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*Section* ARTICLES

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# Falling urban wage premium and inequality trends: evidence for Brazil

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**ABSTRACT:** In this paper, we use data from the National Household Survey (PNAD) for Brazil to investigate the dynamics of the urban wage premium and the relationship between the urban wage premium and inequality trends, and we find two main results. First, we find a decreasing urban wage premium over the period 2002-2009 using both OLS and quantile regression. Second, we show that the fall in the urban wage premium is more pronounced at the 90th percentile than at the 10th percentile. This finding suggests that the falling urban wage premium has contributed to the reduction in inequality observed in Brazil in the last decade.

**JEL Classification:** J31, J61, R23.

**Keywords:** Urban Wage Premium, Wage Inequality, Brazil.

## La caída en la prima salarial urbana y la tendencia en la desigualdad: evidencia para Brasil

**RESUMEN:** En este trabajo utilizamos datos de la encuesta de hogares brasileños, PNAD, entre 2002-2009, para investigar la dinámica de la prima salarial urbana, y más concretamente, la relación entre la prima salarial urbana y las tendencias de la desigualdad, llegando a dos conclusiones principales. En primer lugar, los resultados muestran que la prima urbana disminuye durante el periodo 2002-2009, tanto con MCO y regresión cuantílica. En segundo lugar, se concluye que la caída de la prima salarial urbana es más fuerte en el percentil 90 con respecto al percentil 10. Los resultados obtenidos sugieren que la caída de la prima del salario urbano ha contribuido a la reducción de la desigualdad observada en Brasil en la última década.

**Clasificación JEL:** J31, J61, R23.

**Palabras clave:** Prima salarial urbana, desigualdad salarial, Brasil.

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## 1. Introduction

The urban wage premium is a stylised fact in urban and labour economics. The most widely accepted explanation refers to urbanisation externalities in terms of reduced transport costs, technology and knowledge spillovers, cheaper inputs and proximity to consumers (Glaeser, 1998; Kim, 1987; Ciccone and Hall, 1996), whereas other possible explanations refer to the «learning» hypothesis, which states that human capital accumulation is faster in cities (Moretti, 2004), or to the «coordination» hypothesis, which states that cities enhance the probability of a better match between workers and firms (Kim, 1990; Yankow, 2006). There is also evidence that urbanisation externalities increase along the wage distribution, even after controlling for observed and unobserved heterogeneity (Matano and Naticchioni, 2012).

Most of the literature concerns the US and advanced economies, even if there is an increasing interest in emerging countries. In this framework, the Brazilian case is one of the most interesting, being characterised by strong imbalances among regions, important differences in the degree of urban intensity, a steady reconfiguration of territory and falling wage inequality.

There is solid evidence that Brazilian wages increase with city size, even after controlling for a large set of covariates. Azzoni and Servo (2001) analyse regional wage inequality, concluding that wage differentials between metropolitan areas do not vanish, even after controlling for regional price level differentials and other covariates. Rocha *et al.* (2011) explicitly address the urban premium among cities in Brazil, using an extensive administrative record database of the Ministry of Labour, RAIS. They show that the urban premium is not negligible in the period 2000-2008 and that there is a persistent differential of approximately 10% in favour of workers in highly agglomerated regions, even after controlling for differences in observable and non-observable characteristics of workers.

The fall in the inequality of earnings is another peculiar feature of the Brazilian economy in recent years, as wages at the bottom of the distribution have increased faster than wages at the top, entailing a reduction in all standard inequality indexes. This is a very peculiar finding among advanced and emerging economies. The most well-known case of increasing differentials is the US, where earnings inequality has increased strongly since the 1980s (Autor and Acemoglu, 2011), and a wide body of literature presents investigations of the causes of this trend, such as the impact of technology, institutions and trade. In addition, the spatial explanation has been considered to address the increase in inequality in the US, as in Moretti (2012), among others. For European countries, the evidence is more mixed. Whereas trends of increasing inequality have been observed in the UK (Machin, 2011) and Germany (Dustmann *et al.,* 2009), decreasing wage inequality has been detected in France (Charnoz *et al.,* 2011), Spain (Izquierdo and Lacuesta, 2012) and Italy (Naticchioni and Ricci, 2008). Considering Europe as a whole, only the paper of Massari *et al.* (2012) concludes that wage inequality increased in Europe in the period 1996-2007.

With regard to the spatial explanation of European inequality trends, there are very few papers, which include that by Matano and Naticchioni (2012).

It is also interesting to note that Brazil displays peculiar features with respect to emerging economies as well. According to OECD (2011), Brazil is the only emerging economy that continues to grow at high rates while experiencing reductions in inequality. In terms of comparisons, China and India experienced in significant increases in inequality recent decades (for the Indian case, see also Kijima, 2006).

What are the factors driving these peculiar trends in falling inequality? In a very comprehensive work, Barros *et al.* (2006) summarise the state of the discussions on earnings inequality in Brazil. Applying decomposition techniques, they investigate the main factors contributing to the reduction in inequality among household earnings (in per capita terms). They find that the «Geographical segmentation» explains 16% of the reduction in total earnings and these spatial variables represent a crucial driver of labour income inequality trends, as approximately a third of the reduction in household income inequality is due to some geographical variable [1].

In this paper, we focus on the dynamics of the urban premium in Brazil, using data from the *Pesquisa Nacional por Amostra de Domícilios* (PNAD), to examine the falling inequality in Brazil. The first interesting finding is that even after controlling for a very rich set of covariates, the urban wage premium is found using both OLS and quantile regression to decrease substantially in Brazil. The second interesting finding is that the drop in the urban wage premium is stronger at the 90$^{th}$ percentile than at the 10$^{th}$ percentile, suggesting that falling urban wage premia have contributed to the reduction in inequality in Brazil. We also show that for any given percentile of the distribution (the 10$^{th}$ percentile, the median and the 90$^{th}$ percentile), the wage differentials between workers in the most agglomerated areas (metropolitan areas) and those in the least agglomerated areas (rural) strongly decreased over time. This finding suggests that the dynamics of returns in areas of different urban intensity have contributed to a decrease in wage inequality and deserves attention for several reasons. Among these reasons is Glaeser *et al.*'s (2009) emphasis that the benefits of income inequality reduction go beyond individual improvement and welfare enhancement, including spillovers related to decreasing crime rate and to positive impact on growth. In addition, Glaeser *et al.* (2009) also claim that because the labour market is spatially limited, it is crucial to study the dynamics of regional economies to have a full understanding of the national dynamics of wage inequality.

