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Union-nonunion wage gap: Some unexpected findings in Brazilian labour market

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**UNION-NONUNION WAGE GAP:
SOME UNEXPECTED FINDINGS IN
BRAZILIAN LABOUR MARKET**

**André Gambier Campos
Ana Carolina Moura**

DISCUSSION PAPER



UNION-NONUNION WAGE GAP: SOME UNEXPECTED FINDINGS IN BRAZILIAN LABOUR MARKET¹

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DISCUSSION PAPER

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ABSTRACT

This paper presents new empirical evidence about the wage gap between union and nonunion workers in Brazil. In principle, due to the rules governing union organization/mobilization, no one should rationally expect such gap. However, as this paper reveals, there is empirical evidence of its existence in the labour market. Furthermore, this wage gap may increase in the future, depending on how the labour reform conducted through the Bill n. 6.787/2016 (under discussion in the Parliament) may be implemented.

Keywords: unions; collective bargaining; wages.

SINOPSE

Este trabalho apresenta novas evidências empíricas sobre a diferença salarial entre trabalhadores sindicalizados e não sindicalizados no Brasil. Em princípio, devido às regras que regem a organização/a mobilização de sindicatos, ninguém deveria esperar essa diferença. Mas, como revela este estudo, há evidências empíricas de sua existência no mercado de trabalho. Além disso, esta diferença pode aumentar no futuro, a depender de como a reforma trabalhista realizada por meio do projeto de lei nº 6.787/2016 (em discussão no Parlamento) for implementada.

Palavras-chave: sindicatos; negociação coletiva; salários.

1 INTRODUCTION

Contrary to other countries, in Brazil, there is a scarcity of studies about wage gaps between union and nonunion workers. The reason is rather obvious: the rules for union organization assert that all workers have to contribute to their class institutions.¹ Affiliated or not, those workers have the obligation to fund those institutions, through the collection of a compulsory fee, which is a fundamental instrument of funding not only for unions, but also for federations, confederations and trade-union centrals.²

This compulsory funding, provided by union and nonunion workers, dates back to the 1930s. It was then a crucial aspect of the labour relations system, implemented by a corporative State, which has ruled the country for many years. This system included also: *i*) an official monopoly of collective representation by unions, according to territorial, economical and professional criteria; *ii*) a lack of collective representation inside companies, like “work councils” and similar organizations; *iii*) a bargaining mechanism with little room to construct collective agreements, due to the extensive role played by individual contracts, strictly defined by labour law; *iv*) a special branch of State justice, dedicated to solve any kind of conflicts between workers and companies, including those concerning collective agreements.

This system has been the subject of many studies in Brazilian academy (Martins, 1989; Martins Rodrigues, 1989; Paoli, 1985; Rodrigues, 1979; Vianna, 1976), so that we will not detail it further here. The only aspect to deserve attention is a consequence of this kind of union funding: as all workers contribute to their organizations, all of them benefit from their mobilizations. In other words, associated or not, those workers benefit from collective agreements signed by unions – including agreements concerning direct and indirect wages (fringe benefits, like food ticket, transport service and health assistance).³

Therefore, contrary to what is seen in other countries (and described by Long, 2013; Mishel, 2012; Sherk, 2009) it is really unexpected to find any kind of wage gap between union and nonunion workers in Brazil. Due to the kind of union funding

1. Rules defined mainly by: *i*) the CLT (*Consolidação das Leis do Trabalho*), which is a compilation of labour laws, edited in 1943; *ii*) the CF (*Constituição Federal*), which brings the fundamental rules of Brazilian State and society, edited in 1988.

2. According to the CLT, the annual amount of money collected by this compulsory fee (named *contribuição sindical*) is equivalent to the amount of money perceived by a worker in one day of regular work. Once a year, this fee is forcibly dis-counted from worker’s payroll and deposited in favor of unions, federations, confederations and centrals.

3. About the relevance of collective bargaining in the definition of direct and indirect wages in Brazil, see Cardoso (2013); Dedecca, Jungbluth e Trovão (2008); e Dieese (2012).

long-established by the State, collective bargaining benefits all workers indistinctly, no matter their union status. Nonetheless, is this really supported by the most recent empirical evidence at disposal? This discussion paper presents such evidence and discusses its implications for the wage-gap debate (despite the scarcity of studies about this in Brazil).

This paper is organized as follows. In the next part, we discuss methodological aspects, including the focus of analysis, the sources of data, the techniques adopted and, finally, the shortcomings of those techniques. After that, we present some evidence about the wage gap between union and nonunion workers, using descriptive statistics, as well as correlational ones (linear, quantile and logistic regressions). In the last part, we present some key facts, which may be useful to discuss not only the current wage gap, but also the future one – because the labour/union reform, which is now under debate in Brazil's Parliament, may eventually increase this gap.⁴

2 METHODOLOGICAL ASPECTS

2.1. Focus

In order to analyze the wage gap between union-nonunion workers, we adopt a very strict focus. In subjective terms, this focus corresponds not to all Brazilian workers, but only to registered wage employees (so-called *celetistas*); working not in all economic sectors, but solely in manufacturing, construction, commerce and private services. Thus, workers like nonregistered wage employees and self-employees, as well as workers in agriculture, livestock and public service are out of the scope of analysis.⁵

Furthermore, in objective terms, the focus of this paper is on direct wages, considered as those gross monetary values, monthly perceived by workers in their principal jobs, as well as on indirect wages, taken as those most relevant fringe benefits paid for workers in their main jobs (food ticket, transport service and health assistance). Other forms of compensation (profit and gain sharing, i.e.) are out of the realm of analysis.

4. This labour/union reform, currently in discussion in Parliament, is consolidated under the Bill n. 6.787/2016. Further information about this bill may be found at the website: <<https://goo.gl/GeiEUK>>.

5. Historically, nonregistered wage employees and self-employees, in all sectors, are involved in very particular kinds of unions in Brazil. Besides, workers of all types (including registered wage employees), in agriculture, livestock and public service sectors, are involved in very specific kinds of unions too. About that, check Campos (2016); Cardoso (2003); e Rodrigues (2015). That is why we opt for a restrict focus in this discussion paper, studying only the workers mentioned above.

2.2 Data

In this paper, we use microdata of the National Household Survey (Pnad), conducted by the Brazilian Institute of Geography and Statistics (IBGE), in September of 2015.⁶ Briefly, this is an annual multipurpose survey, with a large sample of cases and lots of information about the insertion of workers in the labour market – what includes information about their affiliation to unions. It is important to notice that this is just cross-section (or latitudinal) data, what has implications for the kind of analysis that can be developed here (more on this, see subsection 2.4).

2.3 Techniques

Regarding techniques of analysis, firstly, this paper presents some descriptive statistics, about the current wage gap between union and nonunion workers – basically, compared means of direct wages and compared distributions of fringe benefits. Secondly, this paper refines those statistics, using some correlational techniques – like linear, quantile and logistic regressions.⁷ The idea is to expunge the effect of many control variables (observable attributes of workers and firms), in order to get closer to the “exclusive” effect of the variable of interest (the act of being associated to a union) on wages. Once more, it is relevant to stress that the type of data used (cross-section) has consequences to the results that can be achieved with those techniques (more on this, see subsection 2.4).

2.4. Shortcomings

There are many methodological shortcomings for the analysis developed in this paper (not to mention the theoretical ones). Among others, it is possible to highlight the following:

- I) There may be “selection” problems in trying to compare wages of union and non-union workers, due to workers’ and firms’ observable attributes (beyond those incorporated in regressions), as well as due to non-observable characteristics of the same units of analysis.
- II) At least in part, those “selection” problems could be solved by using longitudinal (panel) data, able to account for fixed non-observable attributes of workers and companies. Nevertheless, the data at our disposal (Pnad/IBGE) are latitudinal, making it impossible to adopt this methodological solution.

6. Several references about Pnad/IBGE (2015) can be found at this website: <<https://goo.gl/BWftPz>>.

7. The Stata coding to get those descriptive and correlational statistics is fully reproduced in the annex of this paper.

III) In some extent, those “selection” problems could be addressed with the use of non-correlational techniques. For example, techniques based on instrumental variables, fully able to predict union membership, but not directly related to workers’ wages. Nonetheless, it is extremely difficult to find adequate instruments in this realm of analysis.

