while the *M_0* of the female population remained below the national average for the same period. Both female and male populations decreased in poverty from 2009 to 2015. From 2011 to 2012, the increase in poverty observed for the male population is due to the loss of access to work, while the increase in poverty observed for the female population is caused not only by the loss of access to work, but also by the increase in vulnerability.

In other words, although the general MPI for the male population is more marked than that observed for the female population, it should be emphasized that in the dimensions "vulnerability" and "access to work" there is a higher percentage of poverty for women in all

years (2009-2015). That is, vulnerability and access to work affect women's poverty more than education, standard of living and resource shortages when compared to men. The impact generated by other dimensions, such as standard of living, education and resource shortage is greater for men when compared to the impact directed at women. Soares (2000) indicated that the gap between men and women is reducing gradually and that, although women could be as well or better qualified than men and be in similar occupations, women's remuneration was 35% lower. From this perspective, Kabeer and Santos (2017), when addressing access to the labour market between the years 2000 and 2010, found that there is a segmentation established by differences in class and sex.

The estimates of the models indicate that there was an increase in the level of informality in employment in Brazil between 2009 and 2015. This trend of informality in the labour market was also pointed out by IBGE: "the worsening of labour market conditions in the last three years is evidenced by the reduction of formal employment" (IBGE 2018). To continue the composition of the poverty profile in Brazil in recent years, the dynamics of poverty in relation to skin colour in Table 5 will be addressed.

Table 5 – The Dynamics of Multidimensional poverty by ethnics (Brazil, 2009-2015)

Ethnics	2009	2011	2012	2013	2014	2015
General Indicator	0.108	0.087	0.090	0.089	0.083	0.082
White	0.071	0.056	0.056	0.055	0.052	0.049
Black	0.115	0.097	0.095	0.098	0.089	0.088
Yellow	0.045	0.059	0.044	0.046	0.037	0.031
Mixed/Coloured	0.144	0.116	0.121	0.118	0.109	0.108
Indigenous	0.161	0.195	0.225	0.249	0.213	0.244

Source: Author´s calculation using data from PNAD 2009-2015.

Table 5 shows the absolute values of *M_0* for ethnic' subgroups. There is a reduction in the poverty rate for the white population in the period 2009 to 2015, which still has values below all multidimensional poverty rates represented each year in the general indicator. The groups for black, mixed/coloured, and indigenous populations are the poorest. Barros, Carvalho and Franco (2006) also observed that black individuals have a high level of poverty and explain this phenomenon largely by the greater vulnerability of this group.

Among these three subgroups, it is observed that two of them, black and brown, showed a drop in poverty between 2009 and 2015, although they were still among the poorest (0.088 and 0.108, respectively, higher rates than the national average (0.082)). Kerstenetzky (2017) contributes to explain the result presented by demonstrating that for blacks, wage inequality has decreased more significantly in that decade than in the previous decade, although it is still present. Between 2004 and 2014, the author found that the wage gap between non-blacks and blacks decreased from 107.8% to 73.6%. The third group, composed of the indigenous population, in addition to presenting the highest poverty values among all ethnic subgroups, also demonstrated poverty growth in the period in question, in 2009 the *M_0* was around 0.161, as early as 2015, this figure had increased to 0.244.

In more detail, it is noted that within the dimension of vulnerability, the indicator that has a great influence on the index is the presence of the mother for both ethnic groups, as also observed by Barros, Carvalho and Franco (2006). Access to work impacts the black population mainly through the informality of work and lower pay, as Kerstenetzky (2017) found.

The comparison between blacks and women corroborates the results found by Barros, Carvalho and Franco (2006): women have a lower degree of poverty than the black population,

but in contrast show greater vulnerability than the black family. Still comparing data from 2015, it is noted that access to work (both in relation to income and labour market informality) hinders the improvement of the poverty rate of women. In addition, the female population has a higher degree of multidimensional poverty compared to blacks with regard to standard of living and vulnerability.

Soares (2000) states that black, brown, and indigenous men encounter barriers to training and have difficulty entering n the labour market. At the same time, black, brown, and indigenous women are affected not only by difficulty in qualifications and entering the labour market, but also in the amount of salaries.