The paper is organised as follows. Following this introduction, in section 2, we describe some figures about regional dynamics in Brazil, whereas in section 3, we present the data used in the paper and the main findings concerning the decrease in the urban wage premium and its consequences on wage dynamics. Section 4 concludes.

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[1] Similar results are obtained by Souza and Osorio (2011), who show the importance of the metropolitan and non-metropolitan differentials to explain over 20% of the fall in inequality from 1980 to 2009. However, Ramos (2006), using a Theilde composition with region as a geographical control, claims that this contribution has been very weak. Menezes-Filho *et al.* (2006), following Gosling *et al.* (2000), run a quantile regression to study the impact of education returns and demographic factors to explain the reduction in inequality.

## 2. Regional Wage Dynamics and Urban Premium

### 2.1. Regional Wage Dynamics

Despite the disappointing results of regional convergence tests [2], the Brazilian economy is characterised by a positive trend in the less developed regions in the country, where average wages in the formal sector and growth domestic product (GDP) have been growing at an increasing rate [3]. For instance, the GDP per capita in the Northeast increased from 42% to 47% of the national average during the period 1995-2007. Similarly, real household income in the Northeast grew at an average rate of 5% per year in the last decade, above the national rate. Meanwhile, it is interesting to note that medium-sized cities are becoming more relevant in the national economy. Da Mata and Mota (2008) show that the average GDP growth rate in cities with a population between 100,000 and 500,000 inhabitants is almost twice that in cities with more than 500,000 inhabitants. Furthermore, there is a relocation of industrial employment towards inland regions and other middle-income regions, such as the interior of the state of São Paulo, the Centre-West and the South. This shift also occurred towards some metropolitan areas in the Northeast, with a subsequent increase in the share in industrial employment in these regions (Cruz and Santos, 2011).

How could this recent and incipient pattern in terms of regional dynamics be related to the observed fall in inequality in the first decade of the 21st century in Brazil? And what is the role played by the urban wage premium? In the next sub-section, we introduce these issues with some descriptive statistics concerning the urban wage premium and income distribution.

### 2.2. Urban Premium and Wage Dynamics

We use PNAD data for the period 2002-2009 to focus on the dynamics of wages by city size. From PNAD, it emerges that the bottom of the distribution, mainly low-skilled workers, indicates an increase in real wages in the period 2002-2009 at the country level. When this impact is investigated by city size, it can be observed that the increase at the bottom of the wage distribution is observed in all city sizes and in all states.

We use the period 2002-2009 for two reasons. First, it is the period when inequality fell at a faster rate. Second, there has been a methodological change in the occupation classification (CBO) in 2002. We also define metropolitan areas (MAs) as the 10 traditional areas defined by the Federal Government in 1973 and explicitly defined in PNAD as metropolitan areas. We define as medium-sized cities those with

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[2] See, for instance, Oliveira and Rodrigues (2011) for a survey on studies on regional convergence in Brazil or Magalhães *et. al.* (2005) that considers spatial dependence on the process of convergence.

[3] Formal Sector workers (or formal workers) are workers who declare having a formal contract with the employer, implying that they are covered by the national social security system.

urban areas that are labeled as «autorepresentativo», cities with a probability of one of being in the PNAD sample and that are not included as Metropolitan Areas. It is not possible in PNAD to identify the exact city size; we thus must aggregate the «autorepresentativo» group and label the cities as medium-sized cities. For the small cities, we use urban areas that are not included as MAs or in the «autorepresentativo» group. We exclude from analysis the rural areas in the North of the Country, as they were included in PNAD only after 2004.

Figure 1 shows the evolution of real average wages [4] between 2002 and 2009 by city size and education in PNAD. More specifically, it shows the real average income by city size in 2002 on the X-axis and the average income by city size in 2009 on the Y-axis. The dots are weighted by population in each area. Therefore, we can divide the quadrant in two spaces, above and below the 45º line. Every point above the 45º line represents a city that experienced an increase in real, whereas points below the identity line concern cities that exhibited a decreased average income.

We present this relation for two different levels of education: primary (or less than primary) and tertiary education. Figure 1.1 presents workers with primary education or less. It can be noted that the slope of the trend line is close to one and that there is a positive intercept, suggesting that unskilled workers in all cities have experienced an increase in their income. The trend is parallel to the identity line, meaning that the points for unskilled workers are located in the space of positive real growth in wages. Figure 1.2 illustrates the behaviour of workers with regard to tertiary education. This trend differs substantially from that shown in the last figure, as the slope is less than one, suggesting that for some groups of workers, the curve crosses the identity line and real labour earnings in 2009 are lower than in 2002.The value at which the trend line of individuals with tertiary education crosses the identity line is R$ 1,754.00/month. Note also that the dots for workers with tertiary educational attainment are more highly dispersed.

To summarise, workers with inferior qualifications in cities of all sizes have observed a real increase in their wages, whereas the real wages of qualified workers have decreased or remained constant [5]. It is also worth noting that highly populated areas are characterised by higher wages, which suggests that in the graph, the regions with higher wages in 2002 are the most agglomerated and those most often located below the 45º line. In Figure 2, we present Gini indexes for wages in 2002 and 2009 by five macro-regions, four degrees of urban intensity, three skill levels [6] and three education levels. In terms of city size, metropolitan areas are more unequal, and the rank