The specialized literature (Addison, Portugal e Vilares, 2017; Budd e Na, 2000; Hirsch, 2004; Western e Rosenfeld, 2011) has already pointed out some of those shortcomings. In addition, to account for the wage gap phenomenon, further analysis is necessary, based on different techniques and on diverse data, in order to confirm the evidences presented in this paper.

3 EVIDENCE ABOUT WAGE GAP

3.1. Descriptive statistics

Through a simple comparison of wage averages (direct wages, expressed in R\$ of September, 2015), it is possible to find a difference between union and nonunion workers. Focusing on a point estimate, this difference equals R\$ 562,18 in absolute terms, in favor of union workers (or 33,5% in relative terms) (table 1).⁸

Moreover, focusing on interval estimates, it is feasible to notice that this difference is statistically significant (at a confidence level of 95,0%). The wage interval of union workers is higher (R\$ 2.157,17-R\$ 2.318,55) and does not cross the one of nonunion (R\$ 1.642,48-R\$ 1.708,87) (table 1).

Even if we take the natural-logarithm of direct wages, it is possible to encounter a difference between union and nonunion workers. Graphs 1 and 2, a box plot and a density plot, show that the distributions of wages for both groups of workers are different.

In sum, although unexpected, there is a wage differential among Brazilian workers, apparently related to their union affiliation. And this is rather relevant (in relative numbers, not less than 33,5%). In subsection 3.2, we will try to go further in this differential, to check to what extent it is linked to union status.

8. Table 2 shows the results for an F-test (adjusted Wald test) for equality of means. It is possible to see that the point estimate of wage difference between union and nonunion workers is statistically significant.

TABLE 1
Direct wages – comparison of means

	Mean	Standard error	Confidence interval (95,0% - low)	Confidence interval (95,0% - high)
Nonunion (A)	1,675.68	16.93	1,642.48	1,708.87
Union (B)	2,237.86	41.16	2,157.17	2,318.55
Difference (B-A) (R\$)	562.18	-	-	-
Difference ((B-A)/A) (%)	33.5	-	-	-

Source: Pnad/IBGE microdata (2015), with sampling design incorporated to the estimates.⁹

Notes: Variable of interest: monthly income of the main job (V4718). Control variable: union membership (V9087). Filter: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809).

TABLE 2
Direct wages – Wald test (adjusted)

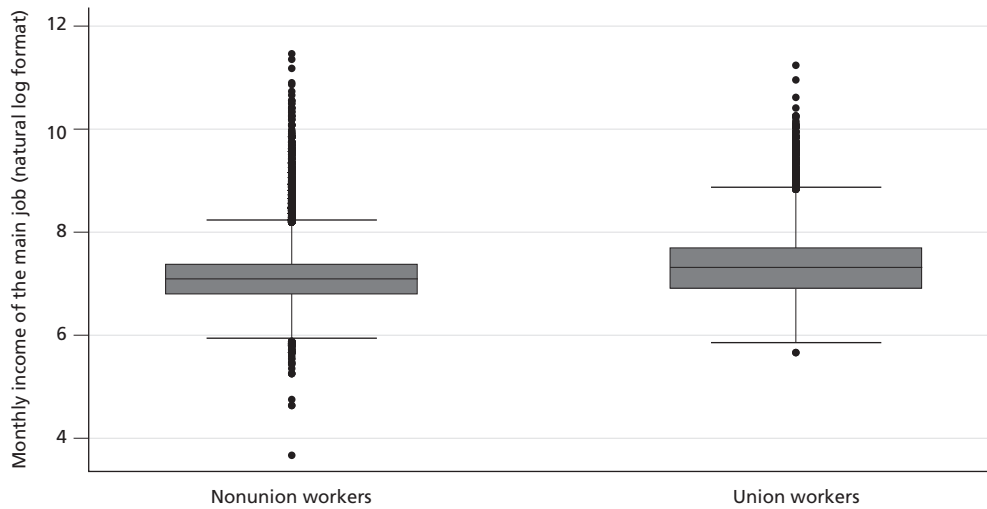
(1) [V4718] Not - [V4718] Yes = 0

F (1, 5436) = 210.52

Probability > F = 0.0000

Source: Pnad/IBGE microdata (2015), with sampling design incorporated to the estimates.

GRAPH 1
Direct wages – distribution of monthly income of the main job (natural log format)

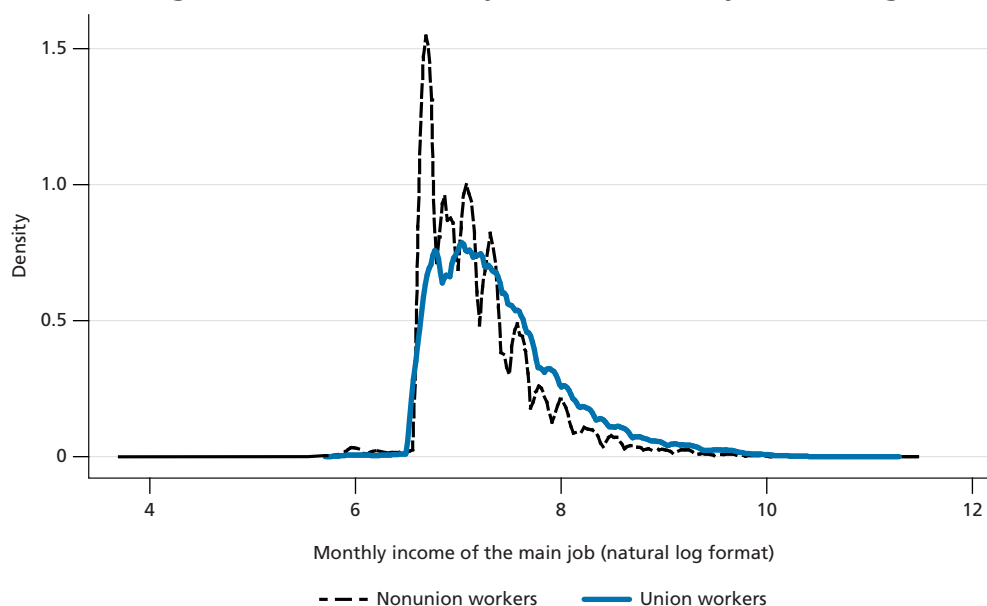


Source: Pnad/IBGE microdata (2015), with sampling design incorporated to the estimates.

Notes: Box plot. Variable of interest: monthly income of the main job (V4718) in natural log format. Control variable: union membership (V9087). Filter: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809).

9. Throughout this paper, we display the code of the variables of Pnad/IBGE always in parentheses.

GRAPH 2
Direct wages – distribution of monthly income of the main job (natural log format)



Source: Pnad/IBGE microdata (2015), with sampling design incorporated to the estimates.

Notes: Kernel density plot. Variable of interest: monthly income of the main job (V4718) in natural log format. Control variable: union membership (V9087). Filter: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809).

Regarding indirect wages (fringe benefits, like food ticket, transport service and health assistance), the situation is similar. A contingency table, comparing the access of union and nonunion workers to those fringe benefits, exhibits marked differences, especially in respect to health and food.

About health assistance, 36,0% of union workers benefit from it, against 20,3% of nonunion. As for the food ticket, 63,9% of union workers have access to it, against 49,3% of nonunion. Finally, about transport service, 54,4% of union workers benefit from it, against 49,1% of nonunion (table 3).

The Pearson chi-square statistics for those percentages (statistics corrected for design-based F) reinforce that there is a relationship between access to benefits and union affiliation (table 3). In subsection 3.2, we will try to go further in this subject, to ascertain how strong this kind of relationship may be.

TABLE 3
Indirect wages – contingency table and association tests

Food ticket	Union membership (% column)		Total
	No	Yes	
No	50,7	36,1	47,0
Yes	49,3	63,9	53,0
Total	100,0	100,0	100,0
Pearson: uncorrected chi2 (1) = 965.4369. Design-based F (1, 5441) = 555.9215 P = 0.0000.			

Transport service	Union membership (% column)		Total
	No	Yes	
No	50,9	45,6	49,6
Yes	49,1	54,4	50,4
Total	100,0	100,0	100,0
Pearson: uncorrected chi2 (1) = 128.5725. Design-based F (1, 5441) = 63.7179 P = 0.0000.			

