





Income Inequality of the Brazilian Amazon Population

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ABSTRACT

The main objective of this study is to evaluate the behavior of income distribution in the Amazonian States of Brazil from 2004 to 2015. As complementary objectives, we sought to determine the immediate causes of any differences of Household Income *Per Capita* (HIPC) distribution in the Legal Amazon, based on the static decomposition of the Gini Index, and to analyze the dynamic decomposition of the Gini Index considering HIPC portions. This methodology used microdata from the National Household Sample Survey (PNAD) for the analyzed period. As a result, the Gini index of the Legal Amazon HIPC performed differently from that of Brazil (without Legal Amazon). The HIPC portion formed by the income of military and civil servants from the Legal Amazon stood out for having the highest degree of negative progressivity when compared to the rest of the country, whereas “government transfers” had the highest degree of positive progressivity, being responsible for 36.7 of the Gini Index variation from 2004 to 2015.

KEYWORDS

Income distribution, Legal Amazon, Brazil

Desigualdade de Renda da População da Amazônia Brasileira

RESUMO

O principal objetivo deste artigo é avaliar o comportamento da distribuição de renda nos estados amazônicos do Brasil de 2004 a 2015. Como objetivos complementares, buscamos determinar as causas imediatas de quaisquer diferenças de distribuição da renda domiciliar *per capita* (RDPC) na Amazônia Legal, com base na decomposição estática do índice de Gini, e analisar a decomposição dinâmica do índice de Gini considerando as parcelas da RDPC. Essa metodologia utilizou microdados da Pesquisa Nacional por Amostra de Domicílios (PNAD) para o período analisado. Como resultado, o índice de Gini da RDPC da Amazônia Legal teve desempenho diferente do observado para o Brasil (sem Amazônia Legal). A parcela da RDPC (Renda Domiciliar *Per Capita*) formada pelos rendimentos de militares e servidores públicos da Amazônia Legal destacou-se por apresentar o maior grau de progressividade negativa quando comparada ao restante do país, enquanto as “transferências do governo” apresentaram o maior grau de progressividade positiva, sendo responsáveis para 36,7 da variação do índice de Gini de 2004 a 2015.

PALAVRAS-CHAVE

Distribuição de renda, Amazônia Legal, Brasil

CLASSIFICAÇÃO JEL

D31, D33, O12

1. Introdução

The Brazilian Legal Amazon is formed by nine States that, in turn, belong to the Amazon Basin and to areas with Amazonian vegetation; namely: Acre, Amapá, Amazonas, Pará, Rondônia, Roraima, Tocantins, Mato Grosso, and Maranhão. These first seven States form the Northern region of Brazil. The formation of Legal Amazon (at that time called only the Brazilian Amazon) was a political strategy devised by Getúlio Vargas in 1953, aimed at promoting the development of agricultural production in the area and its integration into the national economy, since this part of the country was then regarded as isolated and underdeveloped by the Federal Government. In subsequent governments, there were attempts at policies to achieve economic development for the region. All of them, however, have had little or few relationships to the economic, social, and sustainable tripod.

As pointed out by Gomes and Braga (2008), the growing demand for agricultural products such as grains and meat, in addition to products extracted from the forest to meet Brazilian exports, caused significant changes in the economic and social aspects of the Legal Amazon. From 2004 to 2019, according to INPE (2020), deforestation in this region amounted to 160.7 thousand km². This was mainly influenced by the disorderly expansion of the agricultural frontier.

With a population of 27.7 million inhabitants in 2015, the group of States that make up the Legal Amazon has the lowest population density in the country, which, in turn, attracts migrants to settle in the region and encourages the expansion of agricultural activities. Nonetheless, even with the advance of agriculture in the Legal Amazon, the GDP *per capita* of Amazonian States was the lowest in comparison with the other regions of the country. According to IBGE (2020), in 2015, for example, the GDP *per capita* in the region was R\$ 18.3 thousand, while it was R\$ 34.4 thousand in the Southern region.

What justifies this study is the possibility of a critical view of factors that contribute to the formation and inequality of HIPC from 2004 to 2015 in the Amazonian States. The period chosen is justified by the fact that from 2004 onwards the IBGE started to include in PNAD data regarding the rural area of the old Northern Region (responsible for 7 of the 9 Amazonian States), and 2015 was the last year the PNAD was conducted, being then replaced by the Continuous PNAD, started in 2012. It is important to highlight that because they have different methodologies, the PNAD and the Continuous PNAD do not allow for continuity in studies from their interposition. Thus, this study sought to answer the following issues: (1) How did inequality in HIPC distribution behave in the Amazonian States from 2004 to 2015? (2) What are the possible immediate causes for the evolution of such inequality?

The main objective of this study is to evaluate the behavior of income distribution in the Amazonian States of Brazil from 2004 to 2015. As complementary objectives, we sought to: 1) determine the immediate causes of any differences in HIPC distribution

in Amazonian States, based on the static decomposition of the Gini Index; II) analyze the dynamic decomposition of the Gini Index. To achieve such objectives, microdata of the PNAD for the period analyzed were used. As for methodology, it was decided that the Gini index was to be calculated, as well as its static decomposition, considering 11 HIPC portions. The dynamic decomposition of the variation (composition effect and concentration effect) of the inequality in HIPC was also made. As a basis of comparison, Brazil was used, excluding the Amazon States, so that “Brazil” is not influenced by data from these States.

Since 2001, Brazil has seen a drop in inequality in the distribution of HIPC, as indicated by the work of the Institute for Applied Economic Research – IPEA (2006). Such decrease was shown to be systematic in subsequent years and was studied by researchers such as Soares (2010) and (Hoffmann, 2011, 2013, 2016, 2017). The inequality of income distribution in Brazil has already been addressed through methodologies such as concentration indexes since 1952, with the studies by Kingston (1952), however, it was in the 1970s, through the works by Hoffmann and Duarte (1972); Fishlow (1972); Langoni (1972), that results acquired greater credibility, being based on data provided by the Brazilian Institute of Geography and Statistics (IBGE).

In the following decades, other works dealt with this theme, giving greater focus to what happened to Brazil as a whole. Nonetheless, regionalized analyzes on HIPC distribution, especially regarding the States that are part of the Legal Amazon of Brazil, are scarce. As an example, the works of Hoffmann (Hoffmann, 2003, 2007, 2010) can be mentioned. We should highlight that, in this study, the States that are part of the Legal Amazon will be called simply Amazonian States, in order to make the text more fluid.

From these studies, one cannot diagnose the current situation of HIPC distribution within these States not knowing whether there has been a decrease in inequality in these States, similar to that of Brazil as a whole. The first article (Hoffmann, 2003), using data from the 1999 National Household Sample Survey (PNAD), decomposed the Gini index by income. The second article (Hoffmann, 2007), still based on PNAD data, calculated the Gini index for HIPC and Income per Economically Active Person (RPEA) of six regions, only for 2005. In the third article (Hoffmann, 2010), the author analyzed, among other things, the Amazonian States using, as a database, the Family Budget Survey (POF) for 2002/03 and 2008/09. The North region has, historically, the lowest average household income *per capita*, ahead only of the Northeast region, but its gross domestic product is the lowest in Brazil. There is a lot of income disparity in the region, and the State has a strategic role in determining the degree of inequality. As already verified by Gabriel (2014), the income paid by the government to the civil service is regressive, and prevents the fall in the concentration of income. In the case of the Legal Amazon, to which the States of Maranhao and Mato Grosso are added to the North, we note that there is a scarcity of studies for this region. Thus, we seek to contribute to this discussion by expanding the literature on this topic that

lacks references. We also hope to contribute to the understanding of the high levels of poverty, a topic related to inequality, which not only affected the region since its first economic cycles but also impacted the population (Silva et al., 2020).