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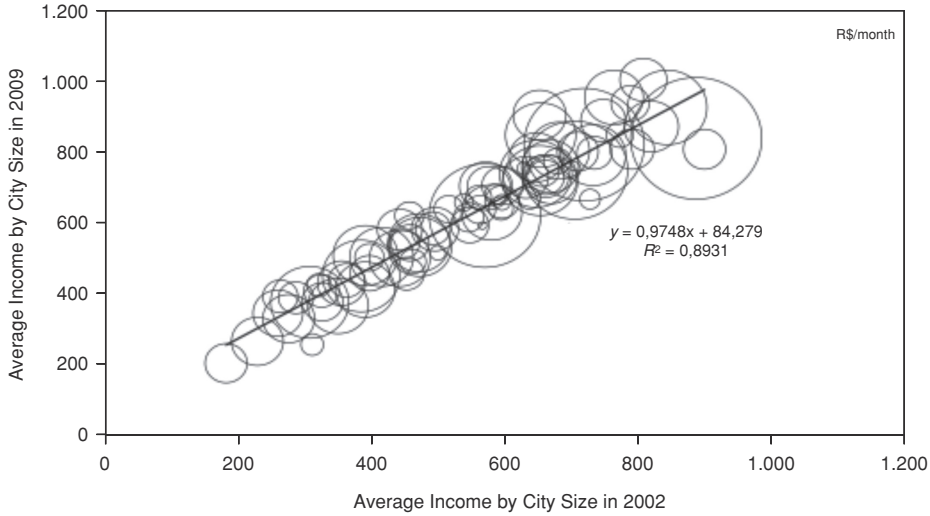
[4] Average wages are deflated by the national price index (IPCA). We did not use any regional adjustment in the price level for two reasons. First, we would like to use the same database used in the literature on inequality. Second, there is no consensus about which index to use.

[5] The reduction in the return to education explains part of the fall in inequality. The point we raise is that this reduction was not uniformly distributed among city sizes but was higher in MAs (World Bank, 2011).

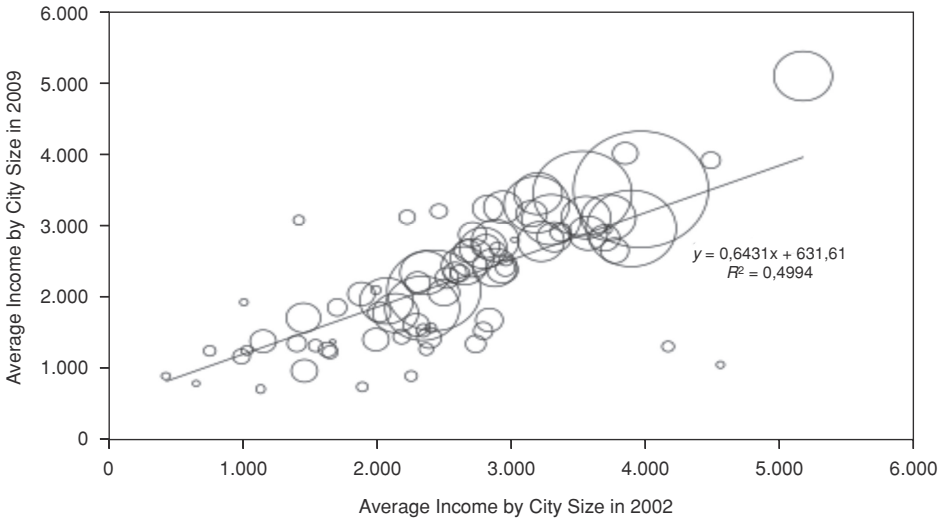
[6] Skills are classified according to their level of complexity and tasks defined in the international standards to occupations. Therefore, high-skilled workers include managers and professional occupations, medium-skilled workers are classified as technicians, and all others with lower levels of complexity are classified as low skilled.

**Figure 1.** Average Labour Earning by City Size and Education in 2002 and 2009

**1.1.** Primary or Less Education. Average Income by City Size 2002 and 2009



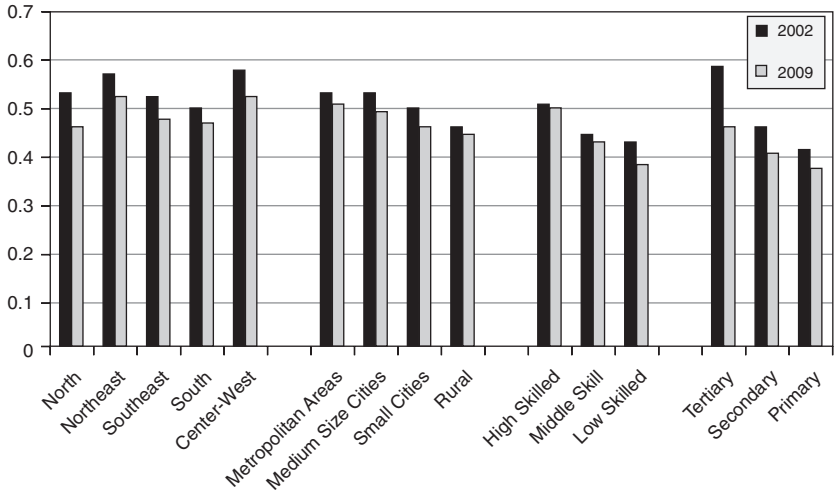

**1.2.** Tertiary Education. Average Income by City Size 2002 and 2009




*Source:* IBGE/PNAD.

of inequality is inversely related to city size: a more populated city has a higher Gini index. It is worth stressing that there has been a strong reduction in tertiary education inequality, whereas smaller reductions in inequality are observed when considering the skill levels: high-skill occupations maintain almost the same level of inequality.

**Figure 2.** Brazil - Gini Index for Hourly Wages (workers with more than 20 hours of labour per week) by Region, City Size, Skills and education (2002-2009)




*Source:* IBGE/PNAD.

To illustrate the evolution of the wages by city size, we present in table 1 the average hourly wage by city size for different percentiles (25th, 75th and 90th percentiles). There is a gain in average real wages for all types of cities, which is more pronounced for less populated cities. This stronger growth reflects an increase in the total labour income share for less populated cities, whereas MA's lose their share of total labour income to small- and medium-sized areas. The two last columns in table 1.1 present the share in total wage and total employment. Regarding employment dynamics by city size, it can be observed that rural and metropolitan areas decrease their share over time in the total working population aged 18-60 years, whereas small- and medium-sized areas increase their employment share. Table 1.2 shows the ratio between the MAs' average wage and the average wages of the other urban intensity categories. It is interesting to note that the ratio in wages between the MAs and other city sizes reduced for all groups (skills, occupation and geographical segmentation). For instance, on average, wages were 1.14 times higher in MA's than in medium-sized cities in 2002 and only 1.07 times higher in 2009.