Health assistance	Union membership (% column)		Total
	No	Yes	
No	79,7	64,0	75,7
Yes	20,3	36,0	24,3
Total	100,0	100,0	100,0
Pearson: uncorrected chi2 (1) = 1495.7579. Design-based F (1, 5441) = 846.4519 P = 0.0000.			

Source: Pnad/IBGE microdata (2015), with sampling design incorporated to the estimates.

Notes: Variable of interest: access to fringe benefits in the main job, for food (V9044), transport (V9045) and health (V9047). Control variable: union membership (V9087).

Filter: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809).

3.2. Correlational statistics

In this subsection, the idea is to scrutinize the results previously found, about differences between union and nonunion workers, regarding direct and indirect wages. The numbers presented above were part of a descriptive analysis, focused on a simple contrast of wages. But the figures depicted are the results of correlational (or regression) analysis, dedicated to a controlled comparison of wages.

This control involves observable attributes of the firms and, at the same time, of the workers. Among the former, it is possible to cite: geographic location of firms, their size in terms of staff and their economic activities. By the other side, amidst the latter, it is possible to name: workers' sex, age, position in the family, race, migration, schooling, occupation, work time and tenure.

The characteristic of interest is the union affiliation, which is believed to be tied to direct and indirect wages, according to descriptive evidence presented above. To check if this belief stands, we use some correlational techniques, like linear, quantile and logistic regressions. Despite the mentioned shortcomings, we consider that these techniques may be a starting point to investigate links between union membership and wages.

To begin with, the multiple linear regression shows that some attributes are particularly relevant to “explain” the variability on direct wages. Referring to firms, they are the geographic region (if affluent, wages increase) and the economic sector (if commerce, wages decrease). Moreover, referring to workers, those attributes are occupation (if skilled, wages increase), schooling (wages increase with years of school), age (wages increase with years of living), sex (if male, wages increase) and migration (if migrant, wages increase) (table 4).

Anyway, the characteristic of interest in this study also appears to “explain” part of the variability on direct wages. When unionized, workers are paid 8,4% more, considering a statistical significance of 0,01. This is the “liquid” effect of union membership, expunging the effects of other attributes, related to firms and workers. Obviously, this is much less than the percentage of 33,5%, seen above in the descriptive analysis – even so, this is important to predict the distribution of direct wages (table 4).

TABLE 4
Direct wages – multiple linear regression

Firms' attributes	Coefficients (and standard errors)
Geographic region - non-affluent (North, Northeast, Center-West) vs. affluent (Southeast, South)	0.161*** (0.005)
Geographic situation - rural vs. urban	0.037*** (0.012)
Geographic area - non-metropolitan vs. metropolitan	0.061*** (0.006)
Number of workers in the firm - up to 10 vs. 11 +	0.097*** (0.005)
Economic activity- other vs. manufacturing/other industries	-0.052*** (0.009)
Economic activity - other vs. commerce	-0.137*** (0.009)
Economic activity - other vs. services	-0.094*** (0.009)
Workers' attributes	Coefficients (and standard errors)
Sex - female vs. male	0.229*** (0.004)
Age (natural log)	0.228*** (0.008)
Position in family - other vs. reference	0.084*** (0.004)

(Continues)

(Continued)

Workers' attributes	Coefficients (and standard errors)
Race – non-white vs. white	0.102*** (0.005)
If migrant - no vs. yes	0.179*** (0.013)
Number of years of school (natural log)	0.192*** (0.010)
Occupation - other vs. low-skilled workers ¹⁰	-0.139*** (0.016)
Occupation - other vs. medium-skilled workers ¹⁰	-0.053*** (0.019)
Occupation - other vs. high-skilled workers ¹⁰	0.512*** (0.021)
Number of hours worked per week (natural log)	0.044*** (0.008)
Tenure - number of months (natural log)	0.070*** (0.002)
Unionization – no vs. yes	0.084*** (0.006)
Constant	5.158*** (0.046)
Number of observations	55,733
R ²	0.455
F (19, 5396)	625.51
Probability > F	0.000

Source: Pnad/IBGE microdata (2015), with sampling design incorporated to the estimates.

Notes: Response variable: monthly income of the main job (V4718), in natural log format. Predictor variables: refer to firms and workers, categorical and numerical (in natural log format), only in their main effects. Method: ordinary least squares estimates, with forced entry of single-stage variables. Filters: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809). Significance: *** p<0.01, ** p<0.05, * p<0.1.

The quantile regression provides another angle to this analysis, showing how firms' and workers' attributes are relevant to “explain” the variability on direct wages, according to each fraction in the distribution of those wages. To keep things simple, the focus is only on three quantiles of this distribution: the 5th (workers with low wages), 50th (workers with median wages) and 95th (workers with higher wages).

As seen in the table 5, the relevant characteristics to “explain” the variability on direct wages are not the same for all workers. Some are important for low-wage workers, but are not for high-wage. Furthermore, some characteristics present a direct relationship

10. The makeup of this variable is detailed in the Stata coding, presented in the annex of this paper. Roughly, it is the result of a combination of the following variables of Pnad/IBGE: V4810 (occupational groups) and V4803 (number of years of school).

with wages among workers in the low-end of the scale, but an inverse relationship amidst the ones in the high-end (table 5).

In spite of that, the attribute of interest in this paper exhibits a singular feature: the (unique) influence of union membership over direct wages increases accordingly to those wages. In the 5th quantile, union workers are paid 3,6% more than nonunion. In the 50th, they are paid 7,5% more. In the 95th, they are paid 8,9% more. All percentages are significant at 0,01 level (table 5) – as well as each one is different from the other (as may be seen in table 6, which affords an F-test for equality of quantile coefficients).

Graph 3 resumes all this in a simple figure, showing the regression coefficients (the “unique” influence) of union membership on each quantile of wages distribution. Roughly speaking, this membership is more and more relevant to “explain” the variability on direct wages as those wages increase. Apparently, unions are more important to foster wages of workers in the high-end of the wage scale – by the way, this is similar to what part of the literature asserts about unions in Brazil (Cardoso, 1999; 2003; Martins Rodrigues, 1989; 1990).

TABLE 5
Direct wages – quantile regression

Firms' attributes	Coefficients (and standard errors)		
	Quantile 5	Quantile 50	Quantile 95
Geographic region - non-affluent (North, Northeast, Center-West) vs. affluent (Southeast, South)	0.076*** (0.003)	0.172*** (0.005)	0.097*** (0.005)
Geographic situation - rural vs. urban	0.005 (0.008)	0.040*** (0.006)	0.022 (0.019)
Geographic area - non-metropolitan vs. metropolitan	0.012*** (0.003)	0.005 (0.004)	0.012 (0.010)
Number of workers in the firm - up to 10 vs. 11 or +	0.034*** (0.004)	0.067*** (0.004)	0.102*** (0.011)
Economic activity - other vs. manufacturing/other industries	-0.021*** (0.006)	-0.059*** (0.007)	-0.088*** (0.020)
Economic activity - other vs. commerce	-0.055*** (0.007)	-0.119*** (0.007)	-0.197*** (0.013)
Economic activity - other vs. services	-0.027*** (0.005)	-0.081*** (0.007)	-0.143*** (0.017)

(Continues)

(Continued)

Workers' attributes	Quantile 5	Quantile 50	Quantile 95
Sex - female vs. male	0.066*** (0.003)	0.212*** (0.004)	0.301*** (0.013)
Age (natural log)	0.083*** (0.006)	0.173*** (0.006)	0.410*** (0.018)
Position in family - other vs. reference	0.025*** (0.003)	0.072*** (0.004)	0.097*** (0.012)
Race – non-white vs. white	0.028*** (0.004)	0.086*** (0.006)	0.116*** (0.009)
If migrant - no vs. yes	0.046*** (0.007)	0.118*** (0.012)	0.322*** (0.030)
Number of years of school (natural log)	0.039*** (0.008)	0.138*** (0.012)	0.240*** (0.032)
Occupation - other vs. low-skilled workers	-0.009 (0.009)	-0.074*** (0.015)	-0.304*** (0.057)
Occupation - other vs. medium-skilled workers	0.049*** (0.012)	0.009 (0.020)	-0.153** (0.067)
Occupation - other vs. high-skilled workers	0.192*** (0.017)	0.551*** (0.021)	0.846*** (0.073)
Number of hours worked per week (natural log)	0.364*** (0.016)	0.030*** (0.006)	0.002 (0.012)
Tenure – number of months (natural log)	0.019*** (0.002)	0.063*** (0.002)	0.084*** (0.004)
Unionization – no vs. yes	0.036*** (0.005)	0.075*** (0.005)	0.089*** (0.013)
Constant	4.696*** (0.074)	5.504*** (0.031)	5.324*** (0.088)
Number of observations	55,733	55,733	55,733
Pseudo R2	0.039	0.236	0.384

Source: Pnad/IBGE microdata (2015), with cases weighted by individuals' weight (V4729).

