UNITED NATIONS UNIVERSITY
UNU-WIDER

WIDER Working Paper 2018/157

Earnings inequality in the Brazilian formal sector

The role of firms, education, and top incomes 1994–2015

Marcelo Neri,[1] Cecilia Machado,[2] and Valdemar Pinho Neto[2]

December 2018

Abstract: This paper documents the evolution and the determinants of earnings inequality in the Brazilian formal sector from 1994 to 2015, using establishment level data. In 2015, schooling explained 33 per cent of overall inequality. Firm-specific effects explain 65 per cent of total inequality level and 76 per cent of the inequality fall observed. The downward inequality trend parallels the one seen in household surveys. However, the distributive decompression goes only until the 90th percentile, which is in line with Personal Income Tax based evidence. The share of inequality explained by top 1 per cent and 0.1 per cent incomes rose 43 per cent and 91 per cent, respectively.

Keywords: earnings inequality, linked employer-employee data, firm and worker heterogeneity, Brazilian inequality, entropy indexes; firms fixed effects

JEL classification: J31, I24

Acknowledgements: This paper was fully supported by FGV Social and *Rede de Pesquisa e Conhecimento Aplicado* (RPCAP) from Getulio Vargas Foundation (FGV). We thank comments given at conferences held in Helsinki and Natal. The paper will be presented at the National Meeting of Brazilian Economists (ANPEC) in Rio de Janeiro, 2018.

All figures and tables are located at the end of the paper.

---

[1] Getulio Vargas Foundation (FGV) - FGV Social and FGV EPGE (*Escola de Pós-Graduação em Economia*), Rio de Janeiro, Brazil, corresponding author: Marcelo.Neri@fgv.br; [2] FGV EPGE, Rio de Janeiro, Brazil.

This study has been prepared within the UNU-WIDER project on 'Inequality in the Giants'.

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9256-599-2 https://doi.org/10.35188/UNU-WIDER/2018/599-2

Typescript prepared by Ans Vehmaaanperä.

The United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland, Sweden, and the United Kingdom as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

The vast majority of the empirical literature in developing countries on income distribution is based on household surveys. Brazil established this tradition during the early 1970s just after the second set of the Demographic Census income data was released (Fishlow 1972; Langoni 1973; Bacha and Taylor 1978). Recently, a series of papers have documented inequality based on Personal Income Tax (PIT) records (Medeiros et al. 2015a; Souza 2016; Medeiros et al. 2015b). However, establishment-level administrative records are also available in Brazil, but those have rarely been used in studies of income inequality. RAIS (*Registro Anual de Informações Sociais*) is a matched employer-employee dataset at the Brazilian Labour Ministry that has gathered around 30 million observations on workers per year over the last two decades. RAIS depicts formal employment dynamics and wage differentials and is a powerful tool that may complement the evidence presented by other data sources (Alvarez et al. 2017; Machado et al. 2017).

This paper describes the evolution and the main determinants of earnings inequality in the Brazilian formal sector from 1994 to 2015 using RAIS. First, we plot growth incidence curves and Lorenz curves over the period of analysis, and calculate the main inequality indexes used in the literature such as earnings ratios across different percentiles in the individual earnings distribution, the Gini index and the Theil indexes. We discuss the role of wages, employment, and missing values among other measurement issues. We also compare these results using RAIS with broader household surveys. Second, we use the standard inequality decompositions-based information theory to understand the main determinants of formal earnings dispersion. This includes workers' characteristics (such as gender, race, age, education, and spatial location) and firms' characteristics (sector of activity, firm size, legal nature, etc.). Besides applying between and within groups decomposition for Theil T and Theil L indexes (Theil 1967), we use J-Divergence measures to disentangle the role played by specific categories of different variables (Jeffreys 1946; Rohde 2016; Hecksher et al. 2017).

We find an overall fall in inequality after 1994. Moreover, schooling was responsible for explaining 30.8 per cent of labour income inequality in 2015 and 25 per cent in 1994, considering the Theil-T index. The explanatory power of firm-specifics was around 65 per cent for the entire series analysed (1994–2015), suggesting that differences between firms explain the largest share of inequality in the Brazilian formal labour market. These results agree with Alvarez et al. (2017), who found that firms played an important role in explaining inequality levels and also the decrease in earnings inequality in Brazil. It is important to note that the between-firm component also seems to drive the overall inequality in developed countries such as the USA (Song et al. 2015) and Germany (Card et al. 2015).

While changes in earnings distribution in the formal sector share some of the trends observed in household surveys, in particular, a marked fall in inequality between 2001 and 2014, the monotonic decrease of earnings growth goes only until the 90 percentile. Above this point the trend is reverted, which is in line with evidence based on Personal Income Tax data. J-Divergence shows that the share of inequality explained by the top 1 per cent and 0.1 per cent rose since 1995 by 43.1 per cent and 90.1 per cent, respectively. Similarly, the share of inequality explained by university graduates rose 37.4 per cent in the same period.

The paper is organized into eight sections as follows. Section 2 discusses the main aspects of the dataset used in this paper, in comparison to other distributive studies. Section 3 defines the indicators applied in the analysis. Section 4 provides the details about the data construction process. Section 5 discusses measurement issues on income distribution (such as earnings vs.

hourly earnings, missing values, null values and the role of employment on earnings inequality), calculates the standard inequality indexes, and plots growth incidence curves and the Lorenz curve. Section 6 applies information theory-based decompositions between and within groups. Section 7 disentangles the effects of specific top income and education groups into inequality changes exploring J-Divergence index properties. The last section concludes.

2 Background of RAIS based distributive studies

Most of the analyses on Brazilian income distribution is based on household surveys, in particular the *Pesquisa Nacional de Amostras a Domicílio* (PNAD – IBGE), the main Brazilian National Household Survey. However, RAIS has some advantages. First, it allows combining formal workers and firms' information to understand wage inequality determinants. In particular, the incorporation of individual firms' fixed effects explains the bulk of earnings distribution levels and changes (Alvarez et al. 2017). Second, it is the only nationwide data source available with long spells of panel data. This longitudinal aspect allows studying the mobility of workers across sectors and individual firms as well as the life-cycle profile of these characteristics (Machado et al. 2017). Third, RAIS also offers the possibility of analysing short-run employment and wage dynamics because it contains information on a monthly basis – used in Brazil - that allows aggregation to higher time-measurement periods - like a year used in most countries[1]. This may facilitate international data comparisons since the measurement unit varies across countries. Fourth, RAIS provides a unique perspective on certain policy-related issues. The evaluation of legal employment quotas for People With Disabilities (PWD) and for the youth, that require certain shares of firms employment allocated for these groups, is only possible using the establishment as the unit of information and analysis (Neri et al. 2003). RAIS also allows to measure how binding minimum wages are at the bottom of formal employment earnings distribution (Engbom and Moser 2017). Finally, RAIS, unlike other data sources, does not have top coding which permits to measure wages at the very upper tail of earnings distribution. Nevertheless, RAIS does not include the informal sector, which is very large in Brazil and mostly misses wages at the lower end of the distribution. Employers and top earners that constitute a juridical person for tax purposes are also not in RAIS. With these caveats in mind, we note RAIS has been rarely employed in studies of the Brazilian income inequality until recent years.

Our calculations over PNAD in Figure 1 show a fall of the Gini of *per capita* income, the most widely used measure, since 1993. However, the bulk of inequality reduction happened between 2001 and 2014. A similar pattern emerges in the concentration index of individual labour income in RAIS (see Figure 2). A second point to notice in the graph is that the fall of *per capita* income from all sources Gini index in the 2001 to 2014 period is more pronounced than the corresponding fall of individual labour concentration index. One possible explanation is that the fall of correlation between schooling of heads and spouse from 0.73 to 0.61 between 2001 and 2015 reinforces the *per capita* income but not that of individual labour earnings. Another possibility is that the expansion of other income sources such as social security benefits and conditional cash transfers is behind this difference (Barros et al. 2006; Kakwani et al. 2010).

[1] A small exercise for Great Rio in 2015 shows that Gini of monthly earnings are 30 per cent higher than those for annual earnings. This includes both sources of variability changes of employment and of real wages within the 12-month period.

3 Inequality analysis

We briefly describe the inequality measures and decomposition we perform in the paper. Readers familiar with them can skip this section without prejudice. Further details are in the Appendix.

3.1 Inequality indexes

Gini Index

The Gini is an inequality index, corresponding to the ratio between the mean absolute deviations of the incomes of all the people in the sample and twice the mean income. N is the population size. Once there are $\frac{N\,(N-1)}{2}$ distinct pairs of people in the sample, Gini's formula is:

$$Gini = \frac{1}{\mu N(N-1)} \sum_{i>j}^{N} \sum_{j}^{N} |x_i - x_j|$$

where x_i ,x_j is individual earnings for two generic and distintic individuals i and j while μ is overall mean income. This formula yields the polar cases:

Perfect Equality: when all individuals have the same income, $x_i = \mu \forall i$, the sum above is equal to zero and Gini is also equal to zero.

Perfect Inequality: when one individual has all the wealth ($N\mu$), we have $N-1$ pairs with absolute deviations equal to $N\mu$, while the rest of the pairs have null deviations. Therefore, Gini is equal to one.

The fact that the Gini index ranges from 0 to 1 makes its interpretation simpler. The direct calculation of the Gini Index from the Lorenz Curve is another explanation for its popularity. However, since the Gini Index is not decomposable, we complement the analysis by using the Theil Indexes.

Theil Indexes

(Theil 1967; Bourguignon 1979; Shorrocks 1980; Foster 1983; Ramos 1993)

The Theil-T index is defined by the following formula:

$$T = \sum_{i=1}^{n} \frac{x_i}{N\mu} \log \frac{x_i}{\mu}$$

The second Theil measure of inequality is Theil-L index, defined by the following formula:

$$L = \sum_{i=1}^{n} \frac{1}{N} \log \frac{\mu}{x_i}$$

while in Theil T the inequality factors of weighting within the groups are the share of retained income, in Theil L the inequality factors of weighting within the groups are their respective share of population.

J-Divergence

J-divergence equals to the sum between two Theil inequality measures $(\mathrm{T}+\mathrm{L})$:

$$\mathrm{J}=\frac{1}{\mathrm{N}}\sum_{\mathrm{i}=1}^{\mathrm{N}}\frac{\mathrm{x_i}-\mu}{\mu}\log\left(\frac{\mathrm{x_i}}{\mu}\right)$$

This is another measure based on information theory that relates shares in population with shares in income and evaluates the level of dissonance between both distributions. While the Theil-T departs from population shares and calculates the information dissonance with income shares distribution, the Theil-L runs in the opposite direction from income to population shares. The J-Divergence takes a more neutral position taking the sum of both directions. This measure is known with different names such as *symmetric Kullback-Leibler divergence*, *symmetric relative entropy*, *symmetric Theil measure* or *J-divergence*, in honour of Jeffreys (1946) seminal article. Given this symmetry and other decomposition properties - described next - we choose to express most of our results in terms of the J-Divergence.

The Dual of Theil-T[2]

The dual concept allows comparisons between different inequality measures. Keeping the scale from 0 to 1. And allowing a direct analysis of the introduction of a new proportion of null values in the original income inequality measure. In the case of the Theil-T it can be shown that:

$$T2=T1-\ln(1-\phi)$$

where $T1$ and $T2$ are initial and final values of the Theil-T index before and after adding a ϕ proportion of new null values. Since the Theil-L and the J-Divergence do not admit null values, they also do not admit a Dual measure.

3.2 Within and between groups decompositions

This framework attempts to identify the main structural determinants of inequality. We explore a step further quantifying the close causes of its evolution by performing a standard inequality decomposition exercise among k-groups of a given characteristic such as education, for example:

Theil-T, Theil-L and J-Divergence indexes decompositions[3]

$$T=T_e+\sum_{h=1}^{K}Y_hT_h$$

where πh is the proportion od group h in the total population. $T_e=\sum_{h=1}^{k}Y_h\log\frac{Y_h}{\pi_h}$ is the Theil-T between groups and $\sum_{h=1}^{K}Y_hT_h$ is the income weighted average of intra-groups Theils.

[2] See Appendix for a step by step deduction of this dual concept.

[3] See Appendix for a step by step derivation of this decomposition.

The first term of the expression above corresponds to the 'between groups' component $T_e = \sum_{h=1}^{k} Y_h \log \frac{Y_h}{\pi_h}$ while the second term $\sum_{h=1}^{K} Y_h T_h$ corresponds to the income weighted 'within groups' component. We will address these components for subgroups arbitrarily defined according to workers' characteristics (gender, race, age, schooling and region) and firms' characteristics (sector of activity, legal nature of the firm, firm size and firm specific effect). Te / T is the gross contribution of a certain characteristic to inequality measured by the Theil-T. The Theil-L index can be decomposed in a similar fashion.

$$\mathrm{L} = \mathrm{Le} + \sum_{\mathrm{h}=1}^{\mathrm{k}} \pi h \, \mathrm{L}h$$

Hence, J-Divergence that is the sum of Theil-T and Theil-L can be written as:

$$\mathrm{J} = \mathrm{T}e + \mathrm{L}e + \sum_{\mathrm{h}=1}^{k} \mathrm{Y}h \, \mathrm{T}h + \sum_{\mathrm{h}=1}^{k} \pi h \, \mathrm{L}h$$

In the decomposition formulas for the three information theory-based inequality indicators presented above, each group has between and within components. Meaning there are differences between income and population shares for each group and also differences within these groups. The standard decomposition analysis relies on the sum of all between-groups distribution dissonance terms to evaluate their relative contribution to total inequality.

3.3 J-Divergence specific groups decomposition

Besides allowing the usual decomposition between and within groups, the J-Divergence measure yields a non-negative contribution of each individual, or specific groups of individuals in total inequality[4]. Why do we care about specific groups and not only variables? Because, for example, we would like to see how much top 1 per cent incomes, or people with completed higher education contribute to overall inequality measures. Or in the limit we would like to know how much a single person - say the richest person alive - explains overall inequality. This contribution considers each particular group between and within components.

To be sure, departing from the last formula above, instead of summing all groups between components as in the traditional gross contribution analysis, we choose a specific group among k groups and compute its respective particular overall inequality impact picking both between and within respective components. As opposed to other measures derived from information theory such as Theil-T and Theil-L, individual groups contribution to this measure is always greater or equal to zero. This property makes total inequality equal to the simple sum of non-negative individual divergences. This tool allows to go beyond impact of characteristics, and assess the direct impact of specific groups of this characteristic in total inequality.

[4] See also Rohde 2016; Hecksher et al. 2017, and the Appendix.

Overall, we will develop most of the analysis in terms of the J-Divergence measure given its enhanced additive decomposability properties[5]. When we assess the impact of specific groups, such as individuals with higher education or in the top percentile, we take advantage of the J-Divergence additive groups criteria. We will also use J-Divergence in the usual between and within groups' decomposition. In these cases, we also present in the tables the other two Theil indicators to allow visualizing the construction of the J-Divergence measure and to test the robustness of the results found using more widespread measures. We will assess the contribution of different characteristics and groups in 2015 and to the change observed between 1994 and 2015.

4 Data

This research uses RAIS (*Relação Anual de Informações Sociais*), a matched employer-employee dataset provided by the Brazilian Ministry of Labour. It constructs a data set covering the universe of the formal labour market in Brazil through restricted-access administrative records with an average of 33 million observations per year from 1994 to 2015.

In Brazil, firms are required to report all the workers formally employed at some point in the previous calendar year and each worker is identified by a unique number (PIS, *Programa de Integração Social*), which allows us to follow the employees over time and across firms. Firms also have a unique identifier (CNPJ, *Cadastro Nacional de Pessoa Jurídica*). Thus, our dataset allows us to track workers and firms over time. RAIS contains a set of variables on both firms' and employees' characteristics as well as about the characteristics of the employment contract. Precisely, the information in the dataset includes firm-related variables (sector of activity, size, state, etc.), worker-related variables (gender, age, schooling, etc.) and job-related variables (earnings, occupation, weekly hours of work, etc.).

In this paper, we restrict the analyses at those employment contracts that were active on December 31. In case of more than one employment, we select the job with the higher salary (in minimum wages). We calculate the real earnings in December 2015 by multiplying the variable '*wage in December (in minimum wages)*' and the value of the minimum wage in each year, and using the INPC (*Índice Nacional de Preços ao Consumidor*) as the deflator. This data is available since the beginning of the series.[6]

4.1 Wage measurement

We chose the start year 1994 for our data because it is the earliest in which we have information about all the variables that will be used in the analysis. Also, it is the period after the stabilization of inflation in Brazil, which would introduce extra measurement error in the analysis. On the other hand, 2015 is the most recent year for which we have access to the RAIS data set.

Before 1999, earnings in RAIS were only expressed using Minimum Wages as a numeraire. After that, one may opt between this and nominal earnings expressed in Brazilian Reals. Figure 3

[5] Except when we want to incorporate zeros we use the dual concept of the Theil-T since it does not exist for the Theil-L and J-Divergence measures. Another advantage of the dual is to keep the domain of the indicator in the 0 to 1 interval.