As we will see in the results section, the government is largely responsible for the high degree of inequality in the Legal Amazon, and at the same time, contributes to minimizing inequality and poverty through social programs. However, it will be clear that the share of employers was the second most responsible for the fall in inequality in the period from 2004 to 2015. With this information, policymakers can, for example, encourage job creation for companies that tend to employ more workers; lower the high salaries of a small portion of the civil service; and improve the focus of social programs on the most vulnerable population.

The study is divided into five sections, including this introduction. In the next section, some considerations on income distribution in Brazil are presented, with a greater focus on the period after 2001, in addition to some commentary on studies that dealt with the topic for some Amazonian States. The third section presents the database and the inequality measures used in this study, as well as the static and dynamic decomposition of the Gini index for HIPC. The fourth presents the results found for inequality measures in Amazonian States and their static and dynamic decomposition according to income portions, comparing them with results found for Brazil (without the Legal Amazon). The last section presents the conclusion.

2. Theoretical Foundations

2.1 Income distribution in Brazil

The concentration of income and wealth in Brazil has its origin, according to Cacciari (2002, p.13), in the “colonial and slave-trading past”, given the high degree of land ownership concentration since the beginning of the country’s colonization. According to the author, this situation, which persisted “until the first decades of the 20th century, led to a structure of concentrated, authoritarian and paternalistic political power”.

In the 1970s, there were memorable discussions on the topic “Income Distribution” in Brazil, generated by controversies about the increase in income inequality between 1960 and 1970. Such discussions were only possible because since the 1960s, in Brazil, systematic statistics provided by IBGE began to exist, which allowed measuring inequality in income distribution with greater certainty.

Hoffmann (1971) calculated the Gini index considering the distribution of income among individuals who declared non-zero income (active and inactive) for Brazil in 1960, and Duarte and Hoffmann (1971) made the same calculation for 1970. Both used data from the Census of the respective years. Together, Hoffmann and Duarte (1972) evaluated the evolution of income inequality between 1960 and 1970 and

showed that the value of the Gini index went from 0.49 to 0.57. Fishlow (1972), analyzing data on income distribution among the economically active population, including those who declared zero income for the 1960s and 1970s, also concluded that there was an increase in income concentration, with the Gini index going from 0.59 in 1960 to 0.63 in 1970.

Simonsen (1972) strongly criticized the work done by Hoffmann and Duarte (1972) and by Fishlow (1972), claiming “the debate about increasing concentration of income from 1960 to 1970 can only be sustained with a good deal of statistical levity” Simonsen (1972, p. 50). However, Langoni (1972), considering the economically active population and excluding those without income, came to establish consensus on the increased income inequality for the period in question. According to the author, the value of the Gini index went from 0.50 in 1960 to 0.57 in 1970. Although there was no consensus among the authors on the causes of the increased inequality, as pointed out by the work of Hoffmann (1973), the common point among them was that such increase was significant.

For the 1970s, Hoffmann and Kageyama (1986) calculated the Gini index for Brazil based on Household Income *per capita* (HIPC). According to the authors, the values found in the Gini index remained practically unchanged during the decade, thanks to the smaller average size of families, the lower degree of inequality in the Southeast region, and the greater number of members who work per family.

Other works followed this, all seeking to clarify the situation of income distribution in the country for their respective periods of analysis, such as the work of Bonelli and Sedlacek (1988), which presented a set of results on the evolution of income distribution between 1960 and 1986, focusing on income *per capita*. According to the authors, there was an increase in the concentration of income, mainly until the mid-1970s. From then on, there was a phase of decreased concentration until the early 1980s. However, influenced by the economic recession of the period, the concentration of income increased again between 1981 and 1985, having a slight fall in 1986.

Research on the distribution of income *per capita* for the late 1980s and early 1990s can be found in the studies of Ramos (1993), Ferreira and Litchfield (1996), and Maia (2010). It is noteworthy that such research did not find, at the time, an encouraging situation for income distribution, in terms of reducing income concentration.

For the first decade of the 2000s, this situation was reversed, as mentioned in the study by IPEA (2006). There has been a decrease in HIPC inequality since 2001¹. According to the study, this situation was provided by the economic stability promoted by the Real Plan. There is a considerable number of studies on HIPC inequality for this period, such as the works of Neri (2006), Ferreira et al. (2008), Hoffmann and Ney (2008), Hoffmann (2006, 2007, 2010, 2016, 2017), Souza (2012) and Rocha (2011);

¹However, when analyzing by employed person, Hoffmann (2002) points out that income inequality has been falling since 1993.

Rocha et al. (2012).

2.2 Income Distribution in the Amazonian States of Brazil

There are few studies that cite income inequality in States that form the Legal Amazon. Still, they do so by analyzing the North region of Brazil and its 7 States (Acre, Amapá, Amazonas, Pará, Roraima, Roraima and Tocantins). Hoffmann (2003) analyzed the contribution of the HIPC portions to the inequality of income distribution in Brazil and its regions in 1999, using as a methodology the decomposition of the Gini index into six portions: main job, other jobs, retirements and pensions, donations, rent, and other income. The results found by the author show that the “main job” portions had a higher percentage share in the income of the States in the North region, compared to the States in other regions. While for the States of the North region this share accounted for 81.9% of income, in the States of the Northeast it participated with 70.2%, and with 75.6% in the southern States. São Paulo, in isolation, approached the percentage of States in the North region, as it had a 79.0% share of the “main job” portion in the formation of total income, as well as those in the Midwest region, with 79.5%. On the other hand, the “retirements and pensions” portion was the one with the lowest percentage participation in the formation of income of the States of the North region in comparison with those of the other regions. The North region had 12.2% of its total income from this portion, while the Northeast had 21.4% and the Midwest had 13.9%.

Hoffmann (2007), using data from the 2005 PNAD, analyzed not only the HIPC, but also the RPEA, excluding people without income, for Brazil and its regions. An interesting point in these results, when compared with those of 1999 (presented in the previous article by the same author), using PNAD data, is that the States of the North region continued with the Gini index lower than that presented by those of the Northeast, MG + ES + RJ and Midwest. However, now the data of the rural population of the old North region (Acre, Amapá, Amazonas, Pará, Rondônia and Roraima) are included in the PNAD. In 2005, while the States in the North region had an index of 0.530, those in the Northeast had 0.570; for MG + ES + RJ the value was 0.547, and for those in the Midwest it was 0.573. This result indicates that the income distribution in the rural area of the old North region is similar to that observed for the income distribution in the urban area. It is also interesting to note that, when assessing the RPEA distribution, the States in the North region have the lowest Gini index among the regions. While the Northeast and Midwest showed 0.555 and 0.557, respectively, the North region had an index of 0.498.