Notes: Response variable: monthly income of the main job (V4718), in natural log format. Predictor variables: refer to firms and workers, categorical and numerical (in natural log format), only in their main effects. Method: quantile estimates, with forced entry of single-stage variables. Filter: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809). Significance: *** p<0.01, ** p<0.05, * p<0.1.

TABLE 6
Direct wages – testing for differences between coefficients on each income quantile – coefficients of variable “unionization”

$$(1) [\text{Quantile 5}] V9087 - [\text{Quantile 50}] V9087 = 0$$

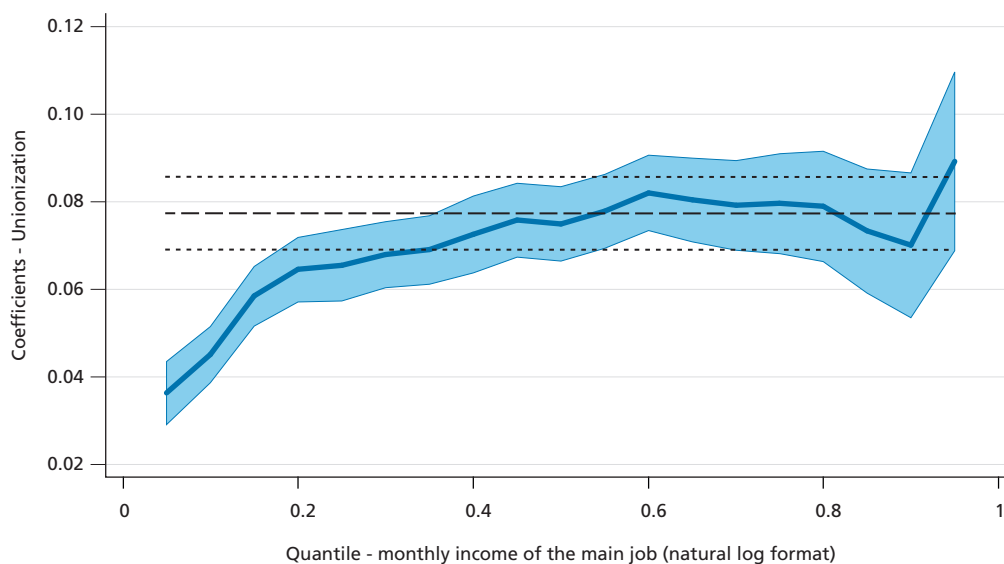
$$(2) [\text{Quantile 5}] V9087 - [\text{Quantile 95}] V9087 = 0$$

$$F(2, 55713) = 37.40$$

$$\text{Probability} > F = 0.0000$$

Source: Pnad/IBGE microdata (2015), with cases weighted by individuals' weight (V4729).

GRAPH 3
Direct wages – distribution of coefficients on each income quantile – coefficients of variable “unionization”



Source: Pnad/IBGE microdata (2015), with cases weighted by individuals' weight (V4729).

Notes: Quantile plot. Response variable: monthly income of the main job (V4718), in natural log format. Predictor variables: refer to firms and workers, categorical and numerical (in natural log format), only in their main effects. Method: quantile estimates, with forced entry of single-stage variables. Filter: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809).

The logistic regression shows that some attributes are especially relevant to “explain” the variability on access to indirect wages (fringe benefits). With respect to food ticket, they are the size of the firm (if bigger, the chance of access to this benefit is 2,4 times higher) and the geographic area (if metropolitan, it is 2,7 times higher). Concerning transport service, those attributes consist mainly in the geographic area (if metropolitan, the chance of access to this benefit is 4,9 times higher). Additionally, in relation to health assistance, they are the economic sector (if manufacturing, the chance of access to this benefit is 2,0 times higher) and the size of the firm (if bigger, it is 3,1 times higher) (table 7).

Anyhow, the characteristic of interest in this paper also seems to “explain” part of the variability on access to indirect wages. Controlling for all characteristics included in the logistic regression, related to firms and workers, union workers have an increased access to fringe benefits, when compared to nonunion. With respect to food ticket, this access is increased by 1,7 times. Regarding transport service, it is increased by 1,3 times. And in relation to health assistance, it is increased by 1,8 times (table 7). Confirming what was noticed above in the descriptive analysis, there really is a relationship between access to fringe benefits (indirect wages) and union affiliation.

Looking from another angle, graphs 4A, 4B and 4C also confirm this relationship. They are density plots, with the predicted probabilities of access to fringe benefits, for union and nonunion workers (predicted by the logistic regression). In all of them, it is possible to observe that the curve of probabilities of union workers is dislocated for the right, when compared to the curve of nonunion. This basically shows that the unionized have larger probabilities of access to food ticket, transport service and health assistance (and this is particularly true in the case of the third and of the first benefits) (graphs 4A, 4B and 4C).

TABLE 7
Indirect wages – logistic regression

Firms' attributes		Food ticket	Transport service	Health assistance
Geographic region - non-affluent (North, Northeast, Center-West) vs. affluent (Southeast, South)	Odds ratio	1.142	1.044	1.728
	Confidence interval	(1.079 - 1.209)**	(0.981 - 1.111)	(1.611 - 1.854)**
	Probability	[0.00]	[0.18]	[0.00]
Geographic situation – rural vs. urban	Odds ratio	1.194	1.406	1.524
	Confidence interval	(1.026 - 1.390)*	(1.189 - 1.661)**	(1.243 - 1.870)**
	Probability	[0.02]	[0.00]	[0.00]
Geographic area – non-metropolitan vs. metropolitan	Odds ratio	2.720	4.874	1.780
	Confidence interval	(2.564 - 2.886)**	(4.570 - 5.199)**	(1.654 - 1.916)**
	Probability	[0.00]	[0.00]	[0.00]
Number of workers in the firm - up to 10 vs. 11 or +	Odds ratio	2.420	1.626	3.125
	Confidence interval	(2.299 - 2.547)**	(1.544 - 1.713)**	(2.884 - 3.386)**
	Probability	[0.00]	[0.00]	[0.00]
Economic activity - other vs. manufacturing/other industries	Odds ratio	0.989	0.793	2.006
	Confidence interval	(0.899 - 1.088)	(0.717 - 0.877)**	(1.774 - 2.270)**
	Probability	[0.82]	[0.00]	[0.00]
Economic activity - other vs. commerce	Odds ratio	0.636	0.758	1.041
	Confidence interval	(0.582 - 0.694)**	(0.691 - 0.830)**	(0.925 - 1.173)
	Probability	[0.00]	[0.00]	[0.50]
Economic activity - other vs. services	Odds ratio	1.131	1.049	1.476
	Confidence interval	(1.041 - 1.229)**	(0.962 - 1.144)	(1.318 - 1.652)**
	Probability	[0.00]	[0.28]	[0.00]

(Continues)

(Continued)