[6] If we were to use earnings data expressed in Brazilian Reals (R$) the series would start in 1999.

presents inequality measures for 2015 using these two income unit possibilities. The two are very similar, which suggests that conclusions are not affected by the concept used.

4.2 Missing values

The individual earnings data present 3.04 per cent of reported zeros, which is not allowed according to Brazilian Minimum Wage legislation. We treat these zeros as missing values. The share of zeros falls from 4.83 per cent in 1994 to 3.7 per cent in 2015 (See Figure 4). Nonetheless, we show that the Theil-T inequality measure that incorporates the zeros (through the dual concept explained in the previous section) remains very similar.

4.3 Hourly earnings

Another possibility is to express inequality in terms of hourly-earnings, instead of total earnings. One may argue that hourly-earning is more relevant than total earning. However, reported hours in RAIS correspond to contractual hours and assume mostly the same value for all observations within the same firm. In Figure 5, we calculate the Theil-T index using both measures. The 2015 inequality level measured with Theil-T rises 28.3 per cent with hourly-earnings (0.597/0.466), while the 1994 to 2015 inequality reduction rises almost 10 percentage points, from 17.1 per cent (0.099/0.565) to 27.1 per cent (0.222/0.819) when we use the latter concept. Between 2001 and 2014, a period of falling inequality, the difference between income concepts amounts to 4 percentage points. Most of the hourly-earnings inequality reduction happens just at the start of the series, but the trends in the two series are almost parallel, as Figure 5 shows.

5 Comparisons between inequality measures: levels and trends

5.1 Mean growth and inequality trends

Before assessing inequality of positive earnings distribution, it is worth addressing mean and dispersion of earnings growth together with formal employment growth (see Figure 6). Between 1994 and 2015, mean earnings grew 29.6 per cent in real terms while formal employment grew 107 per cent, amounting to a 165.2 per cent growth in terms of the total mass of formal wages earned. This means that of the total increase in formal earnings, three quarters are due to formal employment growth. If we subtract the total Brazilian population growth, 34.4 per cent according to the PNAD (National Household Survey), the cumulative growth of the earnings mass expressed on a *per capita* basis is 97.4 per cent.

An alternative way is to look at the share of formal employees relative to the whole population. In the 1994–2015 period, this share has increased 54 per cent, changing from 14.5 per cent to 22.3 per cent. Figure 7 and Table 1 present the evolution of standard inequality measures applied to strictly positive earnings according to RAIS in the 1994–2015 period, in which the Gini reduced from 0.547 to 0.472. This trend is also verified for the Theil-L and the Theil-T indexes, and hence the J-divergence. From 2001 onwards, especially until 2014, there is a clearer inequality downward trend and it may be advisable also to consider this period of analysis. For example, when we look at J-Divergence, all of the inequality fall observed from 1994 to 2001 happened in the first three years. Brazilian inflation fell sharply with the launch of the Real stabilization Plan occurred in mid-1994 but inflation was still falling in the 1994 to 1996 period. This may affect inequality assessment especially when we consider monthly earnings as it is the case in Brazil.

5.2 Growth incidence

Figure 8 plots cumulative growth curves across the 1994 to 2015 period, from the bottom vintile to the top 0.1 per cent, yielding growth in the bottom 5 per cent of 364.3 per cent falling monotonically as we approach the top decile when it reaches 12.27 per cent. Then there is a reversion of this trend growing monotonically as we approach the top 0.1 per cent where growth is 35.31 per cent. Zooming in, we separate the growth rates in the lower part from the top parts of the distribution. We note a reduction of inequality up to the top decile and an increase that goes from this point onwards to the very top end of the earnings distribution (see Figures 9 and 10). The two lowest vintiles in the formal sector are directly affected by the real minimum wage hikes which occurred in this period. The value of the minimum wage in 2015 was R$ 788, situated between earnings levels in the first two vintiles, R$ 544 and R$ 812, respectively.

5.3 Lorenz curves

We start with the most general representation of inequality provided by the Lorenz curve. Figure 11 presents the Lorenz curve in percentiles from 1995 to 2015 in evenly distributed five-year intervals. The curves moved inwards over the years suggesting a continuous earnings inequality reduction. In order to verify the occurrence of Lorenz dominance across these five-year periods, we plot the difference between these curves, as shown in Figure 12. The Lorenz curves for the pair of years 1995 and 2000 and also 2000 and 2005 crossed themselves in the upper percentiles, while the curves for the 2010 and 2015 interval had a slight cross in the bottom percentiles. Only the curves for 2005 and 2010 did not cross, suggesting a more general inequality reduction in this period. To evaluate the whole 20-year period, we compare the extremes 1995 and 2015 in Figure 13. The data shows that the Lorenz curve for 2015 is more equal than the 1995 one in almost all parts of the distribution, except for the very top percentile.

6 Inequality indexes and between-within decomposition of Theil

Tables 6 to 15 show the between-within decomposition, for the Theil-T, Theil-L and J-Divergence indexes, considering the following groups of individual characteristics one at a time: gender (female or male workers), schooling (less than high, high school or more than high school), age groups (workers less than 25 years of age, aged 25-35, aged 36-45 or older than 45), race (Indigenous, White, Black, Yellow, Mullato or Ignored) and region (North, Northeast, Southeast, South or Central-West). In general, the results indicate the predominant role played by the 'within' component in explaining the total inequality, for the entire historical series of 1994–2015. However, looking at the 'between' effect for the educational categories, we observe a relatively higher contribution of this attribute. For instance, in 1994, schooling explained 24.1 per cent (=0.262/1.086) of the total inequality measured by the J-Divergence index, while in 2015 this statistic reached 32.8 per cent (=0.273/0.832), see Tables 5 and 6.

We also applied the decomposition of the Theil indexes considering firms' characteristics, such as: size (0-4, 5-9, 10-19, 20-49, 50-99, 100-249, 250-499, 500-999 and more than 1000 employees), sector of activity (Agriculture, Cattle and Fishing; Manufacturing and Extractive; Construction and Infrastructure; Commerce, Food and Lodging; Transportation, Communications, Financial; Real Estate, Defense and Public Administration; Education, Health and Social Services; or Other Social Services, Domestic Services, International Organizations), legal nature of firm (Public; Private; Non Profit; Individuals; International) and specific fixed effects of firms.

Similar to what we found for several individual workers' characteristics above, the between-within decomposition for firms' characteristics shows a predominant power of the 'within' component in determining the total inequality. Nonetheless, when we look at a highly disaggregated level by considering a firm-fixed effect (i.e., each firm being a category itself), the results show a remarkable contribution of individual firms. For the 1994 to 2015 period, the contribution of firms' specific factors explained around 65 per cent of total inequality in each year considered. In 2015, the portion of the total inequality measured by the J-Divergence index explained by the between component reached 64.7 per cent (=0.538/0.83), see Tables 5 and 14.

Taken together, our findings suggest that, among several workers' characteristics, the differences in schooling between groups were a primary factor in explaining total inequality in the Brazilian formal labour market. However, the explanatory power of firm-fixed effects is even more pronounced, playing the major role in determining labour earnings inequality levels in the Brazilian formal labour market.

6.1 Changes

When one looks at the changes observed from 1994 to 2015, the explanatory power of individual firm-effects to explain the fall of inequality observed is 64.5 per cent (change of between groups 0.5381 – 0.7024 = -0.1643 over total inequality change -0.2547 per cent), as Table 5 shows. Its last columns are based on the results of Tables 6 to 15. Applying the same type of analysis across time to different characteristics, we have also found: education (-4.3 per cent), gender (2.55 per cent), age (8.8 per cent)[7], macro-region (1.96 per cent), sector of activity (9.92 per cent), nature of the firm (-2.61 per cent from 1995 to 2015)[8] and firm size (3.06 per cent). The specific firm-effect explains around three times more the 1994 to 2015's inequality fall than the joint gross contribution of all other characteristics considered.

The other striking result is the increasing impact of education on inequality in this period[9]. This earnings concentration effect disappears if one uses a more recent period of analysis. From 2001 onwards, there is a clearer inequality downward trend and it may be advisable to also consider this period. Education explained 33.3 per cent of the marked inequality fall observed, assuming the role of the second higher explanatory power to explain inequality change (Lam et al. 2015). Once again, specific firm effects explain 75.9 per cent of inequality fall occurred between 2001 and 2014. Table 5 also presents the contribution of other variables for the 2001–15 period.

7 The contribution of specific top incomes and educational groups

One key advantage of the J-Divergence is to go beyond the between/within groups dichotomy, allowing to evaluate the role of a specific group in overall inequality. To be sure, by characteristic we mean schooling, and by group we mean those with completed college education, for example. It includes the impact of education premiums paid to those with university degree, their respective

[7] Ferreira et al. (2014) emphasize the reduction of age earnings premium using PNAD surveys.

[8] Nature of the firm, that is if a firm is public, private, etc., contributed to a rise of inequality. Courseil et al (2011) show an increase of market concentration on larger firms using RAIS. Alvarez et al. (2017) show a growing detachment of earnings and productivity distributions in the manufacturing sector.

[9] If we use a finer schooling division with 9 categories, instead of 3 categories, the contribution of education would rise less than 3 percentage points in 2015 but the positive impact of education in the 1994 to 2015 period would be reverted. Measurement error on schooling might influence these results.

share in the population but also the level of inequality within groups[10]. Tables 16 to 24 present the results opened by all groups for all socio-demographic and firm-related characteristics explored in the paper.

As we have seen, the main variables that explain formal earnings inequality fall in Brazil during the 1994 to 2015 period are individual firms, schooling, and age. We focus initially here on the group with high school degree. This group explained by itself, in 2015, 48.7 per cent per cent of total inequality while in 1994 it amounted to 37.6 per cent (Figure 14 and Table 16). That is, there was a relative rise of this category relative impact on overall inequality of 29.5 per cent in this period.

Another application of this J-Divergence property explored here is assessing the role played by top income brackets (or individual income of a single person for that matter) in total inequality. According to RAIS (Figures 15 and 16 and Table 25 based on Table 24) between 1994 and 2015: i) the top 10 per cent rose their share in total inequality from 49.91 to 59.97 per cent, a 20.2 per cent rise; ii) the top 5 per cent rose their share in total inequality from 41.4 to 52.2 per cent, a 26.2 per cent rise; iii) the top 1 per cent's share rose from 19.28 to 27.57 per cent, a 43.1 per cent rise. iv) the top 0.1 per cent's share rose from 3.74 to 7.13 per cent, a 91 per cent rise. The concern with top income shares has been increasing around the World (Piketty 2014). The Brazilian case assessed here is curious because it demonstrates that in spite of overall formal earnings inequality fall, according to most measures there was an increasing concentration at the very top end of earnings distribution.

8 Conclusions

The assessment of income inequality normally uses household surveys. More recently, there was a series of papers based on Personal Income Tax (PIT) records and also combining these two types of data sources. However, Brazil also has a long series of establishment-level administrative records seldom used in distributive studies. The best example of these microdata sets is RAIS (*Registro Anual de Informações Sociais*) source collected by the Labour Ministry with an average of 30 million observations gathered per year in the last two decades.

This paper describes the evolution and the close causes of formal earnings inequality in the Brazilian formal sector from 1994 and 2015 using RAIS. First, we show that earnings distribution changes observed in RAIS reveal a marked inequality fall that is also observed in other more usual measures of inequality extracted from household surveys. For example, the Gini of labour earnings in RAIS fell 12.5 per cent between 1995 and 2015, while the concentration index obtained with PNAD survey fell 19.3 per cent in the same period.

Second, unlike other data sources, RAIS does not have top coding, which permits to measure wages at the very upper tail of earnings distribution. The paper shows that in spite of overall inequality fall, the monotonic decrease of earnings increase goes until the 90 percentile and raises specially above the 95 percentile. This concentration increase goes in the same direction as PIT-based measures and deserves further scrutiny.

[10] If we are interested only in contributions of groups situated in the top part of the income distribution, the Theil – T could be used as well. The Theil-T presents always positive contributions to those above the mean (Morley 1999; Neri and Camargo 1999).

Third, we use standard inequality decompositions applied to the J-Divergence index to understand the main close determinants of inequality. Schooling sticks out among other characteristics explaining 32.8 per cent of total inequality in 2015. The same statistics for individual firm-effects reach 64.7 per cent. Meaning that the gross explanatory power of individual firms to explain inequality in the Brazilian formal labour market is almost twice the one for education. We also explore the change of inequality where firms appear as the main driving variable.

Finally, the paper also explores J-Divergence properties that allows to see beyond the gross contribution of different variables and to capture the relative role played by specific groups. We apply it to isolate the role of top incomes. Our results reveal that since 1995 the share of inequality explained by the top 10 per cent, 1 per cent and 0.1 per cent incomes rose 20.2 per cent, 43.1 per cent and 91 per cent, respectively. Similarly, in spite of falling mean schooling returns, the share of inequality explained by those with high school diploma rises 29.5 per cent in the same period.

References

ALVAREZ, J.; BENGURIA, F.; ENGBOM, N.; and MOSER, C. (2017). 'Firms and the Decline of Earnings Inequality in Brazil,' IMF Working Paper No. 17/278. Geneva: International Monetary Fund.

BACHA, E.; TAYLOR, L. (1978). 'Brazilian Income Distribution in the 1960s: 'Facts', Model Results and the Controversy'. *Journal of Development Studies*, 14(3): 271–97.

BARROS, R. P. DE; FOGUEL, M. N.; ULYSSEA, G. (Eds.) (2006). *Desigualdade de renda no Brasil: uma análise da queda recente*: p. 15–85. Brasília: Ipea.

BOURGUIGNON, F. (1979). 'Decomposable, income inequality measures'. *Econometrica*, 47: 901–20.

CARD, David; HEINING, Jörg; KLINE, Patrick (2013).. 'Workplace heterogeneity and the rise of West German wage inequality'. *The Quarterly Journal of Economics*, 128(3): 967–1015.

COURSEIL, C., MOURA, R. AND RAMOS, L. (2011). 'Determinantes da expansão do emprego formal: O que explica o aumento do tamanho médio dos estabelecimentos?'. *Economia Aplicada*, 15(1): 45–63.

ENGBOM, N. and MOSER, C. (2017). 'Earnings Inequality and the Minimum Wage: Evidence from Brazil'. CESifo Working Paper no 6393, mimeo. Munich: CESifo Group.

FOSTER, J. E. (1983). 'An axiomatic characterization of the Theil measure of income inequality'. *Journal of Economic Theory*, 31(1): 105–21.

FERREIRA, F. H.; FIRPO, S. P.; MESSINA, J. (2016). 'Understanding Recent Dynamics of Earnings Inequality in Brazil'. *New Order and Progress: Development and Democracy in Brazil*, 187.

FISHLOW, A. (1974). 'Brazilian Size Distribution of Income'. *American Economic Review*, 52(2): 391–402.

JEFFREYS, H. F. R. S. (1946). 'An invariant form for the prior probability in estimation problems'. *Proceedings of the Royal Society of London. Series A, Mathematical and Physical Sciences*, 186(1007): 453–61.

HECKSHER, M.; SILVA, P.L.N.; COURSEIL, C. (2017). *Preponderância dos ricos na desigualdade de renda no Brasil (1981-2016): Aplicação da J-divergência a dados domiciliares e tributaries*. Tese de Mestrado ENCE/IBGE.

HOFFMANN, R. (1998). *Distribuição de renda, medidas de desigualdade e pobreza*, São Paulo: Editora da Universidade de São Paulo (Edusp).

KAKWANI, N. ; NERI, M. ; SON, H. (2010). 'Linkages Between Pro-Poor Growth, Social Programs and Labour Market: The Recent Brazilian Experience'. *World Development*, 38: 881–94.

LANGONI, C. G. (2005). *Distribuição da Renda e Desenvolvimento Econômico do Brasil.* Rio de Janeiro: Editora FGV, 3ª edição, caps. 3 e 5.

MACHADO C., NERI, M. and NETO, V. (2017). 'The Gender Gap and the Life Cycle in the Brazilian Formal Labour Market'. Mimeo, presented at ANPEC.

MEDEIROS, M.; SOUZA, P. H. G. F.; CASTRO, F. Á. (2015a). 'O Topo da Distribuição de Renda no Brasil: Primeiras Estimativas com Dados Tributários e Comparação com Pesquisas Domiciliares, 2006-2012'. *Dados - Revista de Ciências Sociais,* 1(58): 7–36.

______ (2015b). 'A estabilidade da desigualdade de renda no Brasil, 2006 a 2012: estimativa com dados do imposto de renda e pesquisas domiciliares'. *Ciência & Saúde Coletiva*, 20(4): 971–86.

MORLEY, S. (1999). 'What happened to the rich and the poor during the post reform period'. Santiago, Chile: CEPAL, mimeo.