One could ask what the relative contribution of regional variables to inequality reduction is. In figure 3, we show a between-within decomposition of the Theil index with respect to some variables of interest. The X-axis presents the decomposition of the Theil index for variables such as urban intensity, region, urban intensity refined by state, skill and education [7]. The Y-axis represents the percentage of the contribu-

[7] Regions are defined as the 5 macro regions in Brazil: North, Northeast, Centre-West, Southeast and South. By urban intensity, we use the definition already made (metropolitan area, medium cities, small

**Table 1.1.** Hourly Wage and the Share in national Income by City Size

| *City Size* | *Mean* | | *P25* | | *P75* | | *P90* | | *Share in Aggregate Wages (%)* | | *Share in total Employment (%)* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *(R$/Hour)* | | *(R$/Hour)* | | *(R$/Hour)* | | *(R$/Hour)* | | *(R$/Hour)* | | *(R$/Hour)* | |
| | *2002* | *2009* | *2002* | *2009* | *2002* | *2009* | *2002* | *2009* | *2002* | *2009* | *2002* | *2009* |
| Rural | 2,66 | 3,70 | 1,16 | 1,67 | 2,94 | 4,17 | 4,90 | 6,67 | 5,5 | 6,1 | 12,4 | 11,2 |
| Small Cities | 4,64 | 5,56 | 1,78 | 2,64 | 4,91 | 5,99 | 9,38 | 10,71 | 25,4 | 27,6 | 32,8 | 33,7 |
| Medium Cities | 6,96 | 7,84 | 2,23 | 2,98 | 7,06 | 8,09 | 14,71 | 15,75 | 25,6 | 26,2 | 22,1 | 22,7 |
| Metrop. Areas | 7,94 | 8,36 | 2,61 | 3,13 | 8,03 | 8,33 | 17,44 | 17,04 | 43,4 | 40,0 | 32,7 | 32,4 |

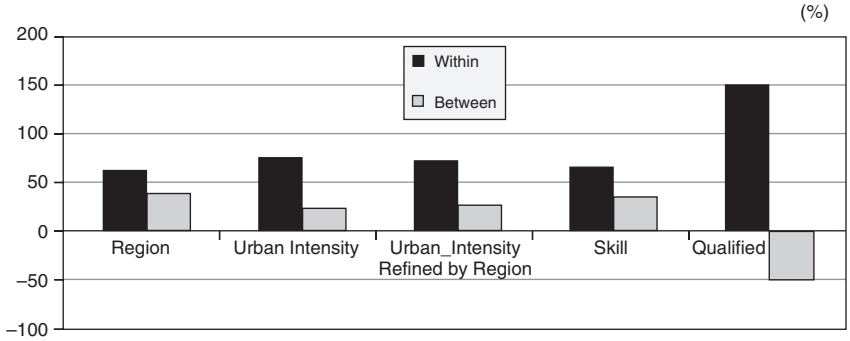
Sample weight used. Individual working at least 20 hours per week, aged 18-60 year-old.

**Table 1.2.** Ratio Metropolitan Areas Average Wage and Average Wage in the City in 2002 and 2009

| | *Mean* | | *P25* | | *P75* | | *P90* | |
|---|---|---|---|---|---|---|---|---|
| | *2002* | *2009* | *2002* | *2009* | *2002* | *2009* | *2002* | *2009* |
| MA/Rural | 2,98 | 2,26 | 2,25 | 1,87 | 2,73 | 2,00 | 3,56 | 2,55 |
| MA/Small Cities | 1,71 | 1,50 | 1,47 | 1,18 | 1,64 | 1,39 | 1,86 | 1,59 |
| MA/Medium Cities | 1,14 | 1,07 | 1,17 | 1,05 | 1,14 | 1,03 | 1,19 | 1,08 |

Sample weight used. Individual working at least 20 hours per week, aged 18-60 year-old.

**Figure 3.** Within-between Theil Index Decomposition and Contribution to Inequality in wages, 2002 to 2009




*Source:* IBGE/PNAD. Note: Hourly Wage individuals with more than 20 hours worked.

tion of each component within and between. For each variable, the sum of each component (within and between) is equal to 100. When considering the five categories in

cities and rural areas). We refine the urban intensity by state, applying the definition of urban intensity to the 27 states in Brazil.

the region variable, the between component represents almost 40% of the reduction in the Theil index, whereas for the urban intensity it represents over a quarter of the reduction in inequality. As for the «between» component of education, it has a negative impact on the inequality measured by the Theil index. Therefore, the fall in the returns to higher education, especially when one compares metropolitan and non-metropolitan within the same qualification group, is consistent with this paper's main proposal. Regarding the decomposition of the skill variable, an important fraction of the inequality is explained by the between component, but over 50% is explained by the within component. Therefore, these findings suggest that with regard to the regional and spatial controls, the between dimension plays a crucial role in explaining inequality trends, confirming that the analysis of inequality can be enriched by the introduction of a regional dimension, whereas the within component is more important for components such as education and occupation.

## 3. The urban wage premium and the wage distribution

### 3.1. The econometric specification

So far, we have investigated the differences in wages across Brazilian regions and for different degrees of urban intensity. Our descriptive analysis shows, among other findings, a reduction in the share of wages in MA with respect to total wages in the economy. The main limitation of using a descriptive approach is that the reduction in wages in agglomerated areas may be the result of a changing composition of the labour force over time and of other factors that cannot be controlled for using a descriptive approach.

For this reason, in this section, we must move to an econometric analysis to estimate the urban wage premium for the Brazilian labour market, using PNAD data and controlling for a wide set of covariates. We make use of two different waves of the PNAD data for the years 2002 and 2009 to investigate the dynamics of the phenomenon.