Workers' attributes		Food ticket	Transport service	Health assistance
	Odds ratio	1.167	0.828	1.157
Sex - female vs. male	Confidence interval	(1.117 - 1.219)**	(0.793 - 0.864)**	(1.097 - 1.220)**
	Probability	[0.00]	[0.00]	[0.00]
	Odds ratio	0.926	0.918	1.008
Age – up to 33 years vs. 34 years +	Confidence interval	(0.884 - 0.970)**	(0.876 - 0.962)**	(0.953 - 1.066)
	Probability	[0.00]	[0.00]	[0.78]
	Odds ratio	1.037	0.912	1.103
Position in family - other vs. reference	Confidence interval	(0.996 - 1.081)	(0.874 - 0.951)**	(1.049 - 1.159)**
	Probability	[0.08]	[0.00]	[0.00]
	Odds ratio	0.918	0.749	0.987
Race – non-white vs. white	Confidence interval	(0.875 - 0.962)**	(0.714 - 0.786)**	(0.932 - 1.045)
	Probability	[0.00]	[0.00]	[0.65]
	Odds ratio	1.041	0.895	1.211
If migrant – no vs. yes	Confidence interval	(0.933 - 1.160)	(0.799 - 1.004)	(1.056 - 1.389)**
	Probability	[0.47]	[0.06]	[0.01]
	Odds ratio	1.219	0.731	2.102
Number of years of school – up to 10 years vs. 11 years +	Confidence interval	(0.928 - 1.602)	(0.564 - 0.947)*	(1.480 - 2.986)**
	Probability	[0.15]	[0.02]	[0.00]
	Odds ratio	1.080	1.133	1.262
Occupation – other vs. low-skilled workers	Confidence interval	(0.981 - 1.190)	(1.028 - 1.247)*	(1.101 - 1.447)**
	Probability	[0.12]	[0.01]	[0.00]
	Odds ratio	1.125	1.842	1.052
Occupation - other vs. medium-skilled workers	Confidence interval	(0.845 - 1.498)	(1.401 - 2.423)**	(0.718 - 1.539)
	Probability	[0.42]	[0.00]	[0.80]
	Odds ratio	1.071	1.123	1.585
Occupation - other vs. high-skilled workers	Confidence interval	(0.807 - 1.419)	(0.859 - 1.468)	(1.095 - 2.296)*
	Probability	[0.64]	[0.40]	[0.01]
	Odds ratio	0.948	0.926	0.977
Number of hours worked per week – up to 43 hours vs. 44 hours +	Confidence interval	(0.902 - 0.995)*	(0.880 - 0.973)**	(0.923 - 1.034)
	Probability	[0.03]	[0.00]	[0.41]
	Odds ratio	0.939	0.850	1.279
Tenure – up to 35 months vs. 36 months +	Confidence interval	(0.899 - 0.981)**	(0.812 - 0.889)**	(1.214 - 1.347)**
	Probability	[0.00]	[0.00]	[0.00]
	Odds ratio	1.663	1.323	1.810
Unionization – no vs. yes	Confidence interval	(1.574 - 1.757)**	(1.247 - 1.404)**	(1.707 - 1.920)**
	Probability	[0.00]	[0.00]	[0.00]
Number of observations		56.360	56.360	56.360
F		F (19, 5401) = 192.92	F (19, 5401) = 191.78	F (19, 5401) = 179.31
Probability		Probability > F = 0.0000	Probability > F = 0.0000	Probability > F = 0.0000

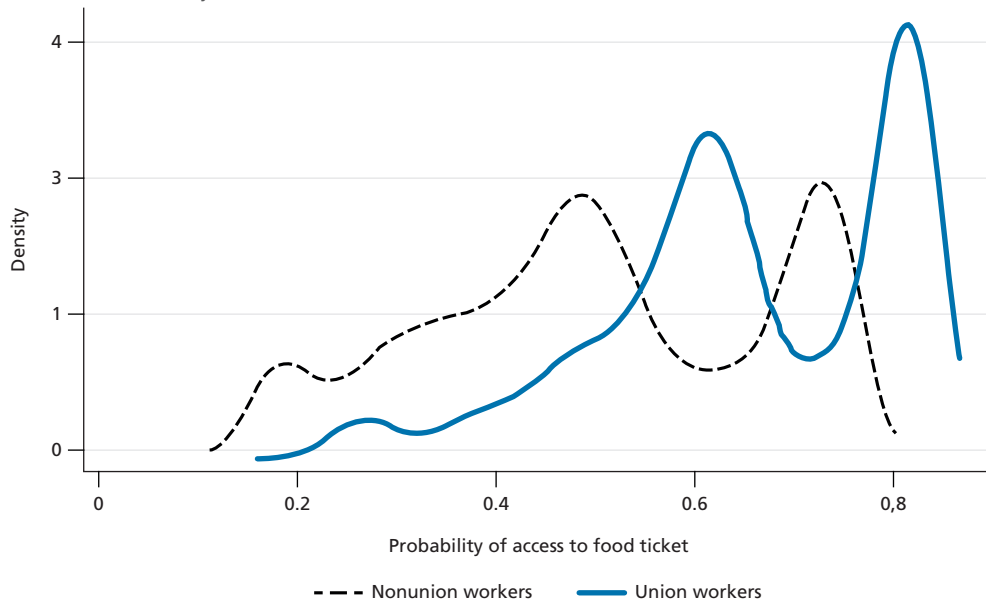
Source: Pnad/IBGE microdata (2015), with sampling design incorporated to the estimates.

Notes: Response variables: fringe benefits on the main job – food ticket (V9044), transport service (V9045) e health assistance (V9047). Predictor variables: refer to firms and workers, categorical and numerical (transformed to categorical by the median), only in their main effects. Method: maximum likelihood estimates, with forced entry of single-stage variables. Filter: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809). Significance: * p<0.05; ** p<0.01.

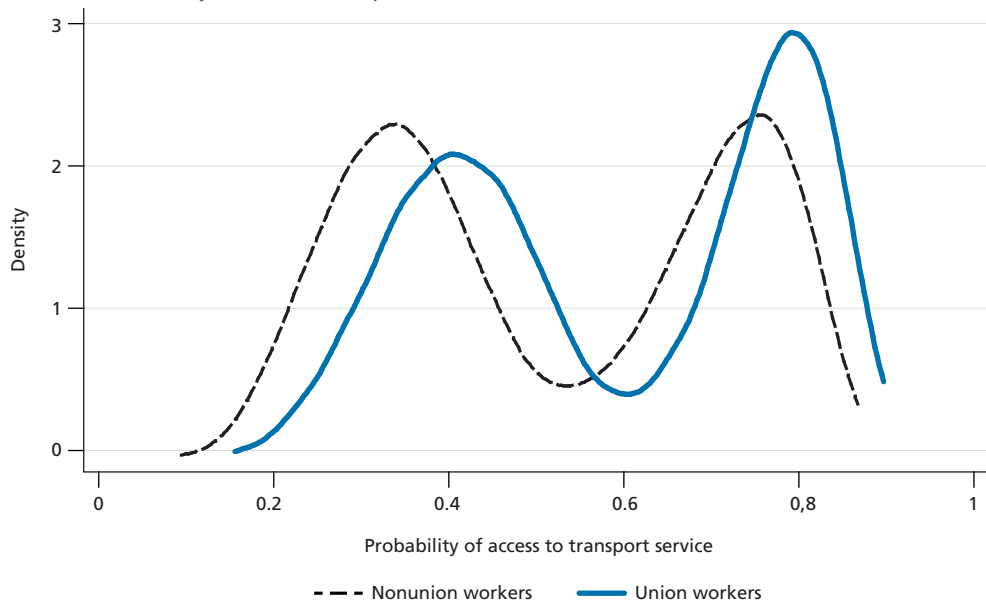
GRAPH 4

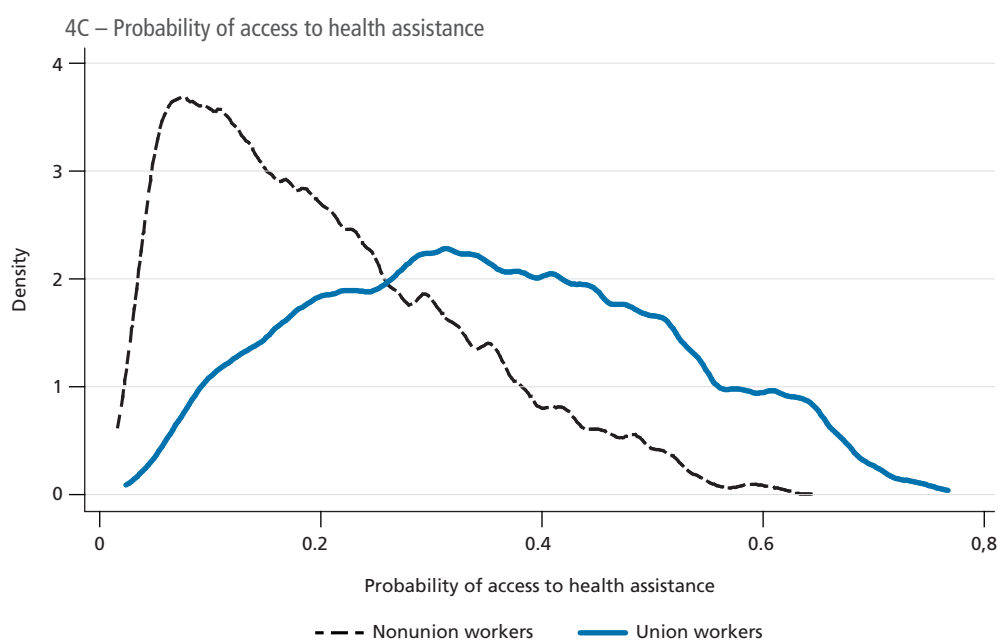
Indirect wages – logistic regression – predicted probabilities of access to fringe benefits

4A – Probability of access to food ticket



4B – Probability of access to transport service





Source: Pnad/IBGE microdata (2015), with sampling design incorporated to the estimates.