LAM, D.; FINN, A.; LEIBBRANDT M. (2015). 'Schooling inequality, returns to schooling and earnings inequality: Evidence from Brazil and South Africa'. WIDER Working Paper 2015/50. Helsinki: UNU-WIDER.

NERI, M. (2003). *Diversidade.* Rio de Janeiro: Editora FGV, 1ª edição, (204 p.).

NERI, M. and CAMARGO, J. M. (2002). 'Distributive Effects of Brazilian Structural Reforms. In Renato Baumann (Org.), *Brazil in the 1990s: A Decade in Transition*. New York: Palgrave.

PIKETTY, T. (2014). *O capital no século XXI.* Rio de Janeiro: Intrínseca.

RAMOS, L. (1993). 'A Distribuição de Rendimentos no Brasil 1976/85'. Brasília: Ipea.

ROHDE, N. (2016). 'J-divergence measurements of economic inequality'. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 179(3): 847–70.

SHORROCKS, A. (1980). 'The class of additively decomposable measures'. Econometrica, 48: 613–25.

SOUZA, P. H. G. F. (2016).*A desigualdade vista do topo: a concentração de renda entre os ricos no Brasil, 1926-2013.* Tese de Doutorado. Brasília: Universade de Brasília..

SONG, J., PRICE, D. J., GUVENEN, F., BLOOM, N., & VON WACHTER T. (2015). 'Firming up inequality'. (No. w21199). Cambridge, MA: National Bureau of Economic Research.

THEIL, H. (1967). *Economics and information theory.* Amsterdam: North-Holland.

Appendix

Information Theory: Inequality Measures and Decompositions (Theil 1967; Hoffmann 1998)

Entropy of a distribution

$$H(x) = E[h(x_i)] = \sum_i x_i h(x_i) = \sum_i x_i \ln \frac{1}{x_i} = -\sum_i x_i \ln x_i$$

We have the following problem:

$$\text{Max } H(x)$$
$$\text{s.a.} \sum x_i$$

$$\text{Max } \{-\sum_i x_i \ln x_i - \lambda(\sum_i x_i - 1)$$

$\text{FOC}: \ln x_i = -(1+\lambda)$ and the lower bound does not exist but as

$\lim x_i \ln x_i = 0$ when xi goes to 0

The H(y) maximum, that is, maximum entropy, occurs when there is a maximum of uncertainty about what can happen, once entropy is the expected informative content of a message. This maximum occurs when all possible events are equally probable, and you do not derive any information about those events: $0 \le H(x) \le \ln n$

The Expected Information of Uncertain Message is $= \sum_{i=1}^{n} y_i \log y_i / xi$ where * is a particular full certainty case.

3. Theil Inequality Measures

Henri Theil (1967) proposed an inequality measure from the entropy of a distribution. However, equality does not mean economic disorder (unpredictability). Therefore, he proposed the following transformation: subtracting from entropy its maximum value, we have:

$$T = \log n - H(y) = \left(\sum_{i=1}^{n} y_i\right)\log n + \sum_{i=1}^{n} y_i \log y_i = \sum_{i=1}^{n} y_i \left[\log n + \log y_i\right] = \sum_{i=1}^{n} y_i \log n y_i$$

$$T = \sum_{i=1}^{n} y_i \log n y_i$$

$0 \le T \le \ln n$, that is, we have $T = 0$ in the case of a perfect egalitarian distribution and $T = \ln n$ in the case of maximum inequality.

In the case of $y_i = 0$ we have $y_i \log y_i = 0$, by convention.

where y_i => share of i in total income intuitively,

$$T = \ln n - H(x) = \sum_i y_i \ln \frac{y_i}{1/n}$$

That is, Theil-T index assesses how much a given income distribution (each person receive y_i of total income) is away of a perfect uniform distribution (each person receive 1/n of total income), or the redundancy degree in relation to the latter, weighting each observation by its share in total income.

Therefore, the Theil-T index is defined by the following formula:

$$T = \sum_{i=1}^{n} y_i \log n y_i$$

or, alternatively, by

$$T = \sum_{i=1}^{n} \frac{x_i}{N\mu} \log \frac{x_i}{\mu}$$

Intra and Inter Groups Decomposition

Suppose I have a population with N samples, divided in K groups:

$N = \sum_{h=1}^{K} n_h$, which n_h is the nº of people in the h-th group. The proportion of the population correspondent to the h-th group would be:

$\pi_h = \frac{n_h}{N}$. Suppose that x_{hi} is the i-th individual income of the h-th group. Thus, total income share of this individual would be:

$y_{hi} = \frac{x_{hi}}{N\mu}$, note that the denominator is the population total income, with μ as the mean income. So, the share of the total income retained by the h-th group is:

$Y_h = \sum_{i=1}^{n_h} y_{hi}$, that is, adding the share of total income retained by the individuals within group h.

We have Theil-T Index:

$T = \sum_{i=1}^{N} y_i \log N y_i = \sum_{h=1}^{k} \sum_{i=1}^{n_h} y_{hi} \log N y_{hi}$, Firstly, I'm only first the individuals within the group, and then adding the others until complete all the population.

Adding and subtracting:

(*) $\sum_{h=1}^{k} Y_h \log \frac{NY_h}{n_h} = \sum_{h=1}^{k}\sum_{i=1}^{n_h} y_{hi} \log \frac{NY_h}{n_h}$ (from left to right, I opened Y_h which is out of the log, as defined above ($Y_h = \sum_{i=1}^{n_h} y_{hi}$). Thereby, the equation turn to:

$T = \sum_{h=1}^{k} Y_h \log \frac{NY_h}{n_h} + \sum_{h=1}^{k}\sum_{i=1}^{n_h} \frac{Y_h}{Y_h} y_{hi} \log Ny_{hi} - \sum_{h=1}^{k}\sum_{i=1}^{n_h} y_{hi} \log \frac{NY_h}{n_h}$, which I added and subtracted (*) and divided and multiplied for Yh. Continuing:

$$T = \sum_{h=1}^{k} Y_h \log \frac{NY_h}{n_h} + \sum_{h=1}^{k} Y_h \sum_{i=1}^{n_h} \frac{y_{hi}}{Y_h} \log Ny_{hi} - \sum_{h=1}^{k}\sum_{i=1}^{n_h} y_{hi} \log \frac{NY_h}{n_h}$$

$$T = \sum_{h=1}^{k} Y_h \log \frac{NY_h}{n_h} + \sum_{h=1}^{k} Y_h \sum_{i=1}^{n_h} \frac{y_{hi}}{Y_h} \left[\log Ny_{hi} - y_{hi} \log \frac{NY_h}{n_h} \right]$$

$$T = \sum_{h=1}^{k} Y_h \log \frac{Y_h}{\pi_h} + \sum_{h=1}^{k} Y_h \sum_{i=1}^{n_h} \frac{y_{hi}}{Y_h} \left[\log \frac{Ny_{hi}}{\frac{NY_h}{n_h}} \right]$$

$$T = \sum_{h=1}^{k} Y_h \log \frac{Y_h}{\pi_h} + \sum_{h=1}^{k} Y_h \sum_{i=1}^{n_h} \frac{y_{hi}}{Y_h} \left[\log \frac{n_h y_{hi}}{Y_h} \right]$$

$$T = T_e + \sum_{h=1}^{K} Y_h T_h$$

Where, $T_e = \sum_{h=1}^{k} Y_h \log \frac{Y_h}{\pi_h}$ is the Theil-T between groups and $T_h = \sum_{i=1}^{n_h} \frac{y_{hi}}{Y_h} \log n_h \frac{y_{hi}}{Y_h}$ is the Theil-T intra groups. Therefore $\sum_{h=1}^{K} Y_h T_h$ is the weighted average of intra-groups Theils.

Te / T is the Contribution of a certain characteristic to inequality measured by the Theil-T.

Similarly, we can show that the Theil-L can be decomposed as between groups (Le) and within groups components:

$$\mathrm{L} = \mathrm{L}e + \sum_{\mathrm{h}=1}^{\mathrm{k}} \pi h \, \mathrm{L}h$$

where $\mathrm{L}e = \sum_{\mathrm{h}=1}^{\mathrm{k}} \pi h \log(\pi h \,/\, \mathrm{Y}h)$ and $\mathrm{L}h = \frac{1}{\mathrm{n}h} \sum_{\mathrm{i}=1}^{k} \pi h \log(\mathrm{Y}h \,/\, (\mathrm{n}h \; yhi))$

Hence, J-Divergence can also be expressed in terms of its within and between groups components. By its turn each of these components can be expressed in terms of the sum of Theil-T and Theil-L respective components:

$$\mathrm{J} = \mathrm{T}e + \mathrm{L}e + \sum_{\mathrm{h}=1}^{k} \Upsilon h\, \mathrm{T}h + \sum_{\mathrm{h}=1}^{k} \pi h\, \mathrm{L}h$$

J-Divergence group decomposition

(Jeffreys 1946; Rohde 2016; Hecksher et al 2017):

The J-Divergence measure allows to gauge the contribution of specific groups of individuals in total inequality. How is it done? In the within and between decomposition formulas for the three information theory based inequality indicators above, instead of summing all groups between groups component, we instead choose a specific group among k groups and compute its respective contribution from both between and within components.

At this point lies a comparative advantage of the J-Divergence. As opposed to other measures derived from information theory such as Theil-T and Theil-L, individual's contribution to this measure is always greater or equal to zero. In Figure 17, we see that while the Theil-T receives negative contributions from individuals below the mean and the Theil-L receives non-negative contributions for those above the mean while in the J-Divergence, these individuals contributions are always non negative. This property makes the simple sum of individual divergences equal to total inequality, allowing analysing the direct impact of specific groups' in inequality.

The contribution of a characteristic and group to inequality level (and growth)

The contribution of a given characteristic to inequality level and change exemplified initially by the J-Divergence of a given characteristic is:

$$Gross\ Contribution\ \ J = J_{et} / \ J_t$$

$$Share\ of\ \ Gross\ Contribution\ Change\ in\ total\ Change\ \ = \Delta(J_{et}) /\ \Delta(J_t)$$

where $\mathrm{Je} = \ \mathrm{T}e + \mathrm{L}e$ and $\mathrm{J} = \ \mathrm{T} + \mathrm{L}$

The two equations above says that the relative contribution of a given characteristic – say schooling - to inequality level in a single point in time (change across time) is given by its between component level (change) divided by initial total inequality. Since in the J-Divergence the same additive decomposability is applied do specific groups – say individuals with higher education diploma - exactly the same idea can also be applied to assess the gross impact of a specific group of a given characteristic to inequality.

The dual of an inequality measure

Dual General Definition:

Be x a random variable with mean μ and distribution with certain value of inequality as **M**. We called *dual* a distribution with the following characteristics:

a. x = 0 with probability U_t and x = μ / (1- U_t) with probability 1 - U_t . That is, maintain the original mean for any U_t.

b. The inequality measure value is also equal to M, once we ajusted U_t value.

Dual maintain the mean and inequality for the value U_t.

Dual allows different comparisons of inequality measures.

Main advantages:

a) identical scales and vary in the interval 0 to 1, (same as Gini's), dimensionless

allows to study the sensitivity of the measure of inequality

allows equivalence between measures.

Deduction of the Dual from the Theil-T Index

In terms of the fraction of the total income of the population received by each person, in the dual distribution we have

$y_i = 0$, for nU_T people, and

$y_i = \dfrac{1}{n(1-U_T)}$, for $n(1-U_T)$ people

Thus, according to the formulas given above, we have:

$$T = \sum_{i=1}^{n} y_i \log ny_i = nU_T\left[0 \log n0\right] + n(1-U_T)\left[\frac{1}{n(1-U_T)} \log n \frac{1}{n(1-U_T)}\right] = \log\frac{1}{(1-U_T)}$$

Raising to exponential, we obtain:

$$e^T = \frac{1}{(1-U_T)} \Rightarrow 1-U_T = e^{-T} \Rightarrow U_T = 1-e^{-T}$$

$$0 \le T \le \log n$$
$$1 \le e^T \le n$$
$$1 \ge e^{-T} \ge \frac{1}{n}$$
$$-1 \le -e^{-T} \le -\frac{1}{n}$$
$$0 \le 1-e^{-T} \le 1-\frac{1}{n}$$

$$0 \le U_T \le 1-\frac{1}{n}$$

A dual distribution follows the equation below:

$U_2 = \phi + (1-\phi)U_1$

Where U_1 is the dual of the initial distribution and U_2 is the dual after adding null values that are a proportion $\phi = \frac{m}{n+m}$ of the new total elements. Thus, for the Theil we have:

$$U_{T2} = \phi + (1-\phi)U_{T1}$$

What bring us to:

$$\begin{aligned}
1-e^{-T2} &= \phi + (1-\phi)(1-e^{-T1}) \\
1-e^{-T2} &= \phi + (1-\phi) - (1-\phi)e^{-T1} \\
e^{-T2} &= (1-\phi)e^{-T1} \\
-T2 &= \ln(1-\phi) - T1
\end{aligned}$$

$$T2 = T1 - \ln(1-\phi)$$

Where $T1$ and $T2$ are values, in *nits*, of the Theil-T index for the initial distribution and after the adding of the *m* set of null values, respectively.

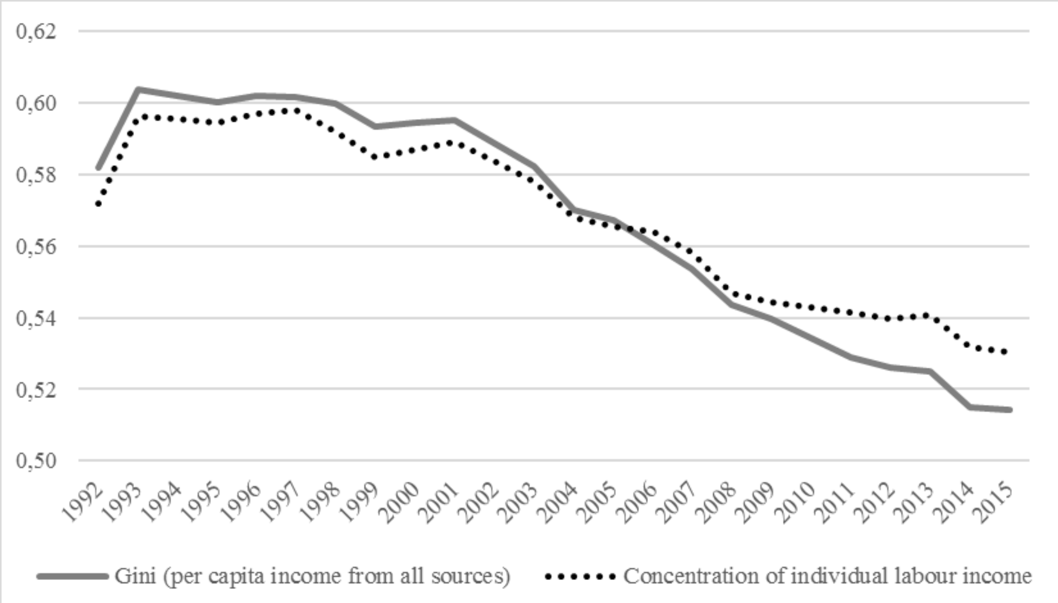
OBS 1: The Dual may be an interesting way to normalize the comparison between different inequality measures. It is a transformation to the scale between 0 and 1 of the Gini index. The dual of the Gini index is the Gini index.

OBS 2: An interesting overall measure of Social Welfare (SW) inspired on Sen (1976) is $SW = mean.(1-U_{T1})$. The dual works as a discount factor between 0 and 1.

OBS 3: Since the Theil L and the J-Divergence do not admit null values, they also do not admit a Dual measure.