It is interesting to note that, although the yellow skin-coloured subgroup presented the lowest multidimensional poverty rate in relation to the national average, the yellow-skinned population has the highest rates of the informality of work. In addition, vulnerability is the dimension that most contributes to the multidimensional poverty rate of this population. The results found in this research, regarding poverty below the national average for individuals of Asian and white origin in Brazil, corroborate Soares's analysis (2000), which identifies whites and Asians as having better salaries when compared to other ethnic groups in society.

Finally, in the Table 6 is possible to identify that there is a great difference between poverty in rural and urban areas. As already evidenced by Barros, Carvalho and Franco (2006), Silva and Neder (2010) and Silva et al. (2017), poverty is more common in rural areas. While the incidence of poverty in rural areas stands at 0.669 in 2015, its incidence in the urban environment is around 0.198. The authors concluded, similarly to this research, that the rural population holds the highest percentage of poor people, 39% compared to the national average of 25%.

Table 6 – The Dynamics of Multidimensional poverty by rural and urban areas (Brazil, 2009-2015)

Area	Rural		Urban		General Indicator
	H	Mo	H	Mo	
2009	0.729	0.279	0.258	0.075	0.108
2011	0.700	0.261	0.204	0.057	0.087
2012	0.706	0.261	0.222	0.062	0.090
2013	0.697	0.258	0.215	0.060	0.089
2014	0.676	0.242	0.206	0.057	0.083
2015	0.669	0.240	0.198	0.055	0.082

Source: Author´s calculation using data from PNAD 2009-2015.

Despite a higher incidence of poverty in rural areas, there is a trend of reduction of *M_0* and incidence *H* over the years analysed for both areas. However, the reduction observed in the rural environment occurred more markedly when compared to poverty reduction in the urban environment. One of the causes of this event may be the decrease in income inequality between rural and urban workers, as highlighted by Ulyssea (2007) and Silva et al. (2017). It is emphasized that between 2009 and 2015, the scarcity of resources contributes in the same way to the level of *M_0* for rural areas; the contribution in the urban region is decreasing.

In the regional perspective, there is a trend of reducing multidimensional poverty in the period addressed. Nevertheless, it is observed that the highest poverty rates continue in the North and Northeast regions (Table 7), results also confirmed by Barros, Carvalho and Franco (2006), Kageyama and Hoffmann (2006) and Silva et al. (2017). The reduction observed between 2009 and 2015 occurred unevenly between the regions. The Southeast has the lowest multidimensional poverty value, corresponding to 0.037 in 2015, which was also expected according to the studies mentioned earlier.

Table 7 – The Dynamics of Multidimensional poverty by regions (Brazil, 2009-2015)

Regions	2009	2011	2012	2013	2014	2015
General Indicator	0.108	0.087	0.090	0.089	0.083	0.082
North	0.165	0.150	0.153	0.150	0.138	0.140
Northeast	0.172	0.141	0.147	0.147	0.138	0.136
Southeast	0.053	0.040	0.040	0.041	0.038	0.037
South	0.060	0.046	0.047	0.043	0.039	0.038
Midwest	0.080	0.058	0.063	0.058	0.055	0.053

Source: Author´s calculation using data from PNAD 2009-2015.

In this same vein, Costa, Machado and Amaral (2018) and Da Silva, Bruno and Silva (2020) studied multidimensional poverty in Brazil and reached similar conclusions: (a) there was a reduction in multidimensional poverty throughout Brazil; (b) the North and Northeast remain the sites of higher concentrations of poverty; (c) the Southeast and South presented the best conditions.

It is interesting to point out that the largest variation in poverty reduction occurred in the Northeast, around 0.036. This ranking is followed by the Midwest (0.027), North (0.025), South (0.022) and Southeast (0.016). When comparing the values of the regions with the national average, it is observed that the Southeast, South and Midwest have the lowest rates of multidimensional poverty; the North and Northeast have values far above average. While for the Northeast region there was an increase in the contribution of vulnerability, the standard of living and access to work for the construction of the poverty index; in the North, the largest contributors were vulnerability, access to work and scarcity of resources.