Notes: Kernel density plots. Response variables: fringe benefits on the main job – food ticket (V9044), transport service (V9045) e health assistance (V9047). Predictor variables: refer to firms and workers, categorical and numerical (transformed to categorical by the median), only in their main effects. Method: maximum likelihood estimates, with forced entry of single-stage variables. Filter: only wage employees with registration (V4706), in sectors other than agriculture and public administration (V4809).

4 KEY ASPECTS

At a first glance, no one should expect any wage differentials between union and non-union workers in Brazil. According to historic rules, all workers have to contribute to union organization, paying a compulsory fee. As a counterpart, associated or not, all workers benefit from unions' mobilization, which results in collective agreements. Thereby, any differences between union and nonunion workers are largely unexpected, regarding direct or indirect wages.

In spite of that, currently, there are plenty of empirical evidences of wage differentials between those workers. A simple comparison of direct wages involving union and nonunion workers reveals that the former are 33,5% above the latter. Furthermore, a simple contrast of indirect wages (fringe benefits) shows that union workers have more access to benefits like food ticket, transport service and health assistance.

Controlled comparisons of wages go in the same way, pointing out empirical evidences of differentials. A multiple linear regression with observable attributes of firms

and workers unveils that union workers are paid 8,4% more than nonunion, concerning direct wages. Moreover, with the same observable characteristics, a quantile regression discloses that these differentials increase, as we move the focus from low-earning workers (3,6% more at the 5th quantile) to high-earning (8,9% more at the 95th quantile).

In turn, with almost the same observable attributes, a logistic regression reveals that, when compared to nonunion, union workers have higher chances of access to benefits considered as indirect wages, like food ticket (chances 1,7 times higher), transport service (1,3 times) and health assistance (1,8 times). In a nutshell, nowadays in Brazil, contrary to what could be expected at a first glance, there are significant evidences of wage differences between all those workers, regarding direct and indirect wages.

As mentioned before, a specialized literature affirms that these differences have been pretty common in other countries, where only unionized workers benefit from collective bargaining and collective agreement. As a consequence, in those countries, there has been significant wage differentials (or gaps), always in disfavor of non-unionized workers (Long, 2013; Mishel, 2012; Sherk, 2009).

In Brazil, the existing wage differentials may increase in the future, depending on how the labour reform conducted through the Bill n. 6.787/2016 (under discussion in the Parliament) is going to be implemented. This Bill is modifying the way unions are funded, turning the compulsory contribution of all workers into a voluntary one. Thus, the collective bargaining promoted by those unions may not benefit all the workers anymore, but only those affiliated.

As a result, in the future, the wage gaps between union and nonunion workers may eventually increase in the labour market. If so, they are going to represent not properly a new, but a reinforced source of wage inequality, in a market already known for many inequalities. In principle, this may be a point of interest in the future debate about the consequences of this labour reform.

Anyway, the analysis developed in this paper has several methodological shortcomings, linked to the sort of data used, the type of techniques adopted and so on. Therefore, it is wise to take some caution with the results presented, mainly in respect to (direct and indirect) wage differentials. Other studies, based on other elements, are extremely necessary to confirm all the numbers disclosed here.

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ANNEX A

STATA CODE

This is the Stata code to get all statistics presented above. The software is the 12.1 version. And the database is the Pnad/IBGE, 2015.

```
/*importing household database to stata format*/
```

```
infix uf 5-6 v0102 5-12 v0103 13-15 v4617 178-184 v4618 185-191 using "address\  
dom2015.txt", clear
```

```
/*sorting cases*/
```

```
sort v0102 v0103
```

```
/*saving database*/
```

```
save pnad_ibge_2015_domicilios, replace
```

```
/*importing individual database to stata format*/
```

```
clear
```

```
infix uf 5-6 v0102 5-12 v0103 13-15 v0302 18 v8005 27-29 v0402 31 v0404 33  
v0601 67 v4803 703-704 v0501 43 v0502 44 v5061 49 v5121 61 v4805 706 v4706  
707-708 v4808 710 v4809 711-712 v4810 713-714 v4718 725-736 v9043 316 v9044  
317 v9045 318 v9046 319 v9047 320 v9058 360-361 v9611 364-365 v9612 366-367  
v9040 313 v90531 353 v9087 405 v4727 789 v4728 790 v4729 791-795 using "ad-  
dress \pes2015.txt", clear
```

```
/*sorting cases*/
```

```
sort v0102 v0103
```

```
/*saving database*/
```

```
save pnad_ibge_2015_individuos, replace
```

```
/*merging databases*/
```

```
use pnad_ibge_2015_domicilios, clear
```

```
#delimit;
```

```
merge m:m v0102 v0103 using pnad_ibge_2015_individuos;
```

```
#delimit cr
```

```
tabulate _merge
```

```
keep if _merge == 3
```

```
drop _merge
```

```
/*saving database*/
```

```
save pnad_ibge_2015_individuos_desenho_amostral, replace
```

```
/*defining the 'svy'*/
```

```
svyset v4618 [pw = v4729], strata(v4617) singleunit(centered)
```

```
/*recodifying variables*/
```

```
recode uf (11/17 = 0)(21/29 = 1)(31/35 = 2)(41/43 = 3)(50/53 = 4), gen (rg)
```

```
recode rg (0 = 1)(else = 0), gen (rg_n)
recode rg (1 = 1)(else = 0), gen (rg_ne)
recode rg (2 = 1)(else = 0), gen (rg_se)
recode rg (3 = 1)(else = 0), gen (rg_s)
recode rg (4 = 1)(else = 0), gen (rg_co)
recode rg (0 1 4 = 0)(2 3 = 1), gen (rg_afluente)
recode v0302 (2 = 1)(4 = 0)
recode v0402 (2/8 = 0)
recode v0404 (2 6 = 1)(4 8 0 = 0)(9 = .)
recode v0601 (3 = 0)
recode v4803 (1 = 0)(2 = 1)(3 = 2)(4 = 3)(5 = 4)(6 = 5)(7 = 6)(8 = 7)(9 = 8)(10 = 9)(11
= 10)(12 = 11)(13 = 12)(14 = 13)(15 = 14)(16 = 15)(17 = .)
generate migrant = 0 if v5061 != 2
replace migrant = 1 if v5061 == 2
recode v4805 (2 = 0)
recode v4810 (1 2 = 1) (3/10 = 0), gen (v4810_1)
generate v4810_2 = 0 if (((v4810 != 1)&(v4810 != 2))&(v4803 <= 3))
replace v4810_2 = 1 if (((v4810 != 1)&(v4810 != 2))&((v4803 >= 4)&(v4803 <= 10)))
replace v4810_2 = 2 if (((v4810 != 1)&(v4810 != 2))&((v4803 >= 11)&(v4803 <= 14)))
replace v4810_2 = 3 if (((v4810 != 1)&(v4810 != 2))&(v4803 >= 15))
replace v4810_2 = 3 if ((v4810 == 1)|(v4810 == 2))
recode v4810_2 (0 = 1)(else = 0), gen (v4810_3_ nao_qualif)
recode v4810_2 (1 = 1)(else = 0), gen (v4810_3_pouco_qualif)
recode v4810_2 (2 = 1)(else = 0), gen (v4810_3_medio_qualif)
recode v4810_2 (3 = 1)(else = 0), gen (v4810_3_qualif)
recode v4718 (999999999999 = .)
generate v4718_v9058 = (v4718/v9058)
generate tenure = ((v9611*12)+v9612)
recode v9040 (2/6 = 0)(8 = 1)
recode v90531 (3 = 0)(5 = .)
recode v9087 (3 = 0)
recode v4727 (2 3 = 0)(1 = 1)
recode v4728 (1/3 = 1)(4/8 = 0)
generate ln_v4718 = log(v4718+1)
generate ln_v8005 = log(v8005)
```

```
generate ln_v4803 = log(v4803+1)
generate ln_v9058 = log(v9058)
generate ln_v4718_v9058 = log(v4718_v9058+1)
generate ln_tenure = log(tenure+1)
recode v8005 (1/33 = 0)(34/120 = 1), gen (v8005_dummy)
recode v4803 (0/10 = 0)(11/15 = 1), gen (v4803_dummy)
recode v9058 (1/43 = 0)(44/98 = 1), gen (v9058_dummy)
recode tenure (0/35 = 0)(36/1050 = 1), gen (tenure_dummy)
recode v9043 (1 = 1)(3 = 0)
recode v9044 (2 = 1)(4 = 0)
recode v9045 (1 = 1)(3 = 0)
recode v9046 (2 = 1)(4 = 0)
recode v9047 (1 = 1)(3 = 0)
recode v4809 (13 = 1)(else = 0), gen (v4809_ativs_mal_defs)
recode v4809 (2 3 = 1)(else = 0), gen (v4809_industria)
recode v4809 (4 = 1)(else = 0), gen (v4809_construcao)
recode v4809 (5 = 1)(else = 0), gen (v4809_comercio)
recode v4809 (6 7 9 10 11 12 = 1)(else = 0), gen (v4809_servicos)

/*verifying missing values*/

inspect v0404 v4803 v4718 v90531 v4809_ativs_mal_defs v4809_industria v4809_construcao v4809_comercio v4809_servicos

/*applying labels to variables and categories*/

label variable uf "unidade da federação"
label variable rg "região geográfica"
label variable rg_n "região geográfica - região norte"
label variable rg_ne "região geográfica - região nordeste"
label variable rg_se "região geográfica - região sudeste"
label variable rg_s "região geográfica - região sul"
label variable rg_co "região geográfica - região centro-oeste"
```