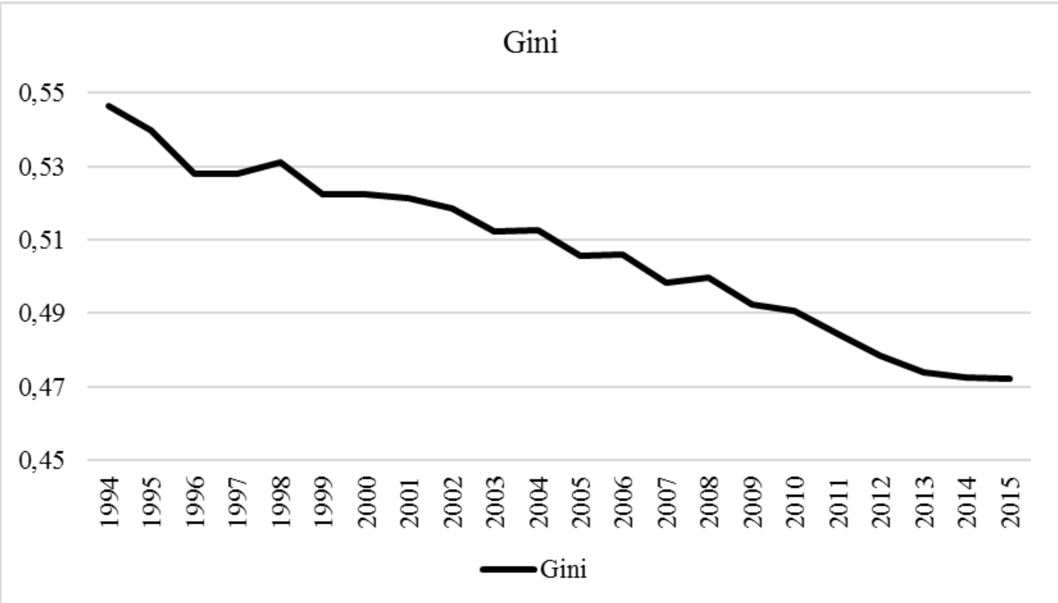
List of Figures

Figure 1: Inequality (Gini Index) in Household Surveys 1994 – 2015



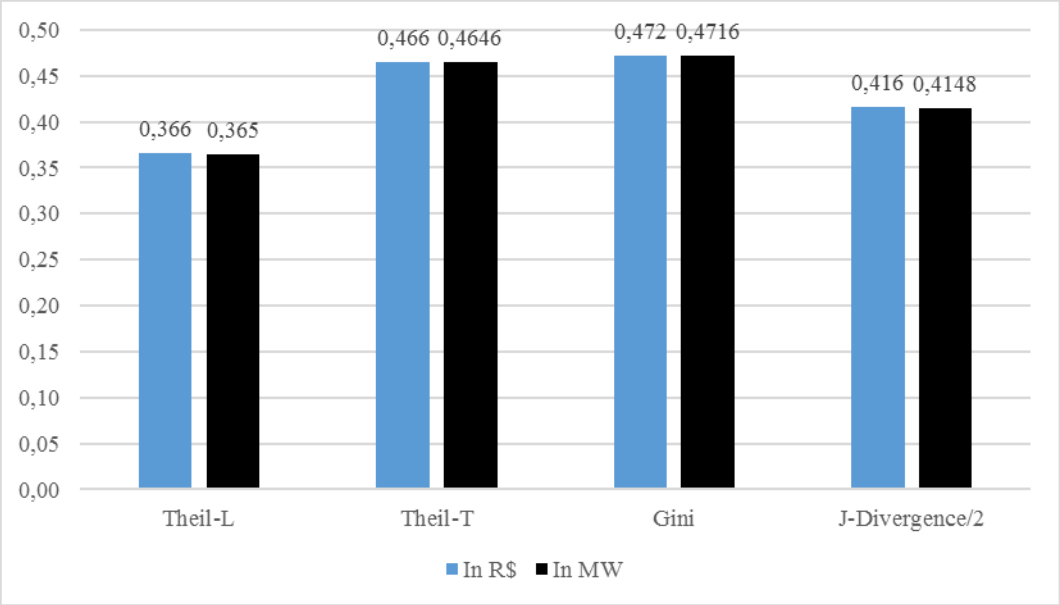
Source: Authors' calculation over PNAD microdata.

Figure 2: Evolution of the Gini Index in RAIS 1994 - 2015



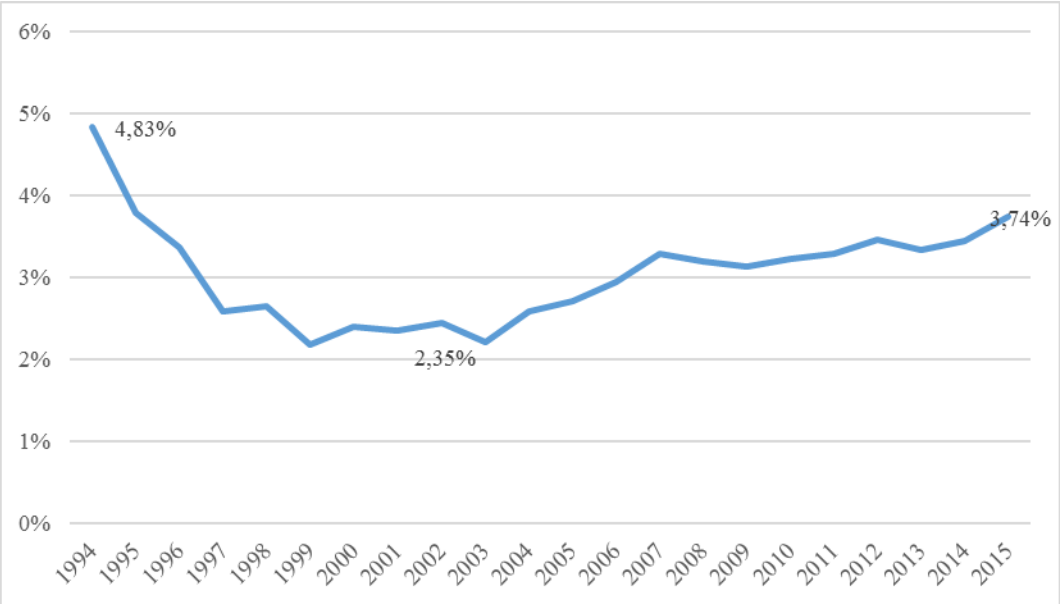
Source: Authors' calculation over RAIS microdata.

Figure 3: Earnings Inequality During 2015 in R$ and in Minimum Wages (MW)



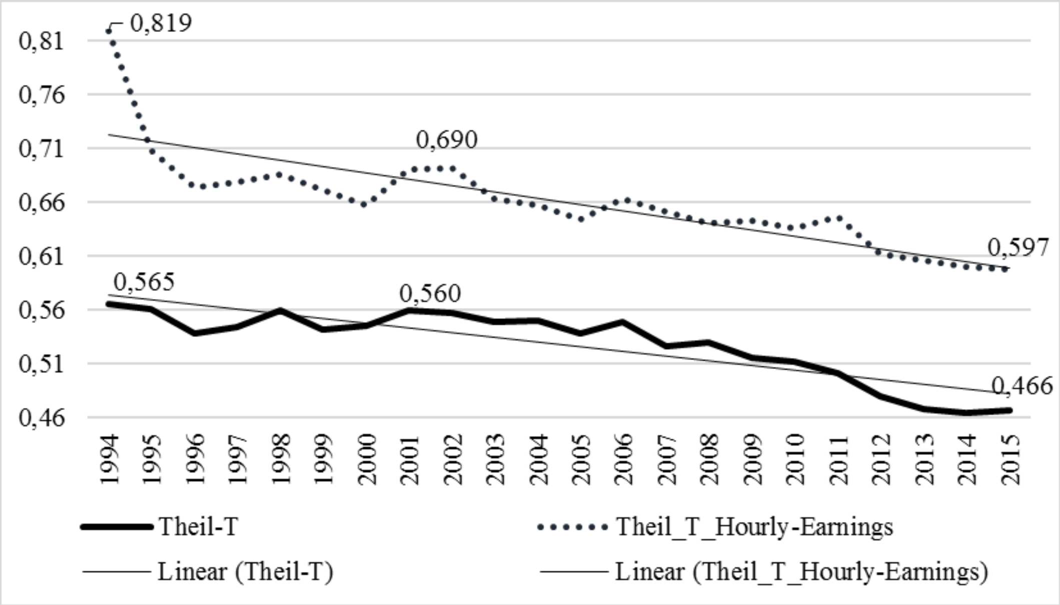
Source: Authors' calculation over RAIS microdata.

Figure 4: Share of Missing Incomes (% 0s - Measurement Error)



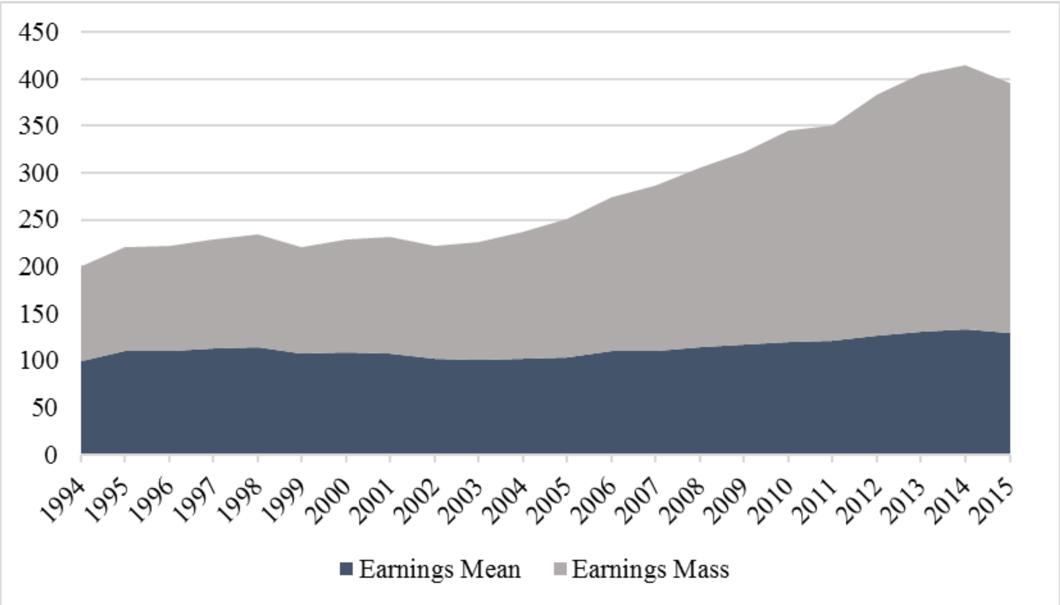
Source: Authors' calculation over RAIS microdata.

Figure 5: Earnings versus Hourly Earnings Inequality – Theil-T 1994–2015



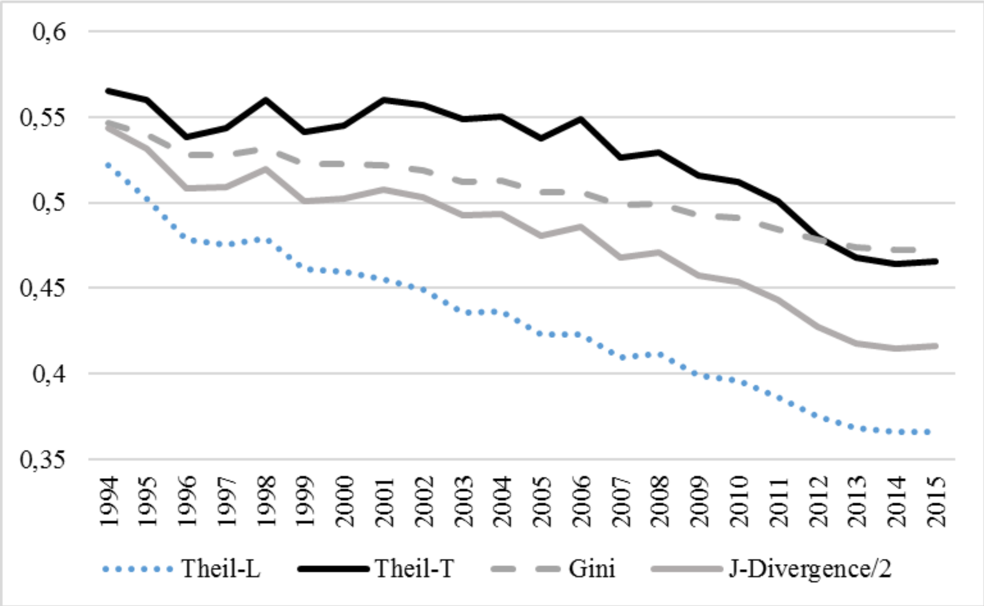
Source: Authors' calculation over RAIS microdata.

Figure 6: Earnings Mean and Earnings – 1994–2015



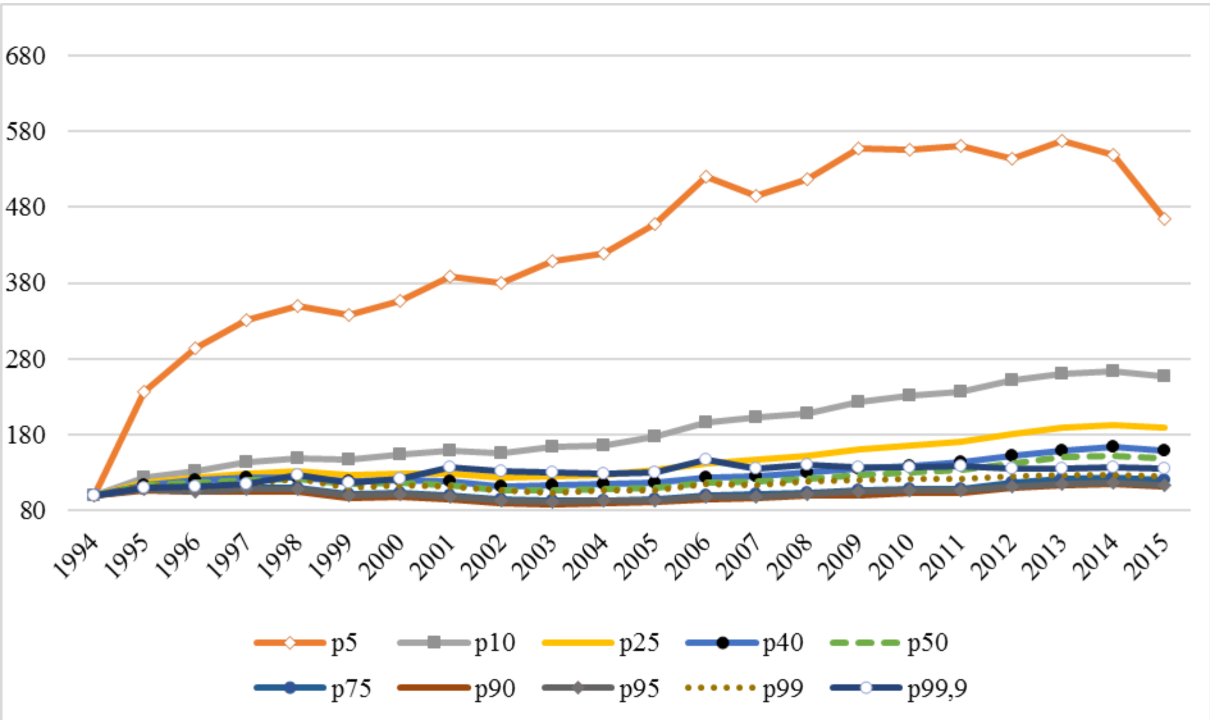
Source: Authors' calculation over RAIS microdata.

Figure 7: Various Inequality Measures Trends 1994 - 2015



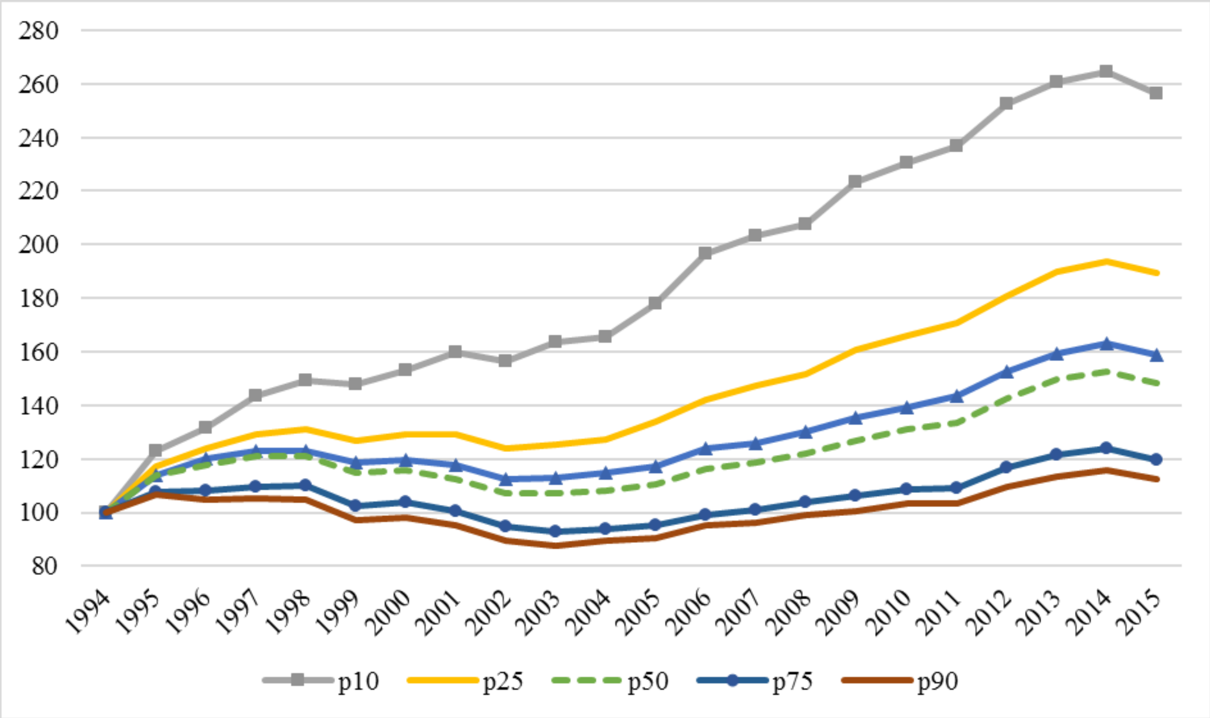
Source: Authors' calculation over RAIS microdata.