It should be noted that between 2014 and 2015, poverty in the Northern region increased again and, for the first time, exceeded poverty in the Northeast region in absolute values (which may have been caused by increased resource shortages), and is still very high. The region with the lowest multidimensional poverty rate in the country, is the Southeast.

During the period analysed, one can further identify the contributions of the indicators to each dimension. It is possible measure, for example, that the two factors that most impact poverty in the Northeast are the presence of the mother and the scarcity of income; in the North, the presence of the mother and informal work. For Kageyama and Hoffmann (2006) the lack of infrastructure in many rural areas such as in the North and Northeast regions is responsible for high poverty rates. It is interesting to note that in the Southeast, in addition to the presence of the mother having a great impact on poverty, informal work and education have a great influence on the level of poverty.

5. Conclusion

The analysis of poverty using various dimensions provides the identification and understanding of the deprivations that affect people considered poor. From this, public policies for the most vulnerable groups can be promoted to monitor and assist the eradication of poverty.

In this sense, the multidimensional poverty index based on the Alkire-Foster method, which was presented in this study, was constructed from the PNAD database and aimed to evaluate the poverty profile in a recent period (between 2009 and 2015) in Brazil. The decomposition by sex, skin colour, age group, region and area allowed the identification of characteristics that hinder the overcoming of deprivations and the development of the potentialities of individuals. In addition, it was possible to observe the different levels of poverty in which the locality determines access or not to essential goods and services.

From the results obtained, it was possible to notice poverty reduction throughout the period analysed, however, this reduction occurred at decreasing rates, and from 2014 to 2015, the index fell from 0.83 to only 0.82. During this period, an economic and political crisis was observed in the country, which resulted in a loss of productivity, a deficit in the primary outcome and an increase in the unemployment rate.

The increase in unemployment generated the movement towards the informality of the labour market, observed in the estimates carried out. Access to work, usually related to the situation component of formal or informal occupation, when it was not the main determinant of the condition of poverty was the second most impactful. In addition to the difficulty of access to work, women also faced greater vulnerability when compared to men. They also presented the highest levels of poverty.

Most Brazilians' incomes come from income from work, so given the decrease or lack of work for the groups of children and the elderly, they continue to present the highest levels of poverty. Despite this, the rate of poverty reduction among children increased, while the poverty reduction rate for the elderly decreased.

It is also possible to indicate an increase in inequality in the country between 2009 and 2015, as the incidence of poverty has decreased more sharply than its intensity. That is, people who are in the condition of poverty in 2015 are suffering more deprivation than people who were in poverty in 2009.

In addition, the highest levels of poverty were observed in the Northeast and North regions of the country, and from 2014 to 2015, the North reached a higher level of poverty than in the Northeast. Comparing rural regions with urban regions, there is a major discrepancy in poverty levels, while the urban area presented a poverty index of 0.55 for the year 2015, the rural area presented about 0.669, an extremely high value when compared to the national average level of 0.82. Despite the improvement in the indices compared to 2009, there is still a restriction of individual access to various types of goods and services.

Another point to be observed concerns the skin colour group. Poverty reduction was observed for black, brown, white, and yellow-skinned populations and increased poverty for the indigenous population. As observed, access to work is the largest contributor to the degree of poverty of indigenous peoples (thus evidencing continued discrimination in the labour market).

The reduction in poverty observed during the study period represents gains for the Brazilian population. However, it was also observed that from 2014 to 2015 this reduction occurred in a very modest way, which could be an indication that poverty would grow again in the following years, 2016, 2017 and 2018. There is evidence, therefore, that the social gains obtained throughout the 2000s, associated with improvements in the labour market, the real increase in the minimum wage and income transfers, were earned from a combination of measures and that they are being lost.

The high unemployment rates observed in recent months, rising public debt and low investment in education and technology tend to contribute to a lack of growth in GDP. Consequently, a scenario conducive to the eradication of poverty ceased to exist. The big challenge, therefore, is to intervene through structural policies, before all the gains made in previous years are effectively lost.

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