Hoffmann (2010) used data from the 2002-2003 and 2008-2009 POF to analyze the main characteristics of RFPC distribution in Brazil and in six regions, including the North region. The real average RFPC in Brazil, in Reais, for January 2009, went from R\$ 696.60 in 2002-2003 to R\$ 838.60 in 2008-2009, an increase of 20.4%. However, when analyzing by region, the RFPC grew more than 30% in the two poorest regions

(North and Northeast) and grew less than 20% in the three richest regions (MG + ES + RJ, SP, and the South), whereas in the Midwest the growth was 25%. Although the States of the North region have grown by 32% in the RFPC, this region continues to be the one with the second worst income among the regions studied, ahead only of the Northeast region. Regarding the inequality of income distribution, Brazil and all the regions studied showed a decrease in the period 2002-03 to 2008-09. The Gini index for Brazil fell from 0.591 in 2002-2003 to 0.561 in 2008-2009, a negative variation of 5.1%. The States of the North region went from 0.569 to 0.546, a negative variation of 4.0%, with the regions that had the greatest falls being the South (-7.7%) and the Midwest (-7.5%).

Analyzing the distribution of the HIPC in Brazil, Hoffmann and de Jesus (2022) show that the remuneration of public and military employees is a regressive portion, and that the income of the *Bolsa Familia* program is the most progressive of the eleven analyzed portions, as it focuses on the poor, its progressivity is superior to that of other social programs. They also note that the North region, in 2020, had an average HIPC of R\$ 918.00, which is only slightly higher than the Northeast region (R\$ 913.00), and 33.57% lower than that of Brazil. This shows the relevance of studying income inequality in the Legal Amazon, which is one of the poorest regions in the country, comparable to the average income of the Northeast region.

3. Methodology

3.1 Database

As a database, microdata from PNAD, from 2004 to 2015, was used². It should be noted that this is an annual survey by a probabilistic sampling of households, carried out throughout the national territory, including, since 2004, the rural areas of the former North region. The classification of urban and rural areas is done according to the legislation in force at the time of the Demographic Censuses, thus maintaining the delimitation of urban and rural areas in the inter-census period. Households with undeclared income were excluded from the analysis.

3.2 Measures of Inequality

There are numerous measures of the degree of inequality of income distribution, such as those found in the works of Cowell (2011); Sen et al. (1997); Hoffmann (1998). In this work, the Gini index and its decomposition according to 11 portions of income are used as an inequality measure, and this measure obeys the Pigou-Dalton condition³.

²With the exception of 2010 due to the Census.

³The Pigou-Dalton condition establishes that inequality measures must have their values increased when there are regressive transfers of income. See Hoffmann (1998).

3.3 Static Decomposition of Gini Index and the Measure of Progressivity of a Portion of the Income

The methodology of static decomposition of the Gini coefficient, presented in this work, is based on Pyatt et al. (1980), being also the basis of works following this, such as Ercelawn et al. (1984), Mariano and Lima (1998); Neder (2001); Ferreira (2003); Hoffmann (2002, 2010). In this work, the income will be divided into eleven portions, which are:

- 1 - Income from the work of private sector employees;
- 2 - Income from military or statutory civil servant work;
- 3 - Income from own account work;
- 4 - Income from employers' work;
- 5 - "Official" pensions of up to 1 minimum wage⁴
- 6 - "Official" pensions and retirement pays above 1 minimum wage;
- 7 - Other pensions and retirement pays;
- 8 - Donations made by people from other households;
- 9 - Rental income;
- 10 - Government transfers;
- 11 - Interest, dividends, and other income.

Income from work, which consists of the gross payments obtained from all activities of people aged 10 and over, is divided into four types, according to the nature of the person's main job, corresponding to portions 1, 2, 3 and 4.

Retirement and pension income are payments made by the federal government or by a federal, State or municipal social security institute, in addition to insurance entities or pension funds. It was divided into three types, represented by portions 5, 6 and 7.

Income from donations is derived from a non-resident in the household, represented by portion 8.

Rental income includes sublease and lease of furniture, real estate, machinery, equipment, animals etc., represented by portion 9.

The yield of government transfers is an estimate made based on Hoffmann (2017). It contains resources from government assistance programs, which may be an official

⁴An income x is calculated to be "less than or equal to the minimum wage" when $x < M$, with M being the value rounded to the nearest integer of 1.095 times the current minimum wage. Thus, in 2015 the value of M was $1,095 \times \text{R\$ } 788.00 = \text{R\$ } 862.86$.

educational assistance program (such as Bolsa-Escola) or social assistance (Minimum Income, *Bolsa Família*, Continuing Work Benefit - BPC-LOAS, Child Labor Eradication Program - PETI, among others), represented by portion 10.

Interest income from investments in fixed income financial assets or savings accounts and other income are represented by installment 11 and, like installment 10, installment 11 is an estimate made based on Hoffmann (2017).

Next, the static decomposition of the Gini index is exposed according to the income portions, according to Hoffmann (2010, p. 214-217).

It can be demonstrated that the Gini index can be represented by:

$$G = \frac{2}{n\mu} \text{cov}(i, x_i) \quad (1)$$

Then, consider the income x_i is formed by k portions, so that

$$x_i = \sum_{h=1}^n x_{hi} \quad (2)$$

Where x_{hi} represents the value of the h -th portion of the income of the i -th person.

The average of the h -th installment is

$$\mu_h = \frac{1}{n} \sum_{i=1}^n x_{hi} \quad (3)$$

and the cumulative proportion of the total of that portion up to the i -th person is

$$\Phi_{hi} = \frac{1}{n\mu_h} \sum_{j=1}^i x_{hj} \quad (4)$$

Similarly to the definition of the Lorenz curve, the concentration curve of the h -th portions is called the curve that shows how Φ_{hi} varies depending on p_i . It is worth mentioning that, in the construction of the concentration curve of x_{hi} , the ordering of x_i (and not the ordering of x_{hi} , which may be different) is used.

Admitting that $x_{hi} \geq 0$ and being β_h the area between the concentration curve of x_{hi} and the abscissa axis (p_i), the respective concentration ratio is defined as

$$C_h = 1 - 2\beta_h \quad (5)$$

Analogous to (02), one can demonstrate that

$$C_h = \frac{1}{n\mu_h} \text{cov}(i, x_{hi}) \quad (6)$$

It turns out that $-1 + \frac{1}{n} \leq C_h \leq 1 - \frac{1}{n}$

The share of the h -th portion in the total income is

$$\varphi = \frac{\sum_{i=1}^n x_{hi}}{\sum_{i=1}^n x_i} = \frac{\mu_h}{\mu} \quad (7)$$

It can be demonstrated that the Gini index is the following weighted average of the concentration ratios:

$$G = \sum_{h=1}^k \varphi_h C_h \quad (8)$$

Like in $\sum \phi_h = 1$, one can write

$$G = G - \sum_{h=1}^k \varphi_h (G - C_h) \quad (9)$$

With $\phi_h > 0$, $G - C_h$ determines whether the portion contributes to reduce or increase the value of the Gini index. If $C_h < G$, the portion x_{hi} is helping to reduce the Gini index. If $C_h > G$, the x_{hi} is helping to increase the Gini index.

For a portion $x_{hi} \geq 0$ of income x_i , the Lerman-Yitzhaki progressivity measure is defined as

$$\pi_h = G - C_h \quad (10)$$

A tribute t_i can be considered a negative portion of the final income, that is,

$$t_i = -x_{hi} \quad (11)$$

The tax concentration curve is constructed using the values of t_i and the respective concentration ratio can be obtained by means of (03) or (04). Note that in this last expression the exchange of signal x_{hi} does not affect the result, as the covariance signal and μ_h is exchanged.