Figure 8: Cumulative Growth Curve Across Percentiles -1994 - 2015



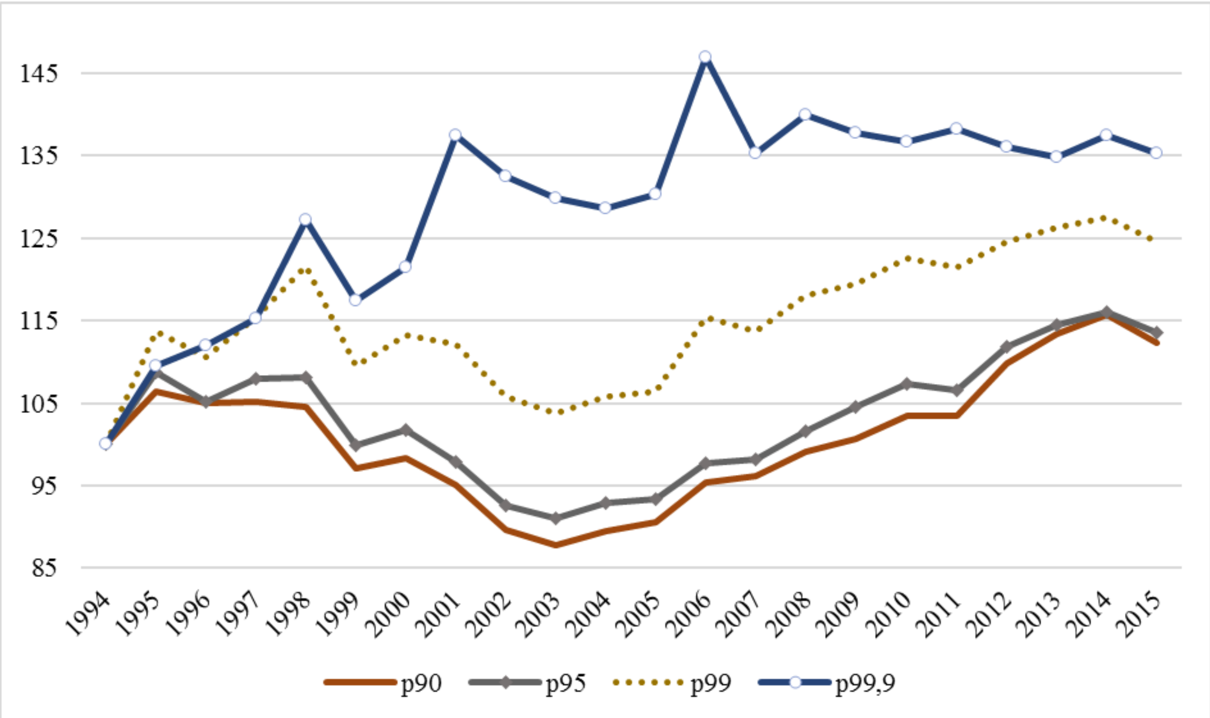
Source: Authors' calculation over RAIS microdata.

Figure 9: Cumulative Growth Curve Across Lower Percentiles -1994 - 2015



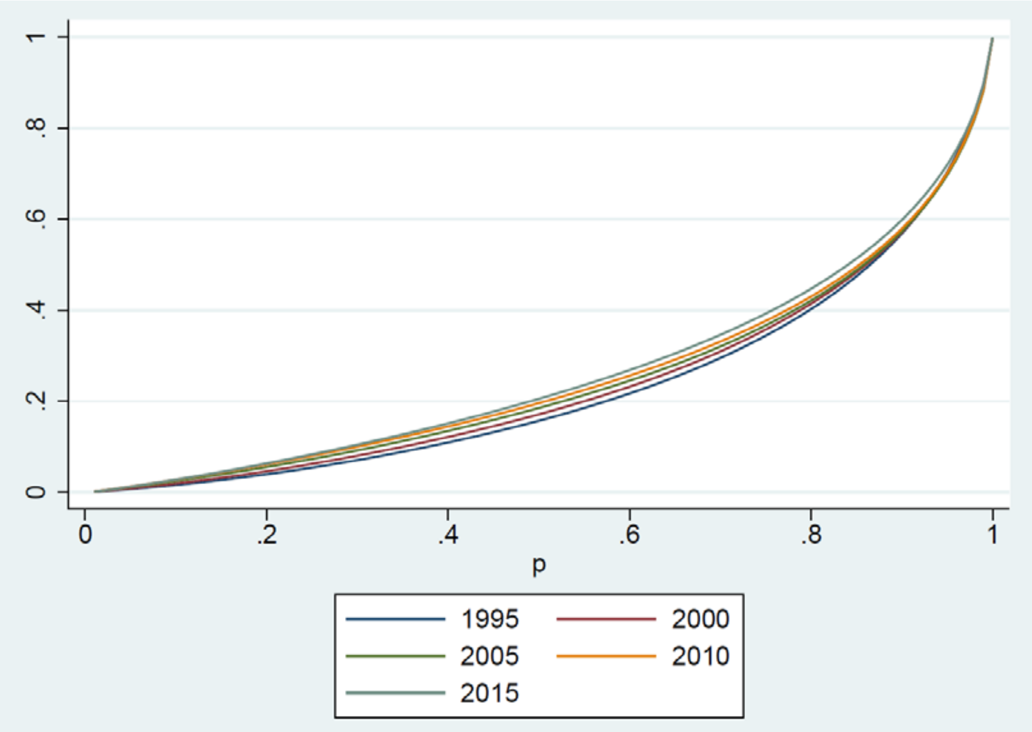
Source: Authors' calculation over RAIS microdata.

Figure 10: Cumulative Growth Curve Across Top Percentiles 1994 - 2015



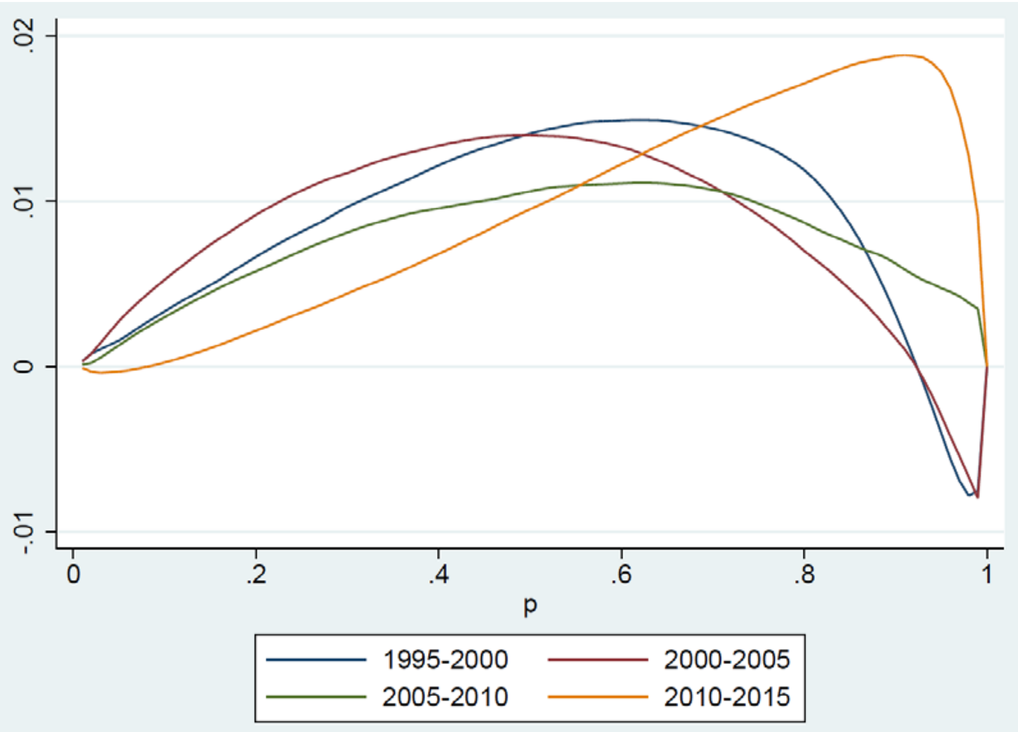
Source: Authors' calculation over RAIS microdata.

Figure 11: Lorenz Curves in Five-Year Intervals



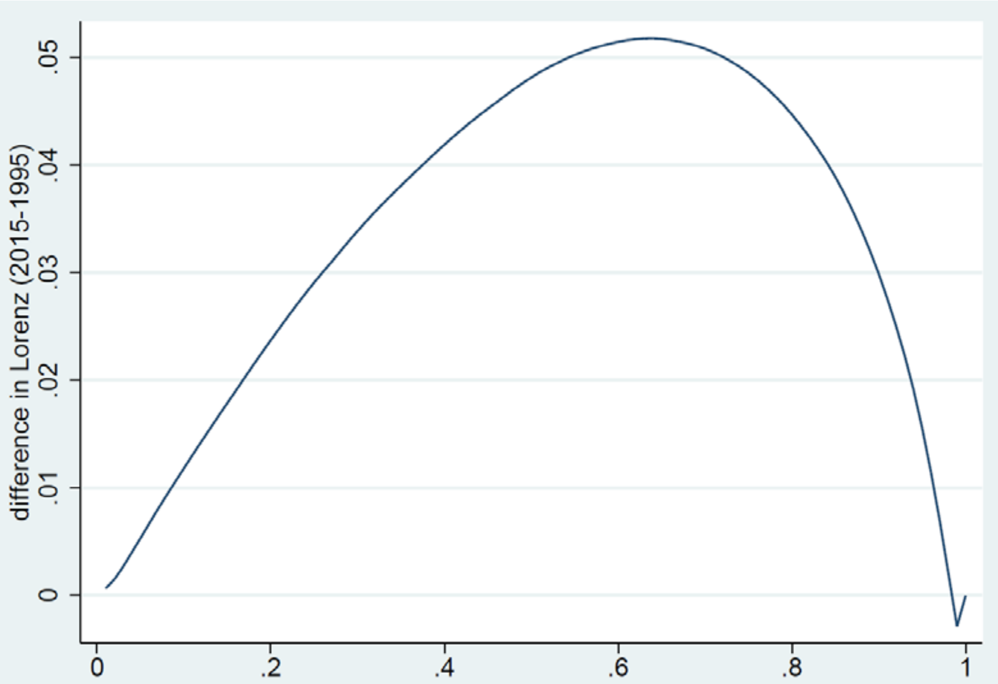
Source: Authors' calculation over RAIS microdata.

Figure 12: Lorenz Curves Differences in Five-Year Intervals



Source: Authors' calculation over RAIS microdata.

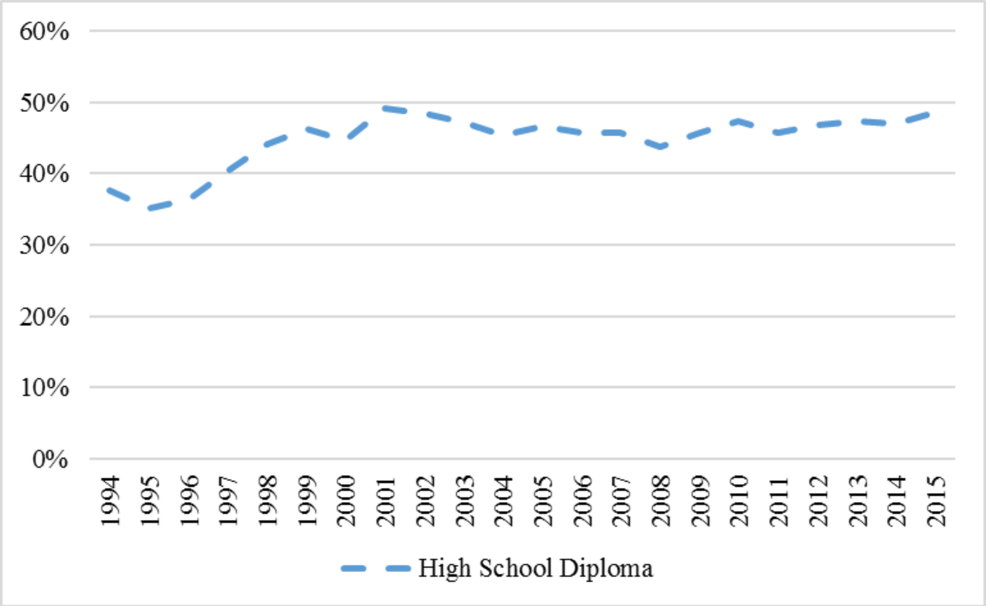
Figure 13: Lorenz Curves Differences Between 1995 and 2015



Source: Authors' calculation over RAIS microdata.

Figure 14: Specific Groups Contributions to Inequality: *J-Divergence*

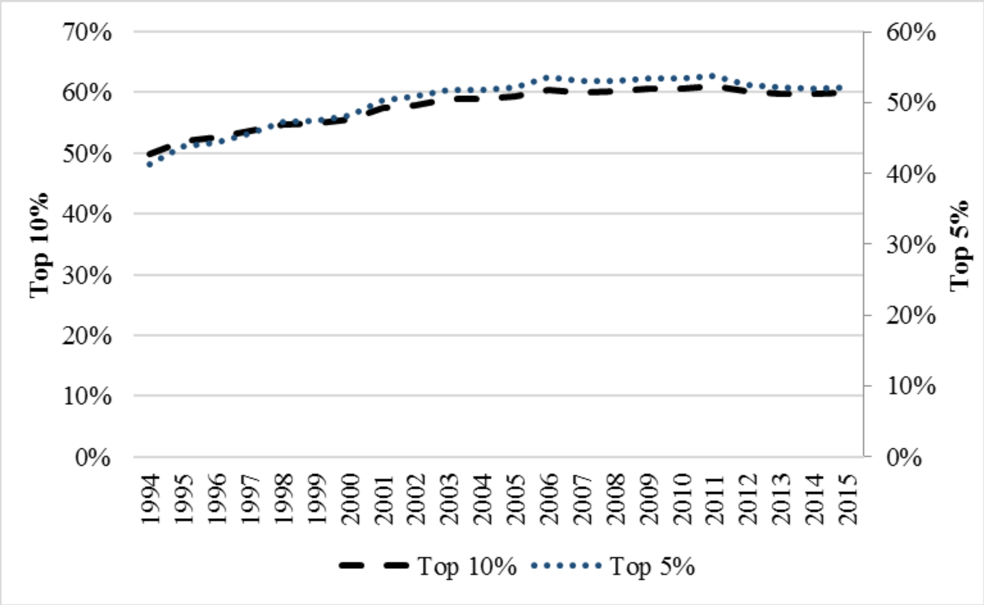
High School Diploma Holders



Source: Authors' calculation over RAIS microdata.

Figure 15: Specific Groups Contributions to Inequality: *J-Divergence*

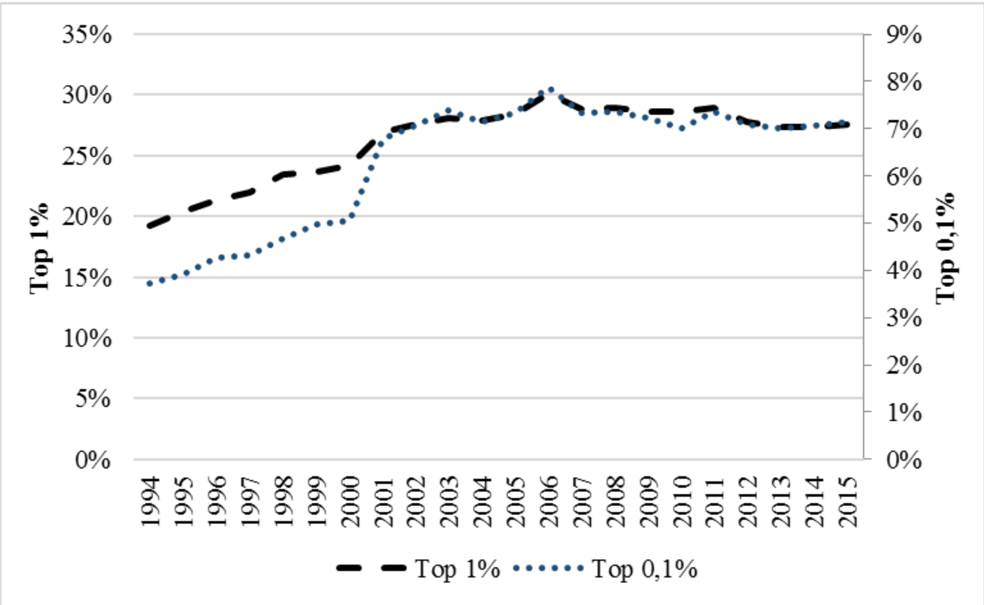
Top 10% Incomes and Top 5% Incomes



Source: Authors' calculation over RAIS microdata.