label variable rg_afluente “região geográfica - se afluyente ou não”
label variable v0302 “sexo”
label variable v8005 “idade”
label variable ln_v8005 “idade (formato log natural)”
label variable v8005_dummy “idade (formato binário - mediana)”
label variable v0402 “condição na família”
label variable v0404 “cor/raça”
label variable v0601 “sabe ler e escrever”
label variable v4803 “anos de estudo”
label variable ln_v4803 “anos de estudo (formato log natural)”
label variable v4803_dummy “anos de estudo (formato binário - mediana)”
label variable v0501 “nasceu no município de residência”
label variable v0502 “nasceu na unidade da federação de residência”
label variable v5061 “na data de referência, tinha até 4 anos ininterruptos de residência na unidade da federação”
label variable v5121 “na data de referência, tinha até 4 anos ininterruptos de residência no município”
label variable migrant “se é migrante”
label variable v4805 “condição de ocupação na semana de referência”
label variable v4706 “posição na ocupação no trabalho principal da semana de referência”
label variable v4808 “atividade principal do empreendimento do trabalho principal da semana de referência”
label variable v4809 “grupamentos de atividade principal do empreendimento do trabalho principal da semana de referência”
label variable v4809_ativs_mal_defs “ativ.princ.empreendimento do trab.principal - ativs_mal-defs.”
label variable v4809_industria “ativ.princ.empreendimento do trab.principal - ind. transf./outras ativs.industrs.”
label variable v4809_construcao “ativ.princ.empreendimento do trab.principal - construção”
label variable v4809_comercio “ativ.princ.empreendimento do trab.principal - comércio”
label variable v4809_servicos “ativ.princ.empreendimento do trab.principal - serviços”
label variable v4810 “grupamentos ocupacionais do trabalho principal da semana de referência”
label variable v4810_1 “grupamentos ocupacionais do trabalho principal da semana de referência”

label variable v4810_2 “grupamentos ocupacionais do trabalho principal da semana de referência”

label variable v4810_3_nao_qualif “grupamentos ocupacionais do trabalho principal da semana de referência - trabalhadores sem qualificação”

label variable v4810_3_pouco_qualif “grupamentos ocupacionais do trabalho principal da semana de referência - trabalhadores de pouca qualificação”

label variable v4810_3_medio_qualif “grupamentos ocupacionais do trabalho principal da semana de referência - trabalhadores de média qualificação”

label variable v4810_3_qualif “grupamentos ocupacionais do trabalho principal da semana de referência - trabalhadores de elevada qualificação”

label variable v4718 “rendimento mensal do trabalho principal”

label variable v4718_v9058 “rendimento horário do trabalho principal”

label variable ln_v4718 “rendimento mensal do trabalho principal (formato log natural)”

label variable ln_v4718_v9058 “rendimento horário do trabalho principal (formato log natural)”

label variable v9043 “recebeu auxílio para moradia no mês de referência”

label variable v9044 “recebeu auxílio para alimentação no mês de referência”

label variable v9045 “recebeu auxílio para transporte no mês de referência”

label variable v9046 “recebeu auxílio para educação ou creche no mês de referência”

label variable v9047 “recebeu auxílio para saúde ou reabilitação no mês de referência”

label variable v9058 “número de horas habitualmente trabalhadas por semana no trabalho principal da semana de referência”

label variable ln_v9058 “número de horas habitualmente trabalhadas por semana no trabalho principal da semana de referência (formato log natural)”

label variable v9058_dummy “número de horas habitualmente trabalhadas por semana no trabalho principal da semana de referência (formato binário - mediana)”

label variable v9611 “número de anos no trabalho principal da semana de referência”

label variable v9612 “número de meses no trabalho principal da semana de referência”

label variable tenure “número de meses no trabalho principal da semana de referência”

label variable ln_tenure “número de meses no trabalho principal da semana de referência (formato log natural)”

label variable tenure_dummy “número de meses no trabalho principal da semana de referência (formato binário - mediana)”

label variable v9040 “número de pessoas ocupadas, no mês de referência, no empreendimento do trabalho principal da semana de referência”

label variable v90531 “o empreendimento tem registro no cadastro nacional de pessoa jurídica - cnpj”

label variable v9087 “era associado a algum sindicato no mês de referência”

label variable v4727 “código de área censitária - não-metropolitana ou metropolitana”

label variable v4728 “código de situação censitária - rural ou urbana”

label variable v4729 “peso da pessoa”

label variable v9033 “área do emprego no trabalho principal da semana de referência”

label define l_rg 0 “n” 1 “ne” 2 “se” 3 “s” 4 “co”

label define l_rg_n 0 “outra rg” 1 “norte”

label define l_rg_ne 0 “outra rg” 1 “nordeste”

label define l_rg_se 0 “outra rg” 1 “sudeste”

label define l_rg_s 0 “outra rg” 1 “sul”

label define l_rg_co 0 “outra rg” 1 “centro-oeste”

label define l_rg_afluente 0 “não afluente (n/ne/co)” 1 “afluente (se/s)”

label define l_v0302 0 “feminino” 1 “masculino”

label define l_v0402 0 “outra posição” 1 “pessoa de referência”

label define l_v0404 0 “não branca” 1 “branca”

label define l_v0601 0 “não” 1 “sim”

label define l_migrant 0 “não é migrante” 1 “é migrante”

label define l_v4805 0 “desocupadas” 1 “ocupadas”

label define l_v4706 1 “empregado com carteira” 2 “militar” 3 “funcionário estatutário” 4 “empregado sem carteira” 6 “doméstico com carteira” 7 “doméstico sem carteira” 9 “conta própria” 10 “empregador” 11 “produção para o próprio consumo” 12 “construção para o próprio uso” 13 “não remunerado”

label define l_v4808 1 “agrícola” 2 “não agrícola”

label define l_v4809 1 “agrícola” 2 “outras atividades industriais” 3 “indústria de transformação” 4 “construção” 5 “comércio e reparação” 6 “alojamento e alimentação” 7 “transporte, armazenagem e comunicação” 8 “administração pública” 9 “educação, saúde e serviços sociais” 10 “serviços domésticos” 11 “outros serviços coletivos, sociais e pessoais” 12 “outras atividades” 13 “atividades maldefinidas”

label define l_v4809_ativs_mal_defs 0 “outras ativs.” 1 “ativs_mal-defs.”

label define l_v4809_industria 0 “outras ativs.” 1 “ind.transf./outras ativs.industrs.”