The dependent variable is the (log) hourly wage. In particular, we use the monthly wage for one's primary job, computing the hourly wage by dividing the monthly wage by the hours worked per week (time 4). Wages are deflated using the IPCA deflator [8].

The main independent variable is a measure of the urban level of agglomeration. Using PNAD, we have defined a variable with four urban intensity levels: 1) rural area; 2) small city areas; 3) medium city areas; and 4) metropolitan areas (MA). As control variables, the PNAD data include a very rich set of variables. This characteristic is crucial for controlling for individual observed heterogeneity and as such correctly identifying the urban wage premium. In particular, we use the following control variables: being female; four education levels (lower than primary; primary; secondary; tertiary); experience in 8 dummies (in months: 0-4; 5-12, 13- 24; 25-48; 49-96; 97-180; 180-

[8] The sample is restricted to individuals aged 18-65 and to individuals working no less than 20 hours per week.

420; more than 420); 11 industry dummies; 8 occupation dummies; having a formal contract; being unionised; being white; being migrant [9], being a household head; and five region dummies (North, Northeast, South-East; South; Centre-West).

This set of covariates allows for accurately controlling for economic condition (sector, occupation, union, formal, and region) and for socio-individual characteristics (gender, experience, race, role in the household). It is also important to stress that we control for the five macro regions; in this way, the identification of our variable of interest, urban intensity, is not affected by the important heterogeneity between regions that characterises the Brazilian economy.

### 3.2. Theoretical Background

Because we aim to evaluate the impact of the region urban intensity on wages, we estimate a wage curve, including controls for observed heterogeneity (individual characteristics, sector, occupation and region). It is worth stressing that in estimating a wage curve, we follow a robust and well-established theoretical background that rationalises the relation between proxies for urban density and wages, although we are not aware of any application for the Brazilian case.

Combes *et al.* (2005) highlight two different strands in the literature to study this issue. One strand began with the seminal paper of Henderson (1974), and the second relates to the New Economic Geography (NEG). In the former case, the positive relationship between urban density and nominal wages is mainly explained by agglomeration economies, such as thickness in the labour markets, cheaper inputs, and localised knowledge spillover. Following this tradition, Moretti (2012) analyses inequality trends in the US among metropolitan areas using a simple general equilibrium model, where the mobility of workers (the relative mobility of skilled and unskilled) and the elasticity of the housing supply are the drivers of the evolution of real wages among cities in the US. Moretti is able to identify that a localised skilled-biased demand was the main driving force of inequality trends.

In the second strand of the literature, Redding and Schott (2003) developed a New Economic Geography model, where pecuniary externalities have an important role for wage inequalities, especially those among skilled and unskilled workers. In this type of model, there is an endogenous decision to accumulate human capital, which is determined by the interplay between variables such as increasing returns to scale, transport costs, input—output linkages and human capital investments. The empirical relationship among wages of skilled and unskilled workers is thus a result of the interaction of these variables. In the original paper, Redding and Schott (2003) estimate the impact of the market and supplier access on bilateral trade. They also investigate how relevant these variables are for educational attainments, as education is an endogenous decision and firms in remote locations pay greater trade costs on

[9] A migrant is defined as a worker who did not live in the city four years before the date of the survey.

both exports and intermediate imports, reducing the amount of value-added remaining to remunerate domestic factors of production. Furthermore, if skill-intensive sectors have higher trade costs, more pervasive input-output linkages or stronger increasing returns to scale, the authors demonstrate that remoteness decreases the skill premium and limits incentives for human capital accumulation. Therefore, the authors exploit structural relationships from the model to show that countries with lower market access have lower levels of educational attainments. López-Rodriguez *et al.* (2007) apply this model to the European Union regions, do not reject the main conclusion of Redding and Schott (2003) that educational attainment levels are higher in those regions with greater market access. Fallah *et al.* (2011) expand Redding and Schott's (2003) model, deriving an explicit wage curve and testing the impact on wages of market access, measured by the traditional market potential, on the skill premium in US Metropolitan Areas. They also find a positive relationship between educational attainment and market access in the US regions.

In such a theoretical framework, our work can be viewed as a first attempt to highlight the role of the urban premium in the dynamics of the inequality in Brazil.

### 3.3. Urban premium and wage inequality trends: results

Table 2 shows the descriptive statistics of the covariates. It is possible to note that over time, individuals become more educated and more experienced, and the female and the formal shares increase, whereas the share of white workers decreases. Interestingly, the distribution by industry and occupation remains quite constant over time. For industry, the only significant difference is in the reduction in the agriculture share, and for occupation, there is a significant increase in professional workers and the decrease in rural workers. As expected, family size reduces over time, and the regional distribution mostly remains constant.

With regard to the dynamics of the variable of interest, it is interesting to note that the distribution of workers among the different categories of urban intensity (rural area, small city area, medium city area, MA) essentially remains constant over time.

To describe further the main characteristic of the sample used in the regression analysis, we also report additional statistics in table 3 and table 4. Table 3 presents the average years of schooling by the covariates used in the regression. There is an increase in average years of schooling for all covariates, and female workers have on average a higher education than male workers. Another interesting remark is that migrants have a slightly higher level of education with respect to residents. Metropolitan areas also display higher levels of education, above the national average. By regions, it can be noted that the Northeast is below the national average and that the North is very close to the national average in terms of schooling.