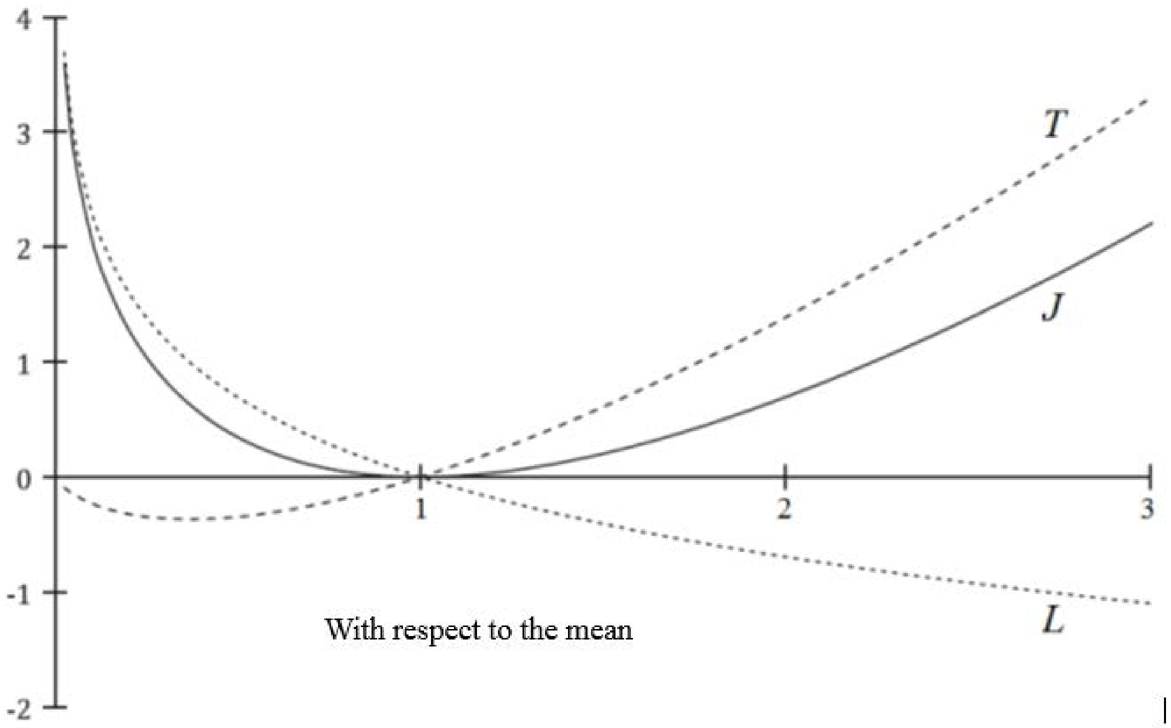
Figure 16: Specific Groups Contributions to Inequality: *J-Divergence*

Top 1% Incomes and Top 0.1% Incomes



Source: Authors' calculation over RAIS microdata.

Figure 17: *Individual* Contributions to Inequality according to Income Level:
Theil-*T*, Theil-*L* and *J-Divergence*



Source: Authors' compilation.

List of Tables

Evolution of Inequality Measures

Table 1: Evolution of Inequality Measures of Strictly Positive Values

Year	Gini	Theil-L	Theil-T	J-Divergence	Dual_Theil-T
	--------------------Stricly Positive Values--------------------------				
1994	0.547	0.522	0.565	1.086	0.432
1995	0.54	0.502	0.56	1.062	0.429
1996	0.528	0.478	0.538	1.016	0.416
1997	0.528	0.475	0.543	1.018	0.419
1998	0.531	0.479	0.56	1.039	0.429
1999	0.522	0.461	0.541	1.002	0.418
2000	0.522	0.46	0.545	1.005	0.42
2001	0.521	0.455	0.56	1.015	0.429
2002	0.518	0.449	0.557	1.006	0.427
2003	0.512	0.436	0.549	0.984	0.422
2004	0.513	0.437	0.55	0.986	0.423
2005	0.506	0.423	0.537	0.961	0.416
2006	0.506	0.423	0.549	0.972	0.422
2007	0.498	0.409	0.526	0.935	0.409
2008	0.5	0.412	0.529	0.941	0.411
2009	0.492	0.399	0.515	0.915	0.403
2010	0.491	0.396	0.512	0.908	0.401
2011	0.485	0.386	0.501	0.887	0.394
2012	0.478	0.375	0.48	0.855	0.381
2013	0.474	0.368	0.468	0.836	0.374
2014	0.472	0.366	0.464	0.83	0.371
2015	0.472	0.366	0.466	0.832	0.372
1994 to 2015	-13.59%	-29.82%	-17.55%	-23.44%	-13.73%
1999 to 2015	-9.6%	-20.58%	-13.91%	-16.98%	-10.89%
2001 to 2015	-9.44%	-19.59%	-16.77%	-18.04%	-13.12%
1995 to 2015	-12.51%	-27.13%	-16.85%	-21.71%	-13.18%
2003 to 2015	-7.8%	-16.03%	-15.11%	-15.52%	-11.82%
2001 to 2014	-9.42%	-19.6%	-17.05%	-18.19%	-13.35%
Mean	0.507	0.431	0.528	0.959	0.41

Source: Authors’ calculation over RAIS microdata.

Table 2: Evolution of Inequality Measures of Including Missings as Null Values

Year	% 0 (missings)	Gini	Theil-T	Dual_Theil-T
	-------Including Missing Values as 0s--------			
1994	0.048	0.568	0.614	0.459
1995	0.038	0.557	0.599	0.45
1996	0.034	0.544	0.572	0.436
1997	0.026	0.54	0.569	0.434
1998	0.026	0.544	0.587	0.444
1999	0.022	0.533	0.563	0.43
2000	0.024	0.534	0.569	0.434
2001	0.023	0.533	0.583	0.442
2002	0.024	0.53	0.581	0.441
2003	0.022	0.523	0.571	0.435
2004	0.026	0.525	0.576	0.438
2005	0.027	0.519	0.565	0.431
2006	0.029	0.52	0.579	0.439
2007	0.033	0.515	0.559	0.428
2008	0.032	0.516	0.562	0.43
2009	0.031	0.508	0.547	0.421
2010	0.032	0.507	0.544	0.42
2011	0.033	0.501	0.534	0.414
2012	0.035	0.496	0.515	0.403
2013	0.033	0.491	0.502	0.394
2014	0.034	0.491	0.499	0.393
2015	0.037	0.492	0.504	0.396
1994 to 2015	-22.60%	-13.45%	-18.00%	-13.78%
1999 to 2015	72.38%	-7.65%	-10.49%	-8.05%
2001 to 2015	59.25%	-7.65%	-13.63%	-10.45%
1995 to 2015	-1.23%	-11.70%	-15.84%	-12.14%
2003 to 2015	70.22%	-5.92%	-11.73%	-9.00%
2001 to 2014	46.65%	-7.91%	-14.42%	-11.08%
Mean	0.03	0.522	0.559	0.428

Source: Authors' calculation over RAIS microdata.

Table 3: Evolution of Inequality Measures Including the Rest of the Population as Null Values

Year	Share of Formal Employees in the Population	Gini	Theil-T	Dual_Theil-T
	---Including the Rest of Population as Null Values---			
1994	0.145	0.934	2.497	0.918
1995	0.144	0.934	2.498	0.918
1996	0.145	0.932	2.471	0.916
1997	0.146	0.931	2.468	0.915
1998	0.147	0.931	2.479	0.916
1999	0.148	0.929	2.45	0.914
2000	0.147	0.93	2.465	0.915
2001	0.149	0.929	2.462	0.915
2002	0.149	0.928	2.461	0.915
2003	0.157	0.923	2.399	0.909
2004	0.165	0.92	2.353	0.905
2005	0.171	0.916	2.304	0.9
2006	0.179	0.912	2.27	0.897
2007	0.189	0.905	2.19	0.888
2008	0.197	0.901	2.152	0.884
2009	0.205	0.896	2.102	0.878
2010	0.219	0.888	2.03	0.869
2011	0.223	0.885	2	0.865
2012	0.231	0.88	1.945	0.857
2013	0.239	0.874	1.898	0.85
2014	0.236	0.875	1.907	0.852
2015	0.223	0.882	1.966	0.86
1994 to 2015	54.04%	-5.57%	-21.27%	-6.29%
1999 to 2015	50.58%	-5.06%	-19.77%	-5.88%
2001 to 2015	49.45%	-4.99%	-20.14%	-5.98%
1995 to 2015	54.89%	-5.51%	-21.3%	-6.29%
2003 to 2015	41.97%	-4.45%	-18.06%	-5.42%
2001 to 2014	58.2%	-5.73%	-22.51%	-6.9%
Mean	0.18	0.911	2.262	0.893

Source: Authors' calculation over RAIS microdata.

Table 4: Evolution of Inequality Ratios

Year	p90p10	p75p25	p50p25	Mean/p40	p90p50	p75p50	p99.9p90	p99p90	p95p90
1994	14.37	3.898	1.824	2.438	4.477	3.898	6.308	3.233	1.555
1995	12.448	3.591	0.564	2.366	4.189	3.591	6.489	3.452	1.588
1996	11.491	3.393	0.579	2.243	4	3.393	6.725	3.407	1.558
1997	10.53	3.308	0.585	2.243	3.899	3.308	6.912	3.548	1.595
1998	10.078	3.27	0.593	2.275	3.863	3.27	7.67	3.759	1.607
1999	9.441	3.146	0.605	2.2	3.789	3.146	7.63	3.646	1.598
2000	9.224	3.14	0.61	2.219	3.794	3.14	7.796	3.722	1.608
2001	8.55	3.025	0.629	2.219	3.781	3.025	9.122	3.815	1.6
2002	8.252	2.981	0.633	2.208	3.739	2.981	9.318	3.816	1.604
2003	7.713	2.877	0.643	2.163	3.67	2.877	9.341	3.821	1.612
2004	7.766	2.862	0.647	2.157	3.71	2.862	9.066	3.824	1.614
2005	7.314	2.777	0.665	2.152	3.675	2.777	9.074	3.796	1.6
2006	6.971	2.715	0.67	2.167	3.665	2.715	9.729	3.914	1.595
2007	6.804	2.669	0.681	2.143	3.634	2.669	8.873	3.821	1.586
2008	6.853	2.664	0.682	2.138	3.641	2.664	8.91	3.853	1.595
2009	6.471	2.574	0.694	2.102	3.548	2.574	8.636	3.839	1.615
2010	6.441	2.55	0.694	2.104	3.532	2.55	8.336	3.833	1.613
2011	6.279	2.485	0.702	2.049	3.473	2.485	8.429	3.795	1.602
2012	6.252	2.515	0.695	2.028	3.444	2.515	7.815	3.666	1.584
2013	6.252	2.5	0.695	2.005	3.389	2.5	7.5	3.602	1.57
2014	6.288	2.5	0.694	1.99	3.389	2.5	7.492	3.566	1.56
2015	6.291	2.463	0.702	1.989	3.393	2.463	7.602	3.59	1.573
1994 to 2015	-56.22%	-36.82%	-61.53%	-18.42%	-24.21%	-36.82%	20.52%	11.02%	1.15%
1999 to 2015	-33.36%	-21.72%	15.88%	-9.60%	-10.46%	-21.72%	-0.37%	-1.56%	-1.58%
2001 to 2015	-26.41%	-18.60%	11.45%	-10.37%	-10.27%	-18.60%	-16.67%	-5.90%	-1.69%
1995 to 2015	-49.46%	-31.42%	24.37%	-15.93%	-19.01%	-31.42%	17.15%	3.98%	-1.00%
2003 to 2015	-18.43%	-14.39%	9.08%	-8.05%	-7.55%	-14.39%	-18.62%	-6.06%	-2.46%
2001 to 2014	-26.45%	-17.36%	10.30%	-10.31%	-10.38%	-17.36%	-17.87%	-6.52%	-2.50%
Mean	8.276	2.905	0.704	2.164	3.713	2.905	8.126	3.696	1.592

Source: Authors' calculation over RAIS microdata.

Table 5: J-Divergence Index: Different Characteristics Contributions

Characteristics	Level		Share of Change	
	2015	1994	1994 - 2015	2001-2015
Schooling	32,81%	24,11%	-4,32%	33,33%
Gender	0,96%	1,33%	2,55%	0,82%
Age	10,82%	10,35%	8,80%	10,82%
Race*	11,11%	5,09%	-	-27,67%
Region	1,77%	1,81%	1,96%	7,54%
Sector	8,63%	8,93%	9,92%	8,37%
Firm Legal Status**	8,15%	3,78%	-2,61%	-2,61%
Firm Size	13,62%	11,15%	3,06%	7,65%
Firm Specific Effect	64,70%	64,66%	64,53%	75,86%

* from 2003 to 2015; ** from 1995 to 2015
Source: Authors' calculation over RAIS microdata.

Between-Within Decomposition of the Inequality Indexes

Table 6: Schooling: Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1994	0.4009	0.1206	0.4235	0.1413	0.8244	0.2620
1995	0.3847	0.1175	0.4246	0.1355	0.8093	0.2530
1996	0.3686	0.1094	0.4094	0.1287	0.7780	0.2381
1997	0.3471	0.1280	0.3937	0.1495	0.7408	0.2775
1998	0.3324	0.1468	0.3887	0.1711	0.7211	0.3179
1999	0.3164	0.1445	0.3724	0.1685	0.6887	0.3131
2000	0.3113	0.1485	0.3719	0.1732	0.6831	0.3216
2001	0.3013	0.1539	0.3795	0.1800	0.6808	0.3339
2002	0.2973	0.1515	0.3794	0.1773	0.6767	0.3288
2003	0.2871	0.1488	0.3775	0.1710	0.6646	0.3199
2004	0.2894	0.1472	0.3805	0.1693	0.6699	0.3165
2005	0.2784	0.1448	0.3715	0.1658	0.6499	0.3107
2006	0.2773	0.1458	0.3817	0.1673	0.6590	0.3130
2007	0.2747	0.1346	0.3719	0.1541	0.6466	0.2887
2008	0.2777	0.1340	0.3755	0.1538	0.6532	0.2878
2009	0.2640	0.1351	0.3616	0.1539	0.6256	0.2889
2010	0.2610	0.1352	0.3576	0.1542	0.6185	0.2893
2011	0.2529	0.1332	0.3480	0.1526	0.6009	0.2858
2012	0.2435	0.1319	0.3304	0.1493	0.5739	0.2812
2013	0.2409	0.1272	0.3245	0.1432	0.5654	0.2704
2014	0.2402	0.1257	0.3239	0.1403	0.5641	0.2660
2015	0.2366	0.1294	0.3222	0.1435	0.5588	0.2729

Source: Authors' calculation over RAIS microdata.
Schooling: 1-"<high school". 2-"high school" e > 3-"high school".

Table 7: Gender Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1994	0.5142	0.0074	0.5577	0.0071	1.0719	0.0145
1995	0.4943	0.0080	0.5523	0.0077	1.0466	0.0157
1996	0.4701	0.0080	0.5303	0.0078	1.0004	0.0157
1997	0.4686	0.0065	0.5369	0.0063	1.0056	0.0128
1998	0.4745	0.0047	0.5552	0.0046	1.0297	0.0092
1999	0.4561	0.0048	0.5362	0.0047	0.9923	0.0094
2000	0.4557	0.0040	0.5411	0.0039	0.9969	0.0079
2001	0.4504	0.0048	0.5548	0.0047	1.0052	0.0095
2002	0.4446	0.0043	0.5525	0.0042	0.9970	0.0085
2003	0.4305	0.0054	0.5433	0.0053	0.9738	0.0107
2004	0.4317	0.0049	0.5450	0.0048	0.9768	0.0096
2005	0.4188	0.0044	0.5330	0.0043	0.9519	0.0087
2006	0.4192	0.0039	0.5451	0.0039	0.9642	0.0078
2007	0.4053	0.0041	0.5221	0.0040	0.9273	0.0081
2008	0.4075	0.0042	0.5252	0.0041	0.9327	0.0083
2009	0.3950	0.0041	0.5114	0.0040	0.9064	0.0081
2010	0.3920	0.0042	0.5076	0.0041	0.8996	0.0083
2011	0.3811	0.0050	0.4957	0.0049	0.8768	0.0099
2012	0.3708	0.0046	0.4752	0.0046	0.8460	0.0092
2013	0.3635	0.0046	0.4632	0.0045	0.8267	0.0091
2014	0.3614	0.0046	0.4596	0.0045	0.8210	0.0091
2015	0.3620	0.0040	0.4617	0.0040	0.8237	0.0080

Source: Authors' calculation over RAIS microdata.
Gender: 0-Females, 1- Males

Table 8: Age Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1994	0.4622	0.0593	0.5117	0.0531	0.9739	0.1125
1995	0.4452	0.0570	0.5089	0.0511	0.9542	0.1082
1996	0.4258	0.0522	0.4910	0.0470	0.9168	0.0993
1997	0.4211	0.0540	0.4948	0.0484	0.9159	0.1024
1998	0.4200	0.0592	0.5069	0.0529	0.9269	0.1121
1999	0.4062	0.0547	0.4918	0.0491	0.8980	0.1038
2000	0.4042	0.0555	0.4951	0.0499	0.8993	0.1054
2001	0.3975	0.0577	0.5074	0.0521	0.9050	0.1098
2002	0.3888	0.0600	0.5022	0.0545	0.8910	0.1145
2003	0.3786	0.0574	0.4961	0.0525	0.8746	0.1098
2004	0.3780	0.0586	0.4959	0.0539	0.8739	0.1125
2005	0.3650	0.0582	0.4835	0.0538	0.8485	0.1120
2006	0.3641	0.0589	0.4942	0.0547	0.8584	0.1137
2007	0.3531	0.0562	0.4737	0.0523	0.8268	0.1085
2008	0.3558	0.0558	0.4773	0.0520	0.8331	0.1079
2009	0.3447	0.0544	0.4647	0.0507	0.8094	0.1051
2010	0.3416	0.0545	0.4607	0.0510	0.8024	0.1055
2011	0.3367	0.0493	0.4545	0.0460	0.7913	0.0954
2012	0.3253	0.0501	0.4333	0.0465	0.7585	0.0966
2013	0.3194	0.0487	0.4230	0.0447	0.7424	0.0934
2014	0.3177	0.0483	0.4202	0.0439	0.7379	0.0922
2015	0.3187	0.0473	0.4230	0.0427	0.7417	0.0900

Source: Authors' calculation over RAIS microdata.
Age: 1-<25. 2-(25-35]. 3-(35-45]. 4->45.