According to (09), a tax contributes to reducing inequality if $C_h > G$ because the respective ϕ_h will be negative. Following Hoffmann (2013), to include the case of taxes, the Lerman-Yitzhaki measure of progressivity must be defined as

$$\pi_h = (\text{sign of } \phi_h)(G - C_h) \quad (12)$$

The name given to this measure of progressivity is a recognition of the pioneering spirit of Lerman and Yitzhaki (1985, 1995), who stressed the importance of considering the ordering of final rents and demonstrated that, given a small proportional

increase in x_i , that is, multiplying x_i per $(1 + \theta)$, with θ arbitrarily small, the variation caused in the Gini index is such that

$$\lim_{\theta \rightarrow 0} \frac{\Delta G}{\theta} = \phi_h(C_h - G) = \pi_h |\phi_h| \quad (13)$$

with $|\phi_h|$ indicating the absolute value of ϕ_h .

This expression shows that the elasticity of G in relation to x_i is

$$\phi_h \left(\frac{C_h}{G} - 1 \right) = - \frac{\pi_h |\phi_h|}{G} \quad (14)$$

Expressions (13) and (14) show how the effect of a small proportional increase in the portion x_i on the Gini index depends on the degree of progressivity of the portion and the absolute value of its participation in the total income. These results justify considering expression (12) as an appropriate measure of portion x_i 's progressivity.

3.4 Dynamic Decomposition of the Gini Index: composition effect and concentration effect

This subtopic is based on Hoffmann (2006) and Soares (2006). The dynamic decomposition of the variation in the Gini index allows us to assess what the contribution of a given portion to this variation is, that is, it allows to determine whether the portion contributed or not to increase the concentration of income. Next, the expression of the dynamic decomposition of the Gini index is deduced. The index's initial value is given by

$$G_1 = \sum_{h=1}^k \varphi_{1h} C_{1h} \quad (15)$$

Keeping the division of income in the same portions, in the final year there is

$$G_2 = \sum_{h=1}^k \varphi_{2h} C_{2h} \quad (16)$$

Thus, the variation in the Gini index between these two years is

$$\Delta G = G_2 - G_1 = \sum_{h=1}^k (\varphi_{2h} C_{2h} - \varphi_{1h} C_{1h}) \quad (17)$$

Adding and subtracting $\varphi_{1h} C_{2h}$ within the expression in parentheses and factoring, we obtain

$$\Delta G = \sum_{h=1}^k (C_{2h} \Delta \varphi_h - \varphi_{1h} \Delta C_h) \quad (18)$$

with $\Delta\phi_h = \phi_{2h} - \phi_{1h}$ and $\Delta C_1 = C_{2h} - C_{1h}$.

Alternatively, adding and subtracting $\phi_{2h}C_{1h}$ within the expression in parentheses in (17), and factoring, we obtain

$$\Delta G = \sum_{h=1}^k (C_{1h}\Delta\varphi_h - \varphi_{2h}\Delta C_h) \quad (19)$$

Expressions (18) and (19) are two possible ways to decompose ΔG . To avoid the question of arbitrarily choosing one of them, it is reasonable to use the arithmetic mean of the two:

$$\overline{\Delta G} = \sum_{h=1}^k (C_h^*\Delta\varphi_h - \varphi_h^*\Delta C_h) \quad (20)$$

with

$$C_h^* = \frac{1}{2}(C_{1h} + C_{2h}) \quad (21)$$

and

$$\varphi_h^* = \frac{1}{2}(\varphi_{1h} + \varphi_{2h}) \quad (22)$$

In expression (20) the increase in the share of a portion of total income ($\Delta\phi_h > 1$) only contributes to reducing the Gini index if the respective concentration ratio C_h is negative.

The average of the Gini indices in the two years considered is

$$G^* = \frac{1}{2}(G_1 + G_2) \quad (23)$$

Like in $\sum \phi_{2h} = \sum \phi_{1h} = 1$, it turns out that

$$\sum_{h=1}^k G^* \Delta\varphi_h = G^* \sum_{h=1}^k (\varphi_{2h} - \varphi_{1h}) = 0 \quad (24)$$

The expression (20) remains valid if subtracted (24) from the second member, obtaining

$$\overline{\Delta G} = \sum_{h=1}^k [(C_h^* - G^*)\Delta\varphi_h + \varphi_h^*\Delta C_h] \quad (25)$$

Mathematically, both expressions (20) and (25) are valid. But, when analyzing the economic meaning of its terms, it turns out that (25) is the most convenient expression. It is more reasonable to adopt a decomposition of the variation of the Gini index

in which, according to expression (25), the increase in the participation of a portion ($\Delta\varphi_h > 0$) contributes to increase or decrease the Gini index according to whether the proportion of concentration of this portion is higher or lower than the Gini index, respectively.

For positive portions, remembering expression (10), expression (25) can be written as

$$\overline{\Delta G} = \sum_{h=1}^k \varphi_h^* \Delta C_h - \pi_h^* \Delta \varphi_h, \text{ with, } \pi_h^* G^* - C_h^*$$

It is verified, therefore, that the increase in the participation of a portion contributes to increase or decrease the Gini index according to whether that portion is, on average, regressive or progressive, respectively.

Adopting the expression (25) as the decomposition of the variation in the Gini index, the total contribution of the h -th portion of income to this variation is

$$(\overline{\Delta G})_h = (C_h^* - G^*) \Delta \varphi_h + \varphi_h^* \Delta C_h \quad (26)$$

and the respective percentage contribution is

$$s_h = \frac{100}{\overline{\Delta G}} (C_h^* - G^*) \Delta \varphi_h + \varphi_h^* \Delta C_h \quad (27)$$

In expressions (26) and (27) it is possible to distinguish an effect associated with variation in the composition of income, called composition effect, and one associated with variation in the concentration ratios, the concentration effect. The composition effect of the h -th portion is

$$(C_h^* - G^*) \Delta \varphi_h \quad (28)$$

or, as a percentage of the variation in the Gini index,

$$s_{\varphi h} = \frac{100}{\overline{\Delta G}} (C_h^* - G^*) \Delta \varphi_h \quad (29)$$