In table 4, we present the evolution of the average hourly wage by covariates. With regard to the region intensity variable, small cities and rural areas are far from the national average, even if a catching-up process is at play. It is also interesting to

**Table 2.** Descriptive statistics of the covariates of the analysis

| *Year* | *2002* | *2009* | | *Year* | *2002* | *2009* |
|---|---|---|---|---|---|---|
| Rural Area | 0,122 | 0,115 | | Clerical Support | 0,090 | 0,105 |
| Small City | 0,332 | 0,345 | | Services Workers | 0,209 | 0,207 |
| Medium City | 0,219 | 0,223 | | Sellers and reatil Workers | 0,093 | 0,092 |
| MA | 0,327 | 0,317 | | Rural Workers | 0,123 | 0,099 |
| Less than primary | 0,494 | 0,392 | | Plant and Machine Operators | 0,267 | 0,267 |
| Primary | 0,173 | 0,154 | | Agriculture | 0,125 | 0,101 |
| Secondary | 0,242 | 0,338 | | Manufacturing Industry | 0,161 | 0,164 |
| Tertiary | 0,092 | 0,116 | | Construction | 0,083 | 0,084 |
| Experience (months 0-4) | 0,095 | 0,082 | | Commerce, Retail and Repair | 0,181 | 0,187 |
| Experience (5-12) | 0,104 | 0,119 | | Lodging and Food | 0,038 | 0,039 |
| Experience (13-24) | 0,132 | 0,120 | | Transport and comunication | 0,055 | 0,055 |
| Experience (25-48) | 0,137 | 0,131 | | Public Administration | 0,060 | 0,061 |
| Experience (49-96) | 0,146 | 0,138 | | Education and Health | 0,103 | 0,105 |
| Experience (97-180) | 0,132 | 0,132 | | Domestic Services Maid | 0,078 | 0,076 |
| Experience (180-420) | 0,115 | 0,122 | | Other Collective Services | 0,039 | 0,041 |
| Experience (>420) | 0,140 | 0,157 | | Other Services | 0,077 | 0,087 |
| Female | 0,416 | 0,450 | | Family size (1-2) | 0,217 | 0,256 |
| Union | 0,181 | 0,185 | | Family size (3-4) | 0,524 | 0,547 |
| Formal | 0,533 | 0,603 | | Family size (more than 4) | 0,259 | 0,197 |
| White | 0,555 | 0,500 | | North | 0,052 | 0,060 |
| Migrant | 0,044 | 0,039 | | Northeast | 0,250 | 0,259 |
| HH head | 0,559 | 0,519 | | Southeast | 0,462 | 0,446 |
| Manager | 0,060 | 0,057 | | South | 0,162 | 0,159 |
| Professionals | 0,065 | 0,083 | | Center-West | 0,075 | 0,077 |
| Techinicians | 0,094 | 0,091 | | | | |

focus on the occupation breakdown. The only category that did not have a positive real growth is that of very high-skilled workers, such as managers and professionals, which essentially remained constant over time, whereas in all other occupations there is a positive increase between 2002 and 2009. Further, despite the higher qualification, on average, female workers earn less than male.

For the first econometric analysis, we perform an ordinary least squares estimation, separately for 2002 and 2009, with all control variables (table 5). The omitted variable for the urban intensity is working in a small city area. As expected, the urban wage premium with respect to this omitted category is negative when considering rural areas, whereas it is positive for medium city areas and MAs, with the latter representing the greatest urban premium. In 2002, the penalisation for living in a rural area was equal to 11%, the premium for living in a medium city area was 16.3%, and the premium for living in a MA was 22.8%, which represents a sizeable impact.

Interestingly, the urban wage premium decreased over time: in 2009 the premium for living decreased to 13.8% for a medium city area and to 17.4% for a MA, representing for the latter a decrease of 5.4 percentage points (p.p.) with respect to 2002. This

**Table 3.** Average Years of Schooling by covariates (2002 and 2009)

| *Year* | *2002* | *2009* | | *Year* | *2002* | *2009* |
|---|---|---|---|---|---|---|
| **Brazil** | **8,2** | **9,2** | | | | |
| Rural Area | 4,7 | 6,0 | | Sellers and reatil Workers | 8,8 | 10,0 |
| Small City | 7,6 | 8,8 | | Rural Workers | 4,0 | 5,1 |
| Medium City | 9,1 | 10,1 | | Plant and Machine Operators | 7,2 | 8,3 |
| MA | 9,5 | 10,3 | | Agriculture | 4,0 | 5,2 |
| Female | 8,9 | 9,7 | | Manufacturing Industry | 8,8 | 9,9 |
| Male | 7,8 | 8,9 | | Construction | 6,2 | 7,3 |
| Union | 9,7 | 10,6 | | Commerce, Retail and Repair | 9,1 | 10,2 |
| Non-Union | 8,2 | 9,4 | | Lodging and Food | 7,9 | 9,1 |
| Formal | 9,8 | 10,7 | | Transport and comunication | 8,6 | 9,7 |
| Informal | 6,8 | 8,0 | | Public Administration | 11,0 | 12,0 |
| White | 9,1 | 10,2 | | Education and Health | 12,0 | 13,1 |
| Non-White | 7,0 | 8,3 | | Domestic Services Maid | 6,3 | 7,2 |
| Migrant | 8,4 | 9,8 | | Other Collective Services | 9,2 | 10,6 |
| Resident | 8,1 | 9,2 | | Other Services | 11,3 | 12,0 |
| Manager | 11,8 | 12,4 | | North | 8,1 | 9,3 |
| Professionals | 14,6 | 15,2 | | Northeast | 6,7 | 7,9 |
| Techinicians | 11,7 | 12,4 | | Southeast | 8,9 | 9,8 |
| Clerical Support | 11,6 | 12,2 | | South | 8,7 | 9,7 |
| Services Workers | 7,0 | 8,2 | | Center-West | 8,4 | 9,5 |

Sample weight used. Individual working at least 20 hours per week.

represents an interesting finding of the paper because as far as we know, this is the first contribution showing declining urban wage premiums in Brazil. This is also particularly interesting because Brazil has been in a high growth cycle in the last ten years, and high growth can be expected to be correlated to agglomeration dynamics and spillovers, which should have increased rather than decreased the urban wage premium.

From table 5, it is also interesting to investigate the dynamics of other covariates. For instance, our analysis confirms the significant decrease in the returns to education. The returns to having a tertiary degree relative to having a primary degree range from 87% to 63%, whereas the returns to having a secondary degree range from 20.9% to 14.1%, consistent with the World Bank's (2011) analysis. This compression in the returns to education is another driver reducing inequality in Brazil: in 2002, the differences between the most and the least educated amounted to 102.2 p.p. on average (87.9 plus 14.3), whereas in 2009, this difference reduced to 76 p.p. (63 plus 12.7).