Table 9: Color Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
2003	0.4108	0.0252	0.5237	0.0249	0.9344	0.0500
2004	0.4107	0.0259	0.5240	0.0258	0.9347	0.0517
2005	0.3968	0.0264	0.5108	0.0266	0.9076	0.0530
2006	0.3819	0.0412	0.5076	0.0414	0.8894	0.0826
2007	0.3709	0.0384	0.4876	0.0384	0.8585	0.0769
2008	0.3710	0.0406	0.4878	0.0415	0.8588	0.0821
2009	0.3586	0.0404	0.4739	0.0415	0.8325	0.0820
2010	0.3523	0.0439	0.4660	0.0457	0.8183	0.0896
2011	0.3486	0.0375	0.4617	0.0389	0.8103	0.0764
2012	0.3339	0.0415	0.4363	0.0435	0.7702	0.0849
2013	0.3276	0.0405	0.4254	0.0423	0.7530	0.0828
2014	0.3221	0.0438	0.4183	0.0459	0.7404	0.0897
2015	0.3207	0.0453	0.4186	0.0471	0.7393	0.0924

Source: Authors' calculation over RAIS microdata.
Ethnicity: 1- Indigenous. 2-White. 4- Black. 6- Yellow. 8-Mullato. 9- Ignored

Table 10: Geographical Regions Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1994	0.5110	0.0105	0.5556	0.0092	1.0666	0.0198
1995	0.4906	0.0117	0.5491	0.0110	1.0397	0.0226
1996	0.4645	0.0136	0.5255	0.0126	0.9899	0.0262
1997	0.4614	0.0137	0.5305	0.0127	0.9919	0.0264
1998	0.4664	0.0128	0.5478	0.0120	1.0142	0.0248
1999	0.4467	0.0142	0.5277	0.0132	0.9744	0.0274
2000	0.4459	0.0139	0.5320	0.0130	0.9779	0.0269
2001	0.4405	0.0147	0.5458	0.0138	0.9863	0.0284
2002	0.4350	0.0139	0.5438	0.0129	0.9788	0.0267
2003	0.4223	0.0136	0.5359	0.0127	0.9582	0.0263
2004	0.4232	0.0134	0.5373	0.0126	0.9605	0.0259
2005	0.4110	0.0122	0.5258	0.0116	0.9367	0.0238
2006	0.4111	0.0120	0.5373	0.0116	0.9484	0.0236
2007	0.3981	0.0112	0.5153	0.0107	0.9135	0.0219
2008	0.4009	0.0108	0.5189	0.0104	0.9198	0.0212
2009	0.3890	0.0101	0.5056	0.0099	0.8945	0.0200
2010	0.3869	0.0093	0.5027	0.0090	0.8895	0.0183
2011	0.3786	0.0074	0.4933	0.0073	0.8719	0.0148
2012	0.3677	0.0077	0.4723	0.0075	0.8399	0.0152
2013	0.3603	0.0078	0.4602	0.0075	0.8205	0.0153
2014	0.3587	0.0073	0.4571	0.0070	0.8158	0.0143
2015	0.3585	0.0075	0.4585	0.0072	0.8170	0.0147

Source: Authors' calculation over RAIS microdata.
Regions: 1-North. 2-Northeast. 3-Southeast. 4-South. 5-Central-West.

Table 11: Sector of Activity Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1994	0.4683	0.0490	0.5187	0.0478	0.9870	0.0969
1995	0.4534	0.0488	0.5125	0.0469	0.9660	0.0957
1996	0.4338	0.0441	0.4957	0.0421	0.9295	0.0863
1997	0.4286	0.0465	0.4994	0.0438	0.9280	0.0902
1998	0.4239	0.0553	0.5064	0.0534	0.9303	0.1086
1999	0.4161	0.0448	0.4994	0.0415	0.9155	0.0863
2000	0.4106	0.0491	0.4999	0.0451	0.9105	0.0943
2001	0.4093	0.0458	0.5182	0.0413	0.9276	0.0872
2002	0.4028	0.0461	0.5153	0.0414	0.9180	0.0875
2003	0.3927	0.0432	0.5092	0.0394	0.9018	0.0827
2004	0.3921	0.0445	0.5093	0.0405	0.9014	0.0850
2005	0.3796	0.0436	0.4976	0.0398	0.8772	0.0834
2006	0.3790	0.0441	0.5091	0.0399	0.8880	0.0840
2007	0.3684	0.0409	0.4887	0.0373	0.8571	0.0782
2008	0.3698	0.0418	0.4914	0.0380	0.8612	0.0798
2009	0.3599	0.0392	0.4797	0.0357	0.8396	0.0749
2010	0.3576	0.0386	0.4765	0.0352	0.8341	0.0738
2011	0.3502	0.0359	0.4676	0.0330	0.8178	0.0689
2012	0.3403	0.0351	0.4475	0.0323	0.7879	0.0673
2013	0.3341	0.0339	0.4365	0.0312	0.7706	0.0652
2014	0.3306	0.0354	0.4316	0.0326	0.7622	0.0679
2015	0.3287	0.0374	0.4312	0.0344	0.7599	0.0718

Source: Authors' calculation over RAIS microdata.
Sector: 0- Agriculture. Cattle and Fishing. 1-Manufacturing and Extractive. 2-Construction and Infrastructure 3-Commerce. Food and Lodging. 4-Transportation. Communications. Financial. 5- Real State. Defense and Public Administration 6- Education. Health and Social Services. 7-Other Social Services. Domestic Services. International Organizations.

Table 12: Legal Nature of Firm Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1995	0.4794	0.0223	0.5410	0.0178	1.0204	0.0401
1996	0.4592	0.0185	0.5237	0.0137	0.9829	0.0322
1997	0.4560	0.0189	0.5284	0.0145	0.9843	0.0335
1998	0.4578	0.0213	0.5424	0.0171	1.0002	0.0384
1999	0.4373	0.0235	0.5208	0.0201	0.9581	0.0436
2000	0.4332	0.0266	0.5214	0.0236	0.9546	0.0502
2001	0.4274	0.0278	0.5337	0.0258	0.9611	0.0536
2002	0.4210	0.0278	0.5304	0.0263	0.9514	0.0541
2003	0.4154	0.0205	0.5297	0.0189	0.9451	0.0394
2004	0.4131	0.0235	0.5275	0.0224	0.9406	0.0458
2005	0.3984	0.0248	0.5130	0.0244	0.9114	0.0492
2006	0.3922	0.0309	0.5175	0.0315	0.9097	0.0624
2007	0.3814	0.0279	0.4975	0.0285	0.8789	0.0564
2008	0.3810	0.0306	0.4974	0.0320	0.8784	0.0626
2009	0.3686	0.0305	0.4836	0.0319	0.8521	0.0624
2010	0.3624	0.0338	0.4758	0.0359	0.8382	0.0697
2011	0.3585	0.0276	0.4713	0.0293	0.8298	0.0569
2012	0.3437	0.0317	0.4457	0.0340	0.7895	0.0657
2013	0.3372	0.0309	0.4346	0.0332	0.7718	0.0640
2014	0.3334	0.0325	0.4291	0.0351	0.7625	0.0676
2015	0.3333	0.0327	0.4305	0.0351	0.7639	0.0678

Source: Authors' calculation over RAIS microdata.
Legal Nature Firm: 1- Public. 2- Private. 3-Non Profit. 4- Individuals. 5- International

Table 13: Firm Size (Number of Employees) Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1994	0.4562	0.0654	0.5092	0.0557	0.9653	0.1210
1995	0.4404	0.0618	0.5070	0.0531	0.9474	0.1149
1996	0.4207	0.0573	0.4884	0.0496	0.9091	0.1070
1997	0.4131	0.0620	0.4886	0.0546	0.9018	0.1166
1998	0.4184	0.0608	0.5058	0.0540	0.9242	0.1148
1999	0.4002	0.0607	0.4862	0.0547	0.8863	0.1155
2000	0.3966	0.0632	0.4879	0.0572	0.8844	0.1203
2001	0.3888	0.0664	0.4986	0.0609	0.8874	0.1273
2002	0.3815	0.0673	0.4944	0.0623	0.8759	0.1296
2003	0.3766	0.0593	0.4941	0.0545	0.8707	0.1138
2004	0.3750	0.0616	0.4929	0.0569	0.8679	0.1185
2005	0.3613	0.0620	0.4799	0.0575	0.8411	0.1194
2006	0.3575	0.0656	0.4875	0.0614	0.8450	0.1270
2007	0.3485	0.0608	0.4692	0.0568	0.8178	0.1176
2008	0.3474	0.0642	0.4691	0.0603	0.8165	0.1245
2009	0.3390	0.0601	0.4591	0.0564	0.7980	0.1165
2010	0.3346	0.0694	0.4645	0.0662	0.7991	0.1356
2011	0.3280	0.0581	0.4454	0.0551	0.7734	0.1133
2012	0.3169	0.0585	0.4241	0.0557	0.7410	0.1142
2013	0.3116	0.0565	0.4140	0.0538	0.7256	0.1102
2014	0.3091	0.0568	0.4098	0.0543	0.7190	0.1111
2015	0.3083	0.0578	0.4102	0.0555	0.7185	0.1132

Source: Authors' calculation over RAIS microdata
Firm size: number of employees (1- 0 to 4. 2- 5 to 9. 3- 10 to 19. 4- 20 to 49. 5- 50 to 99. 6- 100 to 249. 7- 250 to 499. 8- 500 to 999 e 9- >1000)

Table 14: Specific Firm Effect Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1994	0.1696	0.3519	0.2143	0.3505	0.3839	0.7025
1995	0.1548	0.3475	0.2070	0.3531	0.3617	0.7006
1996	0.1514	0.3266	0.2032	0.3349	0.3546	0.6616
1997	0.1471	0.3280	0.2001	0.3432	0.3471	0.6712
1998	0.1446	0.3346	0.1971	0.3627	0.3417	0.6973
1999	0.1416	0.3193	0.1978	0.3431	0.3394	0.6624
2000	0.1362	0.3236	0.1939	0.3511	0.3301	0.6746
2001	0.1360	0.3192	0.2018	0.3578	0.3378	0.6770
2002	0.1351	0.3137	0.2023	0.3543	0.3375	0.6680
2003	0.1299	0.3060	0.1936	0.3549	0.3235	0.6610
2004	0.1277	0.3089	0.1922	0.3577	0.3198	0.6665
2005	0.1279	0.2953	0.1925	0.3449	0.3204	0.6402
2006	0.1252	0.2978	0.1907	0.3583	0.3159	0.6561
2007	0.1244	0.2849	0.1876	0.3385	0.3120	0.6234
2008	0.1246	0.2870	0.1872	0.3421	0.3119	0.6291
2009	0.1231	0.2760	0.1832	0.3323	0.3063	0.6083
2010	0.1230	0.2731	0.1834	0.3283	0.3065	0.6014
2011	0.1222	0.2639	0.1817	0.3189	0.3039	0.5828
2012	0.1220	0.2534	0.1792	0.3006	0.3012	0.5540
2013	0.1233	0.2448	0.1781	0.2896	0.3014	0.5344
2014	0.1228	0.2431	0.1769	0.2873	0.2997	0.5304
2015	0.1203	0.2457	0.1733	0.2924	0.2936	0.5381

Source: Authors' calculation over RAIS microdata.
Each firm represents a group.

Table 15: Income Brackets: Contribution to Theil Indexes and J-Divergence

Year	Theil-L		Theil-T		J-Divergence	
	within	between	within	between	within	between
1994	0.0503	0.4712	0.0466	0.5183	0.0969	0.9895
1995	0.0464	0.4559	0.0437	0.5164	0.0901	0.9722
1996	0.0442	0.4338	0.0416	0.4964	0.0858	0.9303
1997	0.0427	0.4324	0.0405	0.5028	0.0832	0.9352
1998	0.0416	0.4377	0.0410	0.5191	0.0826	0.9568
1999	0.0405	0.4204	0.0404	0.5011	0.0809	0.9214
2000	0.0400	0.4198	0.0405	0.5053	0.0805	0.9250
2001	0.0383	0.4168	0.0414	0.5194	0.0798	0.9362
2002	0.0377	0.4111	0.0414	0.5167	0.0791	0.9278
2003	0.0354	0.4006	0.0401	0.5102	0.0755	0.9108
2004	0.0355	0.4011	0.0402	0.5115	0.0756	0.9126
2005	0.0345	0.3888	0.0403	0.4993	0.0747	0.8881
2006	0.0332	0.3899	0.0405	0.5110	0.0737	0.9009
2007	0.0335	0.3758	0.0404	0.4884	0.0739	0.8641
2008	0.0338	0.3778	0.0405	0.4915	0.0743	0.8693
2009	0.0324	0.3667	0.0393	0.4790	0.0716	0.8457
2010	0.0322	0.3640	0.0390	0.4756	0.0712	0.8396
2011	0.0312	0.3549	0.0380	0.4655	0.0692	0.8204
2012	0.0309	0.3445	0.0375	0.4453	0.0683	0.7899
2013	0.0307	0.3373	0.0371	0.4336	0.0679	0.7709
2014	0.0309	0.3351	0.0371	0.4301	0.0679	0.7652
2015	0.0310	0.3351	0.0371	0.4316	0.0680	0.7667

Source: Authors' calculation over RAIS microdata
Earnings brackets: 1- (0% to 5%], 2- (5% to 40%], 3- (40 to 50%], 4- (50% to 90%], 5- (90 to 95%], 6- (95% to 99%], 7- (99% to 99.9%] e 8- >99.9%

Decomposition of Specific Groups Contribution to J-Divergence Inequality

Table 16: Schooling: Contribution to J-Divergence Inequality

Year	< high school	high school	> high school
1994	46.06%	16.36%	37.58%
1995	51.73%	13.12%	35.15%
1996	51.63%	12.03%	36.34%
1997	46.38%	13.37%	40.25%
1998	43.42%	12.54%	44.04%
1999	41.62%	12.22%	46.16%
2000	39.82%	15.56%	44.62%
2001	36.55%	14.25%	49.19%
2002	36.04%	15.51%	48.45%
2003	37.19%	15.69%	47.12%
2004	36.70%	17.91%	45.39%
2005	35.55%	17.83%	46.62%
2006	34.81%	19.50%	45.68%
2007	33.18%	21.11%	45.71%
2008	34.93%	21.35%	43.72%
2009	32.12%	22.10%	45.78%
2010	30.11%	22.59%	47.30%
2011	30.15%	24.35%	45.50%
2012	28.89%	24.36%	46.75%
2013	28.27%	24.37%	47.36%
2014	27.18%	25.79%	47.03%
2015	25.13%	26.20%	48.66%

Schooling:1-<high school, 2-high school and > 3-high school

Source: Authors' calculation over RAIS microdata.