The total composition effect is

$$\sum_{h=1}^k (C_h^* - G^*) \Delta \varphi_h \quad (30)$$

The concentration effect of the h -th portion is

$$\varphi_h^* \Delta C_h \quad (31)$$

or, as a percentage of the variation in the Gini index,

$$s_{ch} = \frac{100}{\Delta G} \varphi_h^* \Delta C_h \quad (32)$$

The total concentration effect is

$$\sum_{h=1}^k \varphi_h^* \Delta C_h \quad (33)$$

4. Results and analysis of the decomposition of Gini Index in the Legal Amazon according to HIPC portions

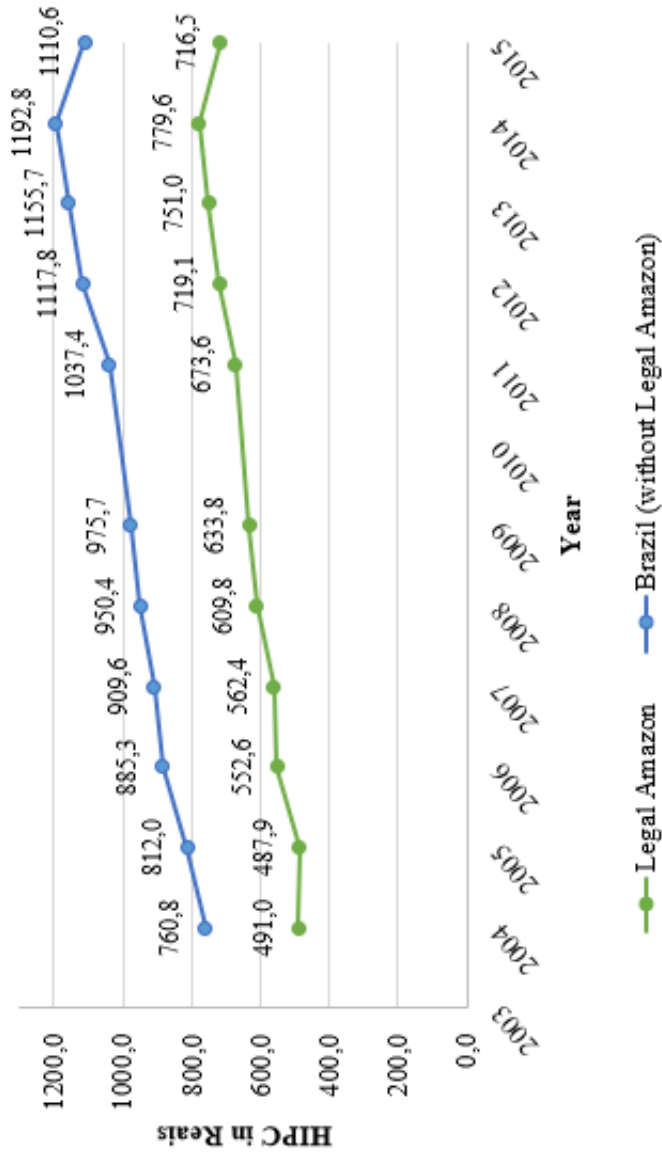
4.1 Average income and the participation of portions in the formation of the HIPC in the Legal Amazon and in Brazil (without Legal Amazon)

It is important to emphasize that, in this work, all calculations made for Brazil are done excluding the Legal Amazon and thus it does not conflict with the formerly taken values. Figure 1 shows the average salary values in Reais from 2004 to 2015, already deflated to 2015 values, for residents in the Amazonian States and for residents in Brazil (excluding those in the Legal Amazon).

Although the analysis of this work is based on the study of income inequality existing in the Legal Amazon and, for that, it confronts it with the results for the rest of Brazil, one must consider that the fact of a given income has presented lower degree of inequality of one group regarding another does not make this group to be necessarily at an advantage in relation to the other. This is because, for there to be a less unequal system between rich and poor, two factors are fundamental: I) reduction of income inequality between members of the same society; II) existence of sufficient average income for all. Thus, considering the results presented in Figure 1, the discrepancy in income between those residing in the Legal Amazon and residents in the rest of Brazil is noticeable. For all years analyzed, income in the Legal Amazon was significantly lower than that of the rest of Brazil. In 2015, as an example, the average income of residents in the Legal Amazon was 35.5% lower than that of residents in the rest of the country (Brazil without Legal Amazon).

The following tables show the percentage participation in the formation of the HIPC in the Amazonian States (Table 1) and in Brazil (without Legal Amazon) (Table 2) in the period from 2004 to 2015. As expected, portion 1 (wages of employees in the private sector) is clearly the highest among the others. However, for the Legal Amazon, it was 10.3% lower than that of the rest of Brazil, on average.

Figure 1. Average, in Reais, for the HIPC of residents of Amazonian States and of the other States of Brazil (Brazil without Legal Amazon), from 2004 to 2015.



Source: Own elaboration based on IBGE - individual data from PNADs from 2004 to 2015. Deflated values with base year 2015.

Table 1. Percentage participation of HIPC portions in the Legal Amazon, from 2004 to 2015

Year	Parcels											Total
	1	2	3	4	5	6	7	8	9	10	11	
2004	36.63	13.68	21.16	11.71	5.82	5.85	1.03	0.97	1.33	1.31	0.52	100.0
2005	36.98	13.59	20.25	11.02	6.53	6.19	1.05	1.09	1.29	1.49	0.52	100.0
2006	35.07	14.50	19.84	11.53	6.15	6.13	1.06	0.87	1.60	2.56	0.69	100.0
2007	36.99	14.30	20.42	9.56	6.85	6.17	1.48	0.73	1.05	1.98	0.46	100.0
2008	37.95	14.48	18.14	11.22	6.69	5.80	1.06	0.58	1.31	2.38	0.39	100.0
2009	37.19	15.07	17.74	10.53	7.23	6.08	1.05	0.65	1.34	2.68	0.43	100.0
2011	37.73	13.29	20.72	8.30	8.13	5.63	1.06	0.27	1.17	2.99	0.70	100.0
2012	36.76	14.17	18.92	9.60	8.44	5.12	0.74	0.35	1.04	3.33	1.53	100.0
2013	38.81	14.02	17.81	8.59	8.95	5.34	0.89	0.34	1.26	3.30	0.69	100.0
2014	37.98	13.91	19.76	7.07	8.90	6.00	0.84	0.45	1.12	3.37	0.60	100.0
2015	36.22	14.73	19.22	7.01	9.83	6.46	0.96	0.57	0.85	3.56	0.60	100.0

Source: Own elaboration based on IBGE - individual data from PNADs from 2004 to 2015.

Note: 1: Private Sector Employee; 2: Military or Public Servant; 3: Own Account; 4: Employers; 5: Retired (≤ 1 MW); 6: Retired (>1 MW); 7: Other pensions; 8: Donations; 9: Rental; 10: Gov. transfers; 11: Interest, dividends.

Table 2. Percentage participation of HIPC portions in Brazil (without Legal Amazon), from 2004 to 2015

Year	Parcels											Total
	1	2	3	4	5	6	7	8	9	10	11	
2004	39.96	9.74	14.91	11.16	4.56	14.10	1.50	0.71	1.77	0.85	0.74	100.0
2005	40.36	9.47	14.26	11.35	4.87	13.74	1.66	0.68	1.86	0.84	0.93	100.0
2006	39.63	10.27	13.63	11.95	5.20	13.26	1.55	0.69	1.74	1.14	0.94	100.0
2007	40.84	10.54	15.11	10.10	5.45	12.95	1.44	0.53	1.52	0.95	0.57	100.0
2008	41.43	10.52	13.22	10.90	5.53	13.17	1.32	0.49	1.72	1.06	0.65	100.0
2009	41.20	10.84	13.12	10.62	6.01	13.30	1.34	0.42	1.58	1.11	0.47	100.0
2011	43.24	10.64	14.91	8.27	6.13	12.46	1.23	0.25	1.07	1.19	0.59	100.0
2012	42.55	10.16	14.80	9.21	6.47	11.89	1.19	0.26	1.27	1.33	0.87	100.0
2013	42.71	10.41	14.28	9.57	6.63	12.10	1.14	0.24	1.13	1.30	0.48	100.0
2014	42.11	10.37	14.68	9.28	6.57	12.00	1.32	0.36	1.19	1.42	0.70	100.0
2015	41.16	11.09	14.61	8.41	7.16	12.98	1.22	0.37	1.08	1.43	0.50	100.0

Source: Own elaboration based on IBGE - individual data from PNADs from 2004 to 2015. Note: 1: Private Sector Employee; 2: Military or Public Servant; 3: Own Account; 4: Employers; 5: Retired (≤ 1 MW); 6: Retired (>1 MW); 7: Other pensions; 8: Donations; 9: Rental; 10: Gov. transfers; 11: Interest, dividends.