The other covariates for which we have a sizeable coefficient variation over time are being formal, which increases by 3.6 p.p., being a household head, which strongly decreases by 7.2 p.p., and being white, which decreases by 3.1 p.p. The gender wage gap also increases by 3.1 p.p., suggesting that the gender differentials are slightly increasing in Brazil. With regard to returns from experience, they do not change substantially over time, nor do the returns to having a given occupa-

**Table 4.** Average hourly wage (Reais per hour) by covariates (2002 and 2009)

| *Year* | *2002* | *2009* | | *Year* | *2002* | *2009* |
|---|---|---|---|---|---|---|
| **Brazil** | **5,87** | **6,69** | | | | |
| Rural Area | 2,66 | 3,70 | | Sellers and reatil Workers | 4,10 | 4,57 |
| Small City | 4,64 | 5,56 | | Rural Workers | 2,70 | 3,53 |
| Medium City | 6,96 | 7,84 | | Plant and Machine Operators | 4,21 | 4,93 |
| MA | 7,94 | 8,36 | | Agriculture | 2,74 | 3,58 |
| Female | 5,22 | 5,88 | | Manufacturing Industry | 5,98 | 6,43 |
| Male | 6,24 | 7,20 | | Construction | 4,43 | 5,08 |
| Union | 9,16 | 9,62 | | Commerce, Retail and Repair | 5,52 | 5,84 |
| Non-Union | 5,14 | 6,02 | | Lodging and Food | 3,90 | 4,65 |
| Formal | 7,59 | 8,04 | | Transport and comunication | 6,62 | 7,33 |
| Informal | 7,59 | 8,04 | | Public Administration | 10,43 | 12,78 |
| White | 7,40 | 8,27 | | Education and Health | 8,51 | 9,62 |
| Non-White | 3,97 | 5,08 | | Domestic Services Maid | 2,18 | 2,87 |
| Migrant | 6,25 | 7,99 | | Other Collective Services | 5,78 | 6,28 |
| Resident | 5,86 | 6,64 | | Other Services | 10,37 | 10,27 |
| Manager | 16,39 | 16,74 | | North | 5,13 | 5,98 |
| Professionals | 17,43 | 17,40 | | Northeast | 3,57 | 4,56 |
| Techinicians | 8,77 | 9,51 | | Southeast | 6,94 | 7,40 |
| Clerical Support | 5,87 | 6,11 | | South | 6,06 | 7,42 |
| Services Workers | 3,02 | 3,66 | | Center-West | 6,65 | 7,98 |

Sample weight used. Individual working at least 20 hours per week.

tion, with some important exceptions: the return to being a professional increases by 8.5 p.p., and the return to being a rural worker decreases by 12.2 p.p. One interesting remark concerns the industry returns, which decrease substantially for virtually all industries, suggesting that industries matter less over time in determining the wage structure. A similar argument applies for family size. Finally, the returns to being in the Southeast decrease by 5.7 p.p., whereas the returns to being in the Centre-West increase by 2.9 p.p.

By means of OLS results, it is possible to claim that returns to the different categories of urban intensity (rural, small size, medium size, MA) are compressed over time, as the penalisation for living in a rural area (with respect to a small city area) reduced as well as the urban premium for being in a medium city area or in a MA. From this evidence, one might argue that urban intensity contributes to the reduction in wage differentials between individuals across regions.

A step further in analysing the relation between the dynamics of the urban wage premium and the wage distribution is to apply quantile regressions (Koenker and Basset, 1978). Quantile regressions enable investigating the magnitude and the dynamics of the urban wage premium along the wage distribution and thus analysing whether the reduction in urban wage premia is stronger for skilled or unskilled individuals. Quantile regressions have been extensively used to study inequality trends in

**Table 5.** OLS estimates for the urban wage premium in Brazil (2002–2009)

| | *2002* | | *2009* | |
|---|---|---|---|---|
| | *Coeff.* | *t–stat* | *Coeff.* | *t–stat* |
| Rural Area | –0,110 | –12,44 | –0,077 | –10,73 |
| Medium City | 0,163 | 29,68 | 0,138 | 30,54 |
| MA | 0,228 | 46,70 | 0,174 | 42,82 |
| Less than primary | –0,143 | –26,13 | –0,127 | –25,52 |
| Secondary | 0,209 | 33,37 | 0,141 | 28,59 |
| Tertiary | 0,879 | 73,69 | 0,630 | 71,15 |
| Female | –0,175 | –32,28 | –0,206 | –48,01 |
| Union | 0,100 | 17,72 | 0,090 | 19,13 |
| Formal | 0,195 | 41,39 | 0,231 | 58,10 |
| White | 0,142 | 32,62 | 0,112 | 30,94 |
| Migrant | 0,100 | 10,25 | 0,117 | 12,85 |
| HH head | 0,196 | 42,59 | 0,124 | 33,53 |
| Experience (0-4) | –0,134 | –18,06 | –0,072 | –11,51 |
| Experience (5-12) | –0,048 | –6,91 | –0,024 | –4,34 |
| Experience (25-48) | 0,066 | 9,88 | 0,062 | 11,09 |
| Experience (49-96) | 0,157 | 23,01 | 0,141 | 24,70 |
| Experience (97-180) | 0,240 | 32,91 | 0,204 | 33,53 |
| Experience (180-420) | 0,358 | 44,27 | 0,328 | 48,86 |
| Experience (>420) | 0,203 | 6,22 | 0,178 | 7,46 |
| Manager | 0,756 | 61,85 | 0,751 | 71,42 |
| Professionals | 0,508 | 36,39 | 0,594 | 58,33 |
| Techinicians | 0,412 | 45,16 | 0,408 | 54,71 |
| Clerical Support | 0,136 | 16,55 | 0,129 | 20,59 |
| Sellers and reatil Workers | 0,114 | 11,14 | 0,118 | 14,04 |
| Rural Workers | –0,006 | –0,25 | –0,128 | –5,60 |
| Plant and Machine Operators | 0,103 | 13,14 | 0,104 | 16,24 |
| Manufacturing Industry | 0,199 | 8,40 | 0,063 | 2,82 |
| Construction | 0,232 | 9,55 | 0,105 | 4,63 |
| Commerce, Retail and Repair | 0,151 | 6,29 | –0,002 | –0,07 |
| Lodging and Food | 0,132 | 5,14 | –0,004 | –0,19 |
| Transport and comunication | 0,359 | 14,43 | 0,158 | 6,77 |
| Public Administration | 0,360 | 14,69 | 0,320 | 13,82 |
| Education and Health | 0,227 | 9,32 | 0,073 | 3,21 |
| Domestic Services Maid | 0,100 | 4,06 | 0,021 | 0,91 |
| Other Collective Services | 0,247 | 9,50 | 0,101 | 4,20 |
| Other Services | 0,303 | 12,32 | 0,152 | 6,63 |
| Family size (3-4) | 0,062 | 11,60 | 0,017 | 3,99 |
| Family size (more than 4) | 0,025 | 3,97 | –0,018 | –3,36 |
| Northeast | –0,286 | –37,93 | –0,266 | –42,54 |
| Southeast | 0,122 | 17,06 | 0,066 | 11,03 |
| South | 0,086 | 10,56 | 0,105 | 15,53 |
| Center-West | 0,107 | 12,91 | 0,136 | 20,00 |
| Constant | 0,353 | 13,47 | 0,783 | 32,26 |
| R2 | 0,56 | | 0,53 | |
| Observation | 118699 | | 149690 | |