Table 17: Gender: Groups Contribution to J-Divergence Inequality

Year	Females	Males
1994	32.29%	67.71%
1995	32.67%	67.33%
1996	32.26%	67.74%
1997	32.95%	67.05%
1998	34.00%	66.00%
1999	34.71%	65.29%
2000	34.88%	65.12%
2001	34.40%	65.60%
2002	34.93%	65.07%
2003	34.07%	65.93%
2004	34.63%	65.37%
2005	35.03%	64.97%
2006	35.86%	64.14%
2007	35.87%	64.13%
2008	36.40%	63.60%
2009	36.63%	63.37%
2010	36.96%	63.04%
2011	36.69%	63.31%
2012	37.59%	62.41%
2013	38.11%	61.89%
2014	38.43%	61.57%
2015	39.11%	60.89%

Gender: 0-Females, 1- Males

Source: Authors' calculation over RAIS microdata.

Table 18: Age: Groups Contribution to J-Divergence Inequality

Year	< 25	(25-35]	(35-45]	> 45
1994	13.80%	24.47%	33.11%	28.62%
1995	12.92%	24.06%	32.53%	30.49%
1996	12.69%	23.81%	32.03%	31.47%
1997	14.88%	22.11%	30.64%	32.36%
1998	12.20%	21.80%	33.18%	32.82%
1999	13.12%	22.62%	30.56%	33.71%
2000	15.25%	24.19%	29.54%	31.01%
2001	13.23%	21.97%	31.21%	33.60%
2002	12.10%	22.30%	30.20%	35.40%
2003	11.49%	20.64%	30.19%	37.69%
2004	10.60%	20.53%	29.44%	39.43%
2005	9.56%	19.23%	28.93%	42.27%
2006	8.24%	17.98%	28.35%	45.43%
2007	9.52%	17.85%	26.92%	45.71%
2008	8.28%	17.48%	26.28%	47.96%
2009	7.53%	16.87%	25.47%	50.14%
2010	7.57%	16.01%	23.67%	52.74%
2011	7.27%	15.76%	23.38%	53.59%
2012	7.73%	15.90%	22.90%	53.48%
2013	7.51%	15.38%	22.82%	54.29%
2014	7.53%	15.04%	22.66%	54.78%
2015	7.12%	14.98%	22.92%	54.98%

Age: 1-<25, 2-(25-35], 3-(35-45], 4->45.

Source: Authors' calculation over RAIS microdata.

Table 19: Color: Groups Contribution to J-Divergence Inequality

Year	Indigenous	White	Black	Yellow	Mullato	Ignored
2003	0.43%	60.39%	2.96%	0.84%	17.37%	18.02%
2004	0.41%	59.54%	2.98%	1.02%	18.55%	17.51%
2005	0.26%	61.64%	3.13%	1.03%	18.55%	15.39%
2006	0.20%	72.80%	3.36%	1.28%	17.28%	5.07%
2007	0.24%	67.31%	3.10%	1.28%	16.19%	11.89%
2008	0.26%	69.07%	3.52%	1.53%	19.27%	6.35%
2009	0.26%	69.89%	3.49%	1.36%	18.65%	6.34%
2010	0.33%	70.04%	3.49%	1.29%	19.39%	5.47%
2011	0.24%	69.62%	3.48%	1.23%	19.94%	5.49%
2012	0.24%	67.85%	3.41%	1.37%	20.99%	6.14%
2013	0.36%	67.17%	3.47%	1.42%	21.38%	6.20%
2014	0.27%	66.35%	3.50%	1.40%	22.15%	6.34%
2015	0.24%	65.37%	3.45%	1.61%	22.66%	6.67%

Ethnicity: 1- Indigenous, 2-White, 4- Black, 6- Yellow, 8-Mullato, 9- Ignored

Source: Authors' calculation over RAIS microdata.

Table 20: Geographical Regions: Groups Contribution to J-Divergence Inequality

Year	North	Northeast	Southeast	South	Central-West
1994	10.59%	24.06%	39.45%	17.39%	8.50%
1995	3.22%	28.78%	45.45%	13.72%	8.83%
1996	3.55%	28.92%	49.32%	9.78%	8.43%
1997	3.44%	23.13%	50.74%	13.65%	9.05%
1998	5.69%	28.11%	44.07%	12.08%	10.05%
1999	3.00%	15.30%	57.27%	13.98%	10.45%
2000	3.08%	15.10%	53.60%	14.32%	13.90%
2001	3.97%	15.00%	52.39%	14.29%	14.35%
2002	3.76%	11.62%	54.17%	14.66%	15.79%
2003	3.61%	14.36%	55.63%	14.56%	11.84%
2004	4.31%	14.96%	55.21%	13.52%	11.99%
2005	3.85%	12.49%	55.51%	14.42%	13.73%
2006	4.11%	12.69%	55.72%	14.96%	12.54%
2007	3.71%	11.64%	60.16%	13.94%	10.54%
2008	4.68%	14.69%	55.31%	15.23%	10.09%
2009	4.07%	13.57%	54.92%	16.03%	11.41%
2010	4.75%	13.94%	53.42%	16.64%	11.25%
2011	4.63%	13.98%	52.30%	17.53%	11.57%
2012	4.56%	16.37%	51.94%	16.40%	10.73%
2013	4.63%	15.69%	52.16%	16.50%	11.02%
2014	4.71%	15.49%	51.71%	16.59%	11.51%
2015	4.72%	15.89%	52.08%	16.28%	11.03%

Regions: 1-North, 2-Northeast, 3-Southeast, 4-South, 5-Central-West.

Source: Authors' calculation over RAIS microdata.

Table 21: Sector of Activity: Groups Contribution to J-Divergence Inequality

Year	Agriculture, Cattle and Fishing	Manufacturing and Extractive	Construction and Infrastructure	Commerce, Food and Lodging	Transportation, Communications, Financial	Real State, Defense and Public Administration	Education, Health and Social Services	Other Social Services, Domestic Services, International Organizations
1994	5.29%	14.62%	8.38%	7.68%	9.34%	43.90%	7.16%	3.63%
1995	5.37%	15.21%	5.86%	7.05%	9.81%	48.57%	3.48%	4.65%
1996	3.86%	14.54%	6.12%	7.23%	11.52%	48.84%	2.84%	5.05%
1997	4.13%	17.28%	5.76%	7.63%	11.32%	44.12%	3.70%	6.05%
1998	4.06%	12.73%	5.40%	6.82%	13.29%	47.47%	4.95%	5.28%
1999	5.84%	16.03%	5.50%	8.42%	10.05%	42.68%	4.20%	7.28%
2000	4.74%	17.14%	4.83%	10.05%	9.39%	41.68%	5.55%	6.62%
2001	3.66%	14.92%	4.57%	9.59%	19.69%	36.81%	4.15%	6.61%
2002	3.96%	15.73%	4.96%	10.02%	16.67%	37.49%	4.72%	6.45%
2003	4.10%	19.41%	5.33%	10.85%	11.26%	36.40%	5.04%	7.60%
2004	4.03%	18.38%	5.19%	11.03%	10.89%	38.86%	4.99%	6.62%
2005	3.72%	19.27%	5.42%	11.20%	11.89%	35.55%	6.12%	6.84%
2006	3.42%	20.85%	5.63%	11.57%	10.91%	36.05%	5.56%	6.01%
2007	3.05%	19.70%	5.36%	11.31%	11.03%	38.46%	5.73%	5.37%
2008	3.00%	20.02%	5.89%	11.64%	11.30%	35.67%	5.87%	6.61%
2009	2.90%	20.93%	6.61%	12.35%	11.53%	33.80%	6.39%	5.50%
2010	2.57%	19.29%	6.92%	12.44%	10.14%	36.48%	7.04%	5.12%
2011	2.68%	20.85%	7.96%	13.20%	11.13%	31.94%	7.68%	4.56%
2012	2.41%	19.45%	8.25%	13.11%	10.06%	35.11%	7.13%	4.48%
2013	2.47%	19.90%	7.91%	13.50%	10.26%	33.54%	7.73%	4.68%
2014	2.52%	20.66%	7.73%	13.64%	10.66%	31.66%	8.69%	4.43%
2015	2.39%	20.70%	7.24%	14.01%	12.02%	30.64%	8.74%	4.25%

Sector: 0- Agriculture, Cattle and Fishing, 1- Manufacturing and Extractive, 2-Construction and Infrastructure, 3- Commerce, Food and Lodging, 4-Transportation, Communications, Financial, 5- Real State, Defense and Public Administration, 6- Education, Health and Social Services, 7- Other Social Services, Domestic Services, International Organizations

Source: Authors' calculation over RAIS microdata.

Table 22: Legal Nature of Firm: Groups Contribution to J-Divergence Inequality

Year	Public	Private	Non Profit	Individuals
1994				
1995	46.92%	45.68%	5.21%	2.19%
1996	46.73%	45.24%	5.95%	2.08%
1997	38.79%	51.49%	7.24%	2.48%
1998	42.59%	47.56%	7.56%	2.29%
1999	35.21%	52.39%	9.62%	2.77%
2000	33.94%	54.28%	8.87%	2.91%
2001	31.02%	58.17%	8.51%	2.30%
2002	30.68%	58.17%	8.95%	2.19%
2003	28.44%	59.24%	10.12%	2.19%
2004	31.24%	57.49%	9.10%	2.17%
2005	27.82%	60.22%	10.05%	1.92%
2006	27.49%	61.83%	8.92%	1.76%
2007	31.15%	59.43%	7.79%	1.63%
2008	26.99%	62.41%	9.10%	1.50%
2009	25.47%	64.90%	8.11%	1.52%
2010	29.10%	62.27%	7.24%	1.39%
2011	23.22%	68.16%	7.17%	1.45%
2012	27.15%	64.91%	6.69%	1.25%
2013	25.50%	65.93%	7.25%	1.32%
2014	23.06%	68.47%	7.18%	1.29%
2015	21.49%	70.12%	7.12%	1.26%

Legal Nature Firm: 1- Public, 2- Private, 3-Non Profit, 4-Individuals

Source: Authors' calculation over RAIS microdata.

Table 23: Firm Size (Number of Employees): Groups Contribution to J-Divergence Inequality

Year	0 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100 to 249	250 to 499	500 to 999	>1000
1994	6.11%	3.98%	4.25%	5.99%	4.99%	8.62%	8.44%	8.80%	48.81%
1995	4.30%	3.35%	4.01%	5.99%	5.61%	11.30%	13.10%	16.11%	36.24%
1996	4.28%	3.17%	3.75%	5.90%	5.12%	10.47%	12.77%	14.40%	40.14%
1997	5.17%	3.82%	4.44%	6.60%	5.84%	12.19%	13.11%	13.67%	35.17%
1998	4.88%	3.84%	4.52%	6.49%	5.26%	9.64%	9.74%	11.77%	43.86%
1999	5.53%	4.12%	4.61%	6.63%	5.73%	10.80%	10.34%	12.23%	40.01%
2000	5.85%	4.45%	5.22%	6.96%	6.26%	10.92%	10.92%	12.19%	37.23%
2001	5.68%	4.80%	6.19%	8.98%	6.63%	10.62%	10.76%	12.50%	33.84%
2002	5.90%	4.81%	5.93%	8.50%	6.49%	10.50%	10.82%	11.82%	35.23%
2003	6.42%	4.67%	5.41%	7.50%	6.12%	11.43%	11.54%	13.55%	33.35%
2004	6.16%	4.55%	5.22%	7.15%	6.12%	10.97%	12.26%	13.60%	33.96%
2005	5.83%	4.41%	5.24%	7.38%	6.08%	10.82%	11.45%	13.59%	35.20%
2006	5.95%	4.45%	5.20%	7.30%	6.17%	10.83%	11.18%	13.52%	35.39%
2007	5.76%	4.23%	4.94%	6.91%	5.72%	9.71%	10.12%	11.59%	41.02%
2008	5.75%	4.21%	4.91%	6.93%	5.76%	10.13%	10.99%	13.43%	37.89%
2009	5.88%	4.29%	5.04%	7.10%	6.24%	10.38%	11.56%	13.02%	36.48%
2010	5.60%	4.12%	4.69%	6.70%	5.54%	9.26%	10.38%	14.37%	39.34%
2011	5.88%	4.41%	5.16%	7.64%	6.46%	10.77%	10.41%	12.34%	36.93%
2012	5.91%	4.47%	5.23%	7.43%	6.45%	10.54%	10.93%	13.05%	35.97%
2013	6.01%	4.57%	5.27%	7.58%	6.49%	10.50%	11.24%	12.79%	35.54%
2014	6.07%	4.67%	5.41%	7.69%	6.61%	10.56%	10.99%	11.82%	36.17%
2015	6.21%	4.82%	5.72%	8.03%	6.61%	10.71%	10.84%	12.27%	34.81%

Firm size: number of employees (1- 0 to 4, 2- 5 to 9, 3- 10 to 19, 4- 20 to 49, 5- 50 to 99, 6- 100 to 249, 7- 250 to 499, 8- 500 to 999 e 9- >1000)

Source: Authors' calculation over RAIS microdata.

Table 24: Income Brackets: Groups Contribution to J-Divergence Inequality

Year	0% to 5%	5% to 40%	40 to 50%	50% to 90%	90 to 95%	95% to 99%	99% to 99,9%	>99,9%
1994	10.13%	29.56%	3.80%	6.60%	8.55%	22.09%	15.54%	3.74%
1995	9.63%	28.77%	3.53%	6.11%	8.22%	23.33%	16.49%	3.92%
1996	9.20%	28.87%	3.48%	5.93%	8.14%	23.02%	17.09%	4.26%
1997	8.36%	28.93%	3.43%	5.65%	7.98%	23.73%	17.61%	4.32%
1998	7.89%	28.28%	3.56%	5.46%	7.47%	23.84%	18.82%	4.67%
1999	7.66%	28.23%	3.52%	5.58%	7.63%	23.72%	18.69%	4.97%
2000	7.51%	27.88%	3.44%	5.55%	7.54%	23.94%	19.08%	5.06%
2001	7.15%	26.42%	3.55%	5.46%	7.05%	23.41%	20.17%	6.78%
2002	7.03%	26.03%	3.57%	5.49%	7.01%	23.31%	20.49%	7.07%
2003	7.43%	24.87%	3.47%	5.36%	7.09%	23.65%	20.74%	7.39%
2004	7.02%	24.99%	3.61%	5.39%	7.16%	23.94%	20.75%	7.13%
2005	7.36%	24.25%	3.55%	5.51%	7.12%	23.80%	21.07%	7.34%
2006	7.33%	23.17%	3.69%	5.33%	6.82%	23.56%	22.22%	7.87%
2007	6.96%	23.67%	3.65%	5.66%	7.10%	24.11%	21.53%	7.33%
2008	6.73%	23.89%	3.59%	5.67%	7.09%	24.10%	21.56%	7.37%
2009	6.78%	23.43%	3.59%	5.59%	7.18%	24.76%	21.44%	7.22%
2010	6.86%	23.27%	3.54%	5.60%	7.29%	24.86%	21.58%	7.00%
2011	6.58%	23.34%	3.56%	5.49%	7.33%	24.78%	21.56%	7.36%
2012	6.74%	23.89%	3.60%	5.65%	7.62%	24.74%	20.69%	7.08%
2013	6.85%	24.27%	3.34%	5.72%	7.69%	24.81%	20.33%	7.00%
2014	6.97%	24.24%	3.36%	5.73%	7.73%	24.56%	20.35%	7.06%
2015	6.96%	24.06%	3.30%	5.71%	7.76%	24.64%	20.44%	7.13%

Earnings brackets: 1- (0% to 5%], 2- (5% to 40%], 3- (40 to 50%], 4- (50% to 90%], 5- (90 to 95%], 6- (95% to 99%], 7- (99% to 99,9%] e 8- >99,9%,

Source: Authors' calculation over RAIS microdata.

Table 25: Specific Income Brackets Contributions to J-Divergence Inequality

Year	Top 10%	Top 5%	Top 1%	Top 0.1%
1994	49,91%	41,36%	19,28%	3,74%
1995	51,96%	43,74%	20,41%	3,92%
1996	52,52%	44,37%	21,35%	4,26%
1997	53,64%	45,66%	21,93%	4,32%
1998	54,81%	47,33%	23,49%	4,67%
1999	55,00%	47,37%	23,66%	4,97%
2000	55,63%	48,08%	24,15%	5,06%
2001	57,42%	50,36%	26,95%	6,78%
2002	57,89%	50,88%	27,56%	7,07%
2003	58,87%	51,78%	28,13%	7,39%
2004	58,98%	51,82%	27,88%	7,13%
2005	59,34%	52,22%	28,41%	7,34%
2006	60,48%	53,65%	30,09%	7,87%
2007	60,07%	52,96%	28,86%	7,33%
2008	60,12%	53,03%	28,93%	7,37%
2009	60,61%	53,43%	28,67%	7,22%
2010	60,72%	53,43%	28,57%	7,00%
2011	61,03%	53,70%	28,92%	7,36%
2012	60,13%	52,51%	27,76%	7,08%
2013	59,82%	52,14%	27,33%	7,00%
2014	59,70%	51,97%	27,41%	7,06%
2015	59,97%	52,22%	27,57%	7,13%
1994-2015 Rate of Change	20,15%	26,24%	43,05%	90,98%

Source: Authors' calculation over RAIS microdata.