Also, according to Tables 1 and 2, it is observed that the importance of portion 2 (Military and Public Servant) is greater in the Legal Amazon. In 2015, the share of this portion in the total income was 14.7% in the Legal Amazon and 11.1% in Brazil (without the Legal Amazon). It is evident that the public sector has an important role in the formation of the HIPC in the Legal Amazon. The importance of the public sector in the regional economy can also be analyzed considering the number of persons employed according to their position in the occupation. According to IBGE data (2020), in 2015, in Brazil (without the Legal Amazon), the military and statutory civil servants represented 7.5% of the total employed persons aged 10 or over, while in the Legal Amazon it was 9.3%.

It must be considered that the Legal Amazon is formed by new States, some just

over 30 years old, such as Amapa, Roraima and Tocantins, which were elevated from National Territory to State by the 1988 Constitution. Thus, it was necessary to form local governments and install public power. This situation is similar to the States of Rondônia and Acre, which were upgraded from National Territory to States in 1981 and 1962, respectively. The role of the public sector for the formation of income in these States is fundamental. While, according to IBGE (2014), the economic activity comprising Administration, Health and Public Education and Social Security in Brazil was 16.6%, in 2012. States like Roraima, Amapa and Acre had participation of 50.7%, 47.3% and 36.2%, respectively, in the gross added value at basic prices.

Portion 3 (income from own accounts) participated with 19.2% in the formation of the HIPC of the Legal Amazon, in 2015. The value found for the rest of Brazil was 14.6%. According to PNAD data, in 2015, 29.2% of workers residing in Amazonian States were “Own Account”, while for the rest of Brazil, this percentage was 22.3%. For those who were employers, Legal Amazon had a smaller share (2.6%) compared to the rest of the country.

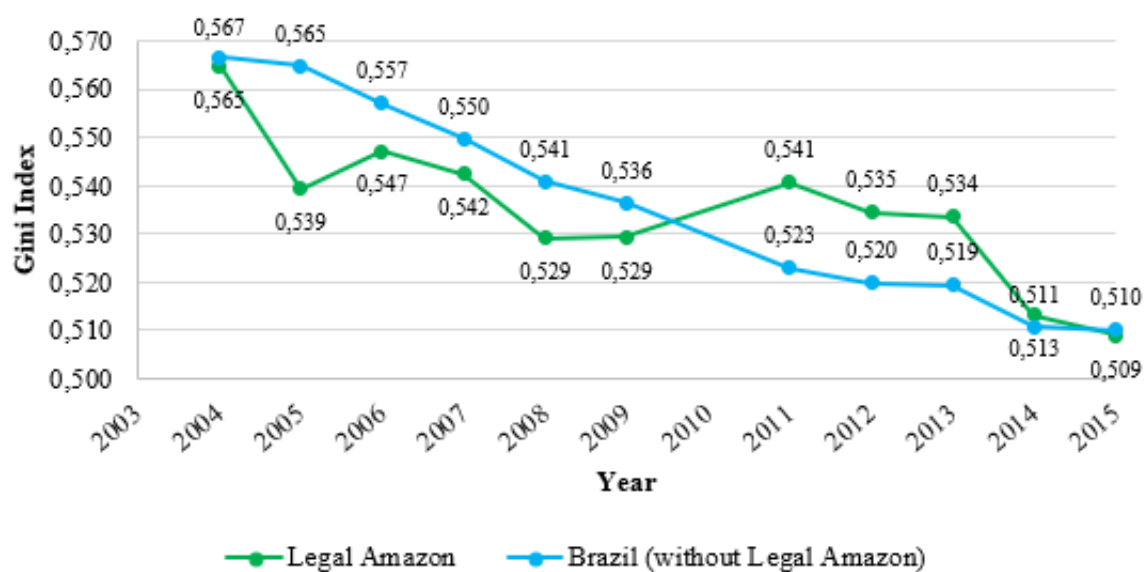
Still based on the 2015 PNAD data, it is possible to make some observations about the variation in the degree of informality of occupations. Comparing the Legal Amazon with the rest of Brazil. The first had, in 2015, 57.5% of its population employed as employees and domestic workers with 23.4% without a formal contract. For the rest of Brazil, the percentage was 67.8% and 18.2%, respectively, showing the condition of greater informality in the labor market in the Legal Amazon. Portions 8, 9, 10 and 11 have little participation in the formation of the HIPC. However, the penultimate one deserves attention. Portion 10 (government transfers), in 2004, participated with 1.31% of the total income of the Legal Amazon and in 2015 it went to 3.56%, while in the rest of Brazil this participation went from 0.85%, in 2004, to 1.43% in 2015.

4.2 Calculation of the Gini Index and its static decomposition by the concentration ratio and the degree of progressivity of the HIPC portions in the Legal Amazon and Brazil (without Legal Amazon)

Figure 2 shows the results found for the Gini index for the Legal Amazon and for Brazil (without Legal Amazon) from 2004 to 2015. It is noticeable the drop in the index for both, however, it is noteworthy that the income inequality in the Legal Amazon resisted the fall more compared to the rest of the country. For the years 2005 to 2013, for the Legal Amazon, the Gini index remained practically the same. However, the variation presented by the extreme years of the study shows that the fall was very close to that which occurred in the rest of the country.

In the previous subtopic (4.1), the participation of each parcel in the formation of the HIPC was presented. However, determining which of them contributed to increasing or decreasing the concentration of the HIPC is the objective of this and the next. To do so, in this topic, the static decomposition of the Gini index was calculated by

Figure 2. Gini Index of the Legal Amazon and Brazil (without Legal Amazon), from 2004 to 2015.



Source: Own elaboration based on IBGE - individual data from PNADs from 2004 to 2015.

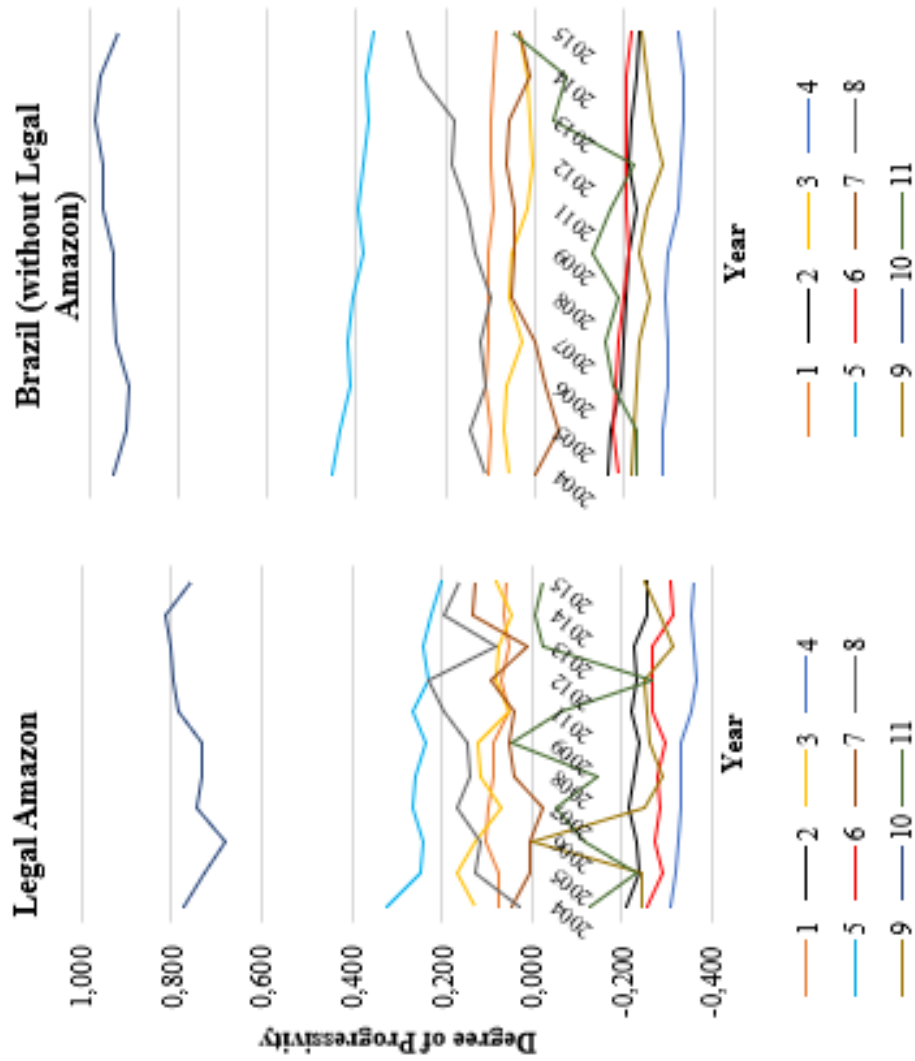
the concentration ratio and the Lerman-Yitzhaki degree of progressivity for each HIPC portion. Recalling that the positive values are the Degree of Positive Progressivity (it contributes, in a static way, to the reduction of inequality: these are progressive portions) and the values with negative sign are the Degree of Negative Progressivity (it contributes, in a static way, for increasing inequality: these are regressive portions), as shown in Figure 3 (Legal Amazon and Brazil without Legal Amazon).