label define l_v4809_construcao 0 “outras ativs.” 1 “construção”

label define l_v4809_comercio 0 “outras ativs.” 1 “comércio”

label define l_v4809_servicos 0 “outras ativs.” 1 “serviços”
label define l_v4810 1 “dirigentes em geral” 2 “profissionais das ciências e das artes” 3
“técnicos de nível médio” 4 “trabalhadores de serviços administrativos” 5 “trabalhadores
dos serviços” 6 “vendedores e prestadores de serviço do comércio” 7 “trabalhadores agrí-
colas” 8 “trabalhadores da produção de bens e serviços e de reparação e manutenção” 9
“membros das forças armadas e auxiliares” 10 “ocupações maldefinidas”
label define l_v4810_1 0 “empregados semi ou não qualificados” 1 “empregados quali-
ficados”
label define l_v4810_2 0 “empregados não qualificados” 1 “empregados semi qualifica-
dos” 2 “empregados qualificados”
label define l_v4810_3_nao_qualif 0 “outros níveis de qualificação” 1 “sem qualificação”
label define l_v4810_3_pouco_qualif 0 “outros níveis de qualificação” 1 “pouca qua-
lificação”
label define l_v4810_3_medio_qualif 0 “outros níveis de qualificação” 1 “média qua-
lificação”
label define l_v4810_3_qualif 0 “outros níveis de qualificação” 1 “elevada qualificação”
label define l_v9040 0 “até dez” 1 “onze ou +”
label define l_v9043 0 “não” 1 “sim”
label define l_v9044 0 “não” 1 “sim”
label define l_v9045 0 “não” 1 “sim”
label define l_v9046 0 “não” 1 “sim”
label define l_v9047 0 “não” 1 “sim”
label define l_v90531 0 “não” 1 “sim”
label define l_v9087 0 “não” 1 “sim”
label define l_v4727 1 “região metropolitana” 2 “autorrepresentativo” 3 “não autorre-
presentativo”
label define l_v4728 0 “rural” 1 “urbana”
label define l_v9033 1 “federal” 3 “estadual” 5 “municipal”

label value rg l_rg
label value rg_n l_rg_n
label value rg_ne l_rg_ne
label value rg_se l_rg_se
label value rg_s l_rg_s
label value rg_co l_rg_co

label value rg_afluente l_rg_afluente
label value v0302 l_v0302
label value v0402 l_v0402
label value v0404 l_v0404
label value v0601 l_v0601
label value migrant l_migrant
label value v4805 l_v4805
label value v4706 l_v4706
label value v4808 l_v4808
label value v4809 l_v4809
label value v4809_ativs_mal_defs l_v4809_ativs_mal_defs
label value v4809_industria l_v4809_industria
label value v4809_construcao l_v4809_construcao
label value v4809_comercio l_v4809_comercio
label value v4809_servicos l_v4809_servicos
label value v4810 l_v4810
label value v4810_1 l_v4810_1
label value v4810_2 l_v4810_2
label value v4810_3_nao_qualif l_v4810_3_nao_qualif
label value v4810_3_pouco_qualif l_v4810_3_pouco_qualif
label value v4810_3_medio_qualif l_v4810_3_medio_qualif
label value v4810_3_qualif l_v4810_3_qualif
label value v9040 l_v9040
label value v9043 l_v9043
label value v9044 l_v9044
label value v9045 l_v9045
label value v9046 l_v9046
label value v9047 l_v9047
label value v90531 l_v90531
label value v9087 l_v9087
label value v4727 l_v4727
label value v4728 l_v4728
label value v9033 l_v9033

*/*selecting cases*/*

```
keep if ((v4706 == 1)&&((v4809 != 1)&&(v4809 != 8)))
```

```
/*descriptive statistics*/
```

```
svy: mean v4718, over (v9087)
```

```
test [v4718]não = [v4718]sim
```

```
graph box ln_v4718, over (v9087)
```

```
kdensity ln_v4718, addplot((kdensity ln_v4718 if v9087 == 0, lcolor(red)) (kdensity  
ln_v4718 if v9087 == 1, lcolor(black)))
```

```
svy: tabulate v9044 v9087, col
```

```
svy: tabulate v9045 v9087, col
```

```
svy: tabulate v9047 v9087, col
```

```
/*linear multiple regression*/
```

```
svy: regress ln_v4718 rg_afluente v4728 v4727 v9040 v4809_industria v4809_comercio  
v4809_servicos v0302 ln_v8005 v0402 v0404 migrant ln_v4803 v4810_3_pouco_qualif  
v4810_3_medio_qualif v4810_3_qualif ln_v9058 ln_tenure v9087  
outreg2 using results_linear_regression_05jul.xls, tex bdec(3) sdec(3) replace
```

```
/*quantile multiple regression */
```

```
sqreg ln_v4718 rg_afluente v4728 v4727 v9040 v4809_industria v4809_comercio  
v4809_servicos v0302 ln_v8005 v0402 v0404 migrant ln_v4803 v4810_3_pouco_qualif  
v4810_3_medio_qualif v4810_3_qualif ln_v9058 ln_tenure v9087, quantile (.05 .50  
.95) [pweight = v4729]  
outreg2 using results_quantile_regression_05jul.xls, tex bdec(3) sdec(3) replace
```

*/*testing whether there are significant differences for bs estimated in each of the quantiles */*

```
quietly sqreg ln_v4718 rg_afluente v4728 v4727 v9040 v4809_industria v4809_comercio
v4809_servicos v0302 ln_v8005 v0402 v0404 migrant ln_v4803 v4810_3_pouco_qualif
v4810_3_medio_qualif v4810_3_qualif ln_v9058 ln_tenure v9087, quantile (.05 .50
.95) [pweight = v4729]
test [q05]v9087=[q50]v9087=[q95]v9087
```

*/*graphical analysis of quantile multiple regression*/*

```
quietly qreg ln_v4718 rg_afluente v4728 v4727 v9040 v4809_industria v4809_comercio
v4809_servicos v0302 ln_v8005 v0402 v0404 migrant ln_v4803 v4810_3_pouco_qualif
v4810_3_medio_qualif v4810_3_qualif ln_v9058 ln_tenure v9087
grqreg v9087, ci ols olsqi qstep (.05)
```

*/*logistic binomial regression*/*

```
svy: logit v9044 rg_afluente v4728 v4727 v9040 v4809_industria v4809_comercio
v4809_servicos v0302 v8005_dummy v0402 v0404 migrant v4803_dummy v4810_3_
pouco_qualif v4810_3_medio_qualif v4810_3_qualif v9058_dummy tenure_dummy
v9087, or
predict v9044_predict /*essas são as probabilidades preditas para v9044 = 1*/
outreg using results_logit_v9044_05jul.doc, stats(e_b e_ci p) varlabels replace
kdensity v9044_predict, addplot((kdensity v9044_predict if v9087 == 0, lcolor(red))
(kdensity v9044_predict if v9087 == 1, lcolor(black)))
```

```
svy: logit v9045 rg_afluente v4728 v4727 v9040 v4809_industria v4809_comercio
v4809_servicos v0302 v8005_dummy v0402 v0404 migrant v4803_dummy v4810_3_
pouco_qualif v4810_3_medio_qualif v4810_3_qualif v9058_dummy tenure_dummy
v9087, or
predict v9045_predict /*essas são as probabilidades preditas para v9045 = 1*/
outreg using results_logit_v9045_05jul.doc, stats(e_b e_ci p) varlabels replace
kdensity v9045_predict, addplot((kdensity v9045_predict if v9087 == 0, lcolor(red))
(kdensity v9045_predict if v9087 == 1, lcolor(black)))
```

```
svy: logit v9047 rg_afluente v4728 v4727 v9040 v4809_industria v4809_comercio  
v4809_servicos v0302 v8005_dummy v0402 v0404 migrant v4803_dummy v4810_3_  
pouco_qualif v4810_3_medio_qualif v4810_3_qualif v9058_dummy tenure_dummy  
v9087, or  
predict v9047_predict /*essas são as probabilidades preditas para v9047 = 1*/  
outreg using results_logit_v9047_05jul.doc, stats(e_b e_ci p) varlabels replace  
kdensity v9047_predict, addplot((kdensity v9047_predict if v9087 == 0, lcolor(red))  
(kdensity v9047_predict if v9087 == 1, lcolor(black)))
```


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