Through Figure 3, the condition of regressivity of portions 2, 4, 6, 9 and 11 for the Legal Amazon and for Brazil (without Legal Amazon) is clear, evidenced by the degree of negative progressivity of these portions. The sum of these four parcels corresponds to 29.7% and 34.0% of the HIPC, in 2015, for the Legal Amazon and for Brazil (without Legal Amazon), respectively.

Among the portions with a negative degree of progressivity, portion 2 (income of military and civil servants) of the Legal Amazon deserves mention. Even though, in absolute terms, it was not the one that had the highest value, it was the one that had the largest participation in the formation of the HIPC (14.7%, in 2015) compared to Brazil (without the Legal Amazon). Consequently, its degree of progressivity has a greater influence on the composition of the index. It can also be seen that the share of this portion increased in the Legal Amazon and that the same did not occur in the rest of the country. Daré and Hoffmann (2012) has already pointed out the high regressiveness of the portion formed by the income of military and statutory civil servants for Brazil, giving an important role for this portion in explaining the variations in inequality in the HIPC.

Among the portions with a positive degree of progressivity, for the Legal Amazon,

Figure 3. Degree of Progressivity by Decomposition of the Gini Index of the Legal Amazon and Brazil's (without Legal Amazon) HIPC, from 2004 to 2015.



1: Private Sector Employee; 2: Military or Public Servant; 3: Own Account; 4: Employers; 5: Retired (\leq 1 MW); 6: Retired (>1 MW); 7: Other pensions; 8: Donations; 9: Rental; 10: Gov. transfers; 11: Interest, dividends. See Annex.

Source: Own elaboration based on IBGE - individual data from PNADs from 2004 to 2015.

are portions 1, 3, 5, 7, 8, and 10, which together accounted for 70.3% of the HIPC in 2015. However, it was portion 1, from the income of private sector workers, that contributed most to the formation of income (36.2%), giving it an important role in reducing the inequality index of HIPC distribution.

The share of income of employees in the private sector to reduce income concentration has already been addressed by Hoffmann (2011), where the author found the significant importance of this share of income to reduce inequality in Brazil's HIPC. However, for the Legal Amazon, although this source of income has had a positive degree of progressivity, it can be seen from Figure 3 that it was less intense than in Brazil (without the Legal Amazon), in addition to dropping in 2004 (0.076) for 2015 (0.057).

Of all portions, 10 showed the greatest positive progressivity. The high progressivity of government income transfer programs, especially *Bolsa Família*, may be responsible for the high values found. As the Legal Amazon is relatively poor than Brazil as a whole, without the Legal Amazon, income transfer programs have a greater influence on the degree of inequality because there are a greater number of people living in poverty in the Amazonian States than in the rest of the country.

4.3 Static Decomposition by variation of the Gini Index: composition effect and concentration effect for the Legal Amazon and for Brazil (without Legal Amazon), from 2004 to 2015

Although the Legal Amazon has fluctuated in the Gini index of the HIPC from 2004 to 2015, when the extremes of the period are evaluated, it is clear that there was a fall of 0.046. Such negative variation can be associated with both the composition effect and the concentration effect of each portion of the HIPC, with the first referring to variations in the share of the portion in the HIPC, while the second refers to variations in the concentration ratio of each portion.

Table 3 shows the results for the composition effect and concentration effect of the decomposition of the Gini index variation of the Legal Amazon (-0.057) and Brazil (without the Legal Amazon) (-0.046). When analyzing the results for the Legal Amazon, attention is drawn to the small contribution of the income of private sector employees to the reduction of the Gini index from 2004 to 2015. Portion 1, for the Legal Amazon, accounted for only 10.63%. However, portion 4, from employers' income, which for Brazil (without the Legal Amazon) was responsible for 18.98% of the fall, in the Legal Amazon contributed 28.43% of the reduction in the Gini index.

Still in relation to the Legal Amazon, although there were differences between income from work in terms of their contribution to the drop in the index, if all of them are added up (portions 1, 2, 3 and 4) they represented 37.53% of the fall. This percentage was not higher only because the contribution of portion 2, from the income of civil servants, was negative (-15.64%), which demonstrates a considerable contribu-

tion of this portion to the increase of income inequality in the Legal Amazon. Portion 10 was the one that most contributed to the variation in inequality in the HIPC, since it contributed with 36.72% of its reduction, with 36.06% of the composition effect and 0.65% of the concentration effect.

In Brazil, public sector employees tend to have higher incomes than those in the private sector, showing that the government contributes to modifying inequalities. Here are some possible explanations for this disparity based on Souza and Medeiros (2013): in the public sector, on average, workers have higher qualifications and education; labor market rules in the public sector are generally different from those in the private sector (e.g., greater job stability, own pension system, differences in productivity control); civil servants may have greater union organization and power over wage increases than other categories in the private sector, as they generally have a single large employer (city, State, or the federal government); not only administrators but public sector employees are political agents, and for that reason, they are subject to political objectives, in which salary policies focus, for example, on elections (the objective of a firm, in general, is to maximize profits and reduce costs); there can be very different careers with relatively homogeneous salaries, and a small portion of civil servants who are among the richest. These results are consistent with the studies presented in section 2.

For Brazil (without Legal Amazon), among the portions from work, it is clear that portion 1 (private sector employees) was largely responsible for the drop in the Gini index from 2004 to 2015, with a total effect of 32.92%, with the concentration effect alone accounting for 31.19% of the fall.

Hoffmann and Ney (2008) and Hoffmann (2010) also reached substantial values for the decrease in the concentration of the HIPC resulting from the share of the work of private sector employees. In the first study, the authors, analyzing for 2001-2006, found that this portion participated in the 46.3% decrease in inequality in the HIPC. In the second, the author, making an analysis for 2001-2007, found participation of portion 1, for the reduction of the Gini index of the HIPC, of 44.7%.

Retirements and pensions also deserve attention due to their considerable participation in the reduction of the Gini index of the HIPC for Brazil (without Legal Amazon). By joining the three portions from this source of income (portions: 5, 6 and 7) it appears that they were responsible for 26.97% of the drop in the index. It is interesting to note that, although in the two extreme years (2004 and 2015), the ratio of concentration of official pensions above 1 minimum wage has been higher than the value of the Gini index and, consequently, it is a portion with a degree of negative progressiveness of the HIPC, it was responsible for 9.55% in the fall of the index. A similar result was also found by Hoffmann (2010) when analyzing the period between 2001 and 2007. According to the author,

It is important not to confuse the progressive or regressive nature of a portion of

Table 3. Decomposition of the Gini index variation in the distribution of HIPC of the Legal Amazon (-0.057) and Brazil (without the Legal Amazon) (-0.046) from 2004 to 2015.

HIPC portions	Legal Amazon			Brazil (without Legal Amazon)		
	Composition Effect (%)	Concentration Effect (%)	Total Effect (%)	Composition Effect (%)	Concentration Effect (%)	Total Effect (%)
1- Private Sector Employees	1.48	9.15	10.63	1.74	31.19	32.92
2- Military or Public Servant	-11.17	-4.46	-15.64	-4.46	-1.24	-5.70
3- Own Account	-9.59	23.70	14.11	-0.22	6.86	6.64
4- Employers	30.18	-1.74	28.43	15.34	3.64	18.98
5- Retirement (up to 1 MW)	16.79	-4.35	12.45	19.24	-3.96	15.29
6- Retirement (over 1 MW)	-1.36	3.42	2.06	3.68	5.88	9.55
7- Others pensions	-0.16	3.27	3.11	-0.08	2.22	2.13
8- Donations	-2.75	6.18	3.43	-1.07	2.03	0.96
9- Rental	1.35	1.29	2.65	2.77	0.87	3.65
10- Government transfers	36.06	0.65	36.72	10.62	1.03	11.65
11- Interest, dividends	0.04	2.00	2.04	0.35	3.58	3.93
Total	60.88	39.12	100.0	47.90	52.10	100.0

Source: Own elaboration based on IBGE - individual data from PNADs from 2004 to 2015.

the income with the sign of its contribution to the change in the value of the Gini index in a given period. Both regressive and progressive portions can undergo changes that contribute to increasing or reducing inequality. (Hoffmann, 2010, p. 227-228).

According to the results of Table 3, in the Legal Amazon, the share of income of civil servants and the military proved to be relevant for inequality, both for the composition effect and for the concentration effect: both were negative for the period from 2004 to 2015, when there was a drop in the Gini index. In general, increases in the real salary of the civil service tend to increase inequality, with distinct effects on regional inequalities.

Portion 10, which includes government transfers, contributed 11.65% to the reduction of inequality in the HIPC. Considering that the participation of this portion was only 0.87% in 2004 and 1.52% in 2015, its relevance for the reduction of inequality in the distribution of the HIPC in Brazil must be considered.

5. Conclusion

This research sought to evaluate the behavior of HIPC distribution in the group of Amazonian States (Legal Amazon) from 2004 to 2015. For this, the static and dynamic decomposition of the Gini index was performed. The Gini index of the Legal Amazon's HIPC showed a different behavior than the index for the rest of Brazil. While Brazil (without the Legal Amazon) had a systematic decline, the one in the Legal Amazon, even though it decreased when comparing 2004 and 2015, presented considerable fluctuations.

Regarding the participation of the portions for the formation of HIPC, it was evident that they contributed differently to the income of the group of Amazonian States in comparison with those of the rest of Brazil. The share of compensation for private sector employees (portion 1) was clearly the largest. However, the remuneration of military personnel and civil servants (portion 2) stood out for having a relevant role in the formation of HIPC of the Legal Amazon, where it participated with 14.7% of the income, in 2015, against 11.1% for the rest of the country.

Still in relation to the participation of the parcels for the formation of the HIPC, the income of "own account" (portion 3) also stood out in the Legal Amazon, for having had a participation above that had in the rest of the country. However, the portion that drew the most attention was that formed by "government transfers" (portion 10), as it showed a significant increase in its participation in the formation of the HIPC from 2004 to 2015 in the Legal Amazon, which went from 1.31% to 3.56%, while in Brazil (without the Legal Amazon) this participation went from 0.85% to 1.43%.

Of the portions that form the HIPC, the one formed by the income of military and civil servants (portion 2) stood out among those that had a negative degree of progressivity. Its regressiveness was more evident in the Legal Amazon than in Brazil

(without the Legal Amazon), which gives this portion a considerable role in increasing HIPC inequality.

Among the portions that showed a degree of positive progressivity in the Legal Amazon, the portion from “government transfers” (portion 10) stood out. It was, throughout the period, in the Legal Amazon and in Brazil (without Legal Amazon), the portion with the highest degree of positive progressivity. Undoubtedly, the high progressivity of government cash transfer programs has made them responsible for the values obtained.

The decomposition of the variation in the inequality indexes of the Legal Amazon's HIPC showed interesting values. According to the Gini index, the share of income from private sector employees (portion 1) in Brazil (without the Legal Amazon) was responsible for 32.92% of the drop in the index, and for the Legal Amazon was responsible for only 10.63%. However, the portion from employers' compensation (portion 4) for the Legal Amazon accounted for 28.43% of the fall, while for Brazil (without the Legal Amazon) it accounted for 18.98%.

Analyzing the dynamic decomposition of the Gini index, the HIPC portion formed by the income of military and civil servants (portion 2) drew attention in the Legal Amazon, as it contributed to preventing the index from falling further, since its participation in the index variation was negative (-15.64%). On the other hand, the portion of the HIPC formed by “government transfers” (portion 10) was the one that most contributed to reducing the index, being responsible for 36.72% of the variation in the index. Much of this is due to the composition effect, with 36.1%, which is directly related to the increased participation of this source of income in the HIPC.

In this paper, we focus on the contribution of eleven portions of the HIPC to inequality in the Legal Amazon. Undoubtedly, behind the generation of these incomes there is a precarious transport infrastructure that increases the prices of food and other essential goods and services with impacts on the population's cost of living; low levels of sanitation services that reflect in diseases that prevent people from fully exercising their occupations and raise the costs of treating diseases; the dynamism of strategic sectors linked to extractivism and agriculture, which can improve the income level of the rural population, but it should be remembered that a large part of the population is concentrated in the largest cities, linked to industrial and service activities. It seems clear that the quality of political and administrative institutions must contribute significantly to regional development, carrying out an assessment of impacts on biodiversity, migration control, and preservation of indigenous people.

As a limitation of this study, it can be verified to what extent internal migration can affect the income disparity between migrants and non-migrants and their degree of progressivity in income inequality in the Legal Amazon based on the Census carried out by the IBGE. de Lima et al. (2019), for example, show another approach that can influence income inequality in the North of Brazil, where 19.3% of the total

population was migrants in 2010, of which about 45% were from the Northeast: the hypothesis it was that migrants tend, on average, to be more economically apt than non-migrants with similar socio-economic characteristics, and therefore tend to earn higher wages; this hypothesis has not been fully validated. On the other hand, Silva and Bacha (2014) explain that, although migrants are looking for higher wages, in urban areas the cost of living is higher, and this increases population density and the price of housing, food, etc., decreasing this advantage over time. One should also not forget about international migratory flows, such as what happened with the crisis in Venezuela, which tend to aggravate social problems in the border region.

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