Sample weight used. Individual working at least 20 hours per week. T–statistics are computed using robust standard errors.

**Table 6.** Quantile regressions on the 10, 50, and 90 percentiles (2002-2009)

| | *2002* | | | | | | *2009* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *10* | | *50* | | *90* | | *10* | | *50* | | *90* | |
| | *Coeff.* | *t-stat* | *Coeff.* | *t-stat* | *Coeff.* | *t-stat* | *Coeff.* | *t-stat* | *Coeff.* | *t-stat* | *Coeff.* | *t-stat* |
| Rural Area | –0,113 | –9,73 | –0,075 | –9,03 | –0,093 | –5,43 | –0,084 | –9,55 | –0,059 | –9,00 | –0,054 | –4,31 |
| Medium City | 0,137 | 16,42 | 0,156 | 27,07 | 0,159 | 15,78 | 0,110 | 17,08 | 0,115 | 24,70 | 0,128 | 15,07 |
| MA | 0,180 | 25,36 | 0,222 | 42,82 | 0,252 | 27,28 | 0,144 | 21,80 | 0,138 | 36,29 | 0,175 | 22,46 |
| Less than primary | –0,120 | –14,27 | –0,108 | –18,28 | –0,160 | –15,13 | –0,106 | –15,03 | –0,092 | –17,73 | –0,124 | –12,53 |
| Secondary | 0,141 | 14,63 | 0,191 | 28,97 | 0,268 | 23,24 | 0,109 | 14,93 | 0,126 | 23,95 | 0,168 | 17,40 |
| Tertiary | 0,729 | 41,86 | 0,887 | 82,63 | 0,988 | 53,76 | 0,426 | 34,59 | 0,639 | 79,18 | 0,790 | 55,69 |
| Female | –0,166 | –19,41 | –0,159 | –28,77 | –0,177 | –19,16 | –0,159 | –25,68 | –0,177 | –41,63 | –0,217 | –28,76 |
| Union | 0,099 | 11,87 | 0,103 | 18,01 | 0,117 | 11,90 | 0,062 | 9,68 | 0,088 | 19,37 | 0,127 | 15,40 |
| Formal | 0,420 | 64,80 | 0,173 | 36,28 | 0,006 | 0,68 | 0,505 | 104,05 | 0,187 | 48,14 | 0,044 | 5,89 |
| White | 0,108 | 16,19 | 0,125 | 27,43 | 0,172 | 21,87 | 0,071 | 13,85 | 0,092 | 25,00 | 0,149 | 22,13 |
| Migrant | 0,054 | 3,78 | 0,079 | 7,98 | 0,129 | 7,77 | 0,032 | 2,73 | 0,074 | 8,76 | 0,219 | 14,20 |
| HH head | 0,163 | 22,53 | 0,176 | 36,39 | 0,226 | 27,56 | 0,083 | 15,88 | 0,107 | 28,82 | 0,155 | 22,70 |
| Experience (0-4) | –0,132 | –11,28 | –0,092 | –11,33 | –0,158 | –10,96 | –0,074 | –7,68 | –0,045 | –6,50 | –0,111 | –8,68 |
| Experience (5-12) | –0,054 | –4,73 | –0,040 | –5,13 | –0,057 | –4,07 | –0,025 | –2,87 | –0,016 | –2,58 | –0,036 | –3,14 |
| Experience (25-48) | 0,029 | 2,71 | 0,063 | 8,60 | 0,095 | 7,29 | 0,030 | 3,49 | 0,063 | 10,20 | 0,093 | 8,20 |
| Experience (49-96) | 0,105 | 9,99 | 0,155 | 21,20 | 0,205 | 15,82 | 0,080 | 9,39 | 0,127 | 20,73 | 0,202 | 17,97 |
| Experience (97-180) | 0,151 | 13,88 | 0,245 | 32,51 | 0,336 | 25,18 | 0,118 | 13,68 | 0,191 | 30,47 | 0,297 | 25,56 |
| Experience (180-420) | 0,236 | 20,54 | 0,359 | 44,99 | 0,524 | 37,35 | 0,185 | 20,49 | 0,315 | 48,52 | 0,508 | 42,39 |
| Experience (>420) | –0,127 | –3,98 | 0,159 | 7,16 | 0,633 | 16,32 | –0,154 | –6,73 | 0,150 | 8,97 | 0,467 | 15,27 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manager | 0,527 | 31,54 | 0,754 | 67,60 | 1,018 | 52,46 | 0,464 | 34,92 | 0,755 | 83,04 | 1,038 | 62,97 |
| Professionals | 0,363 | 17,63 | 0,504 | 39,74 | 0,676 | 31,28 | 0,447 | 30,94 | 0,578 | 61,27 | 0,760 | 45,98 |
| Techinicians | 0,293 | 20,38 | 0,438 | 45,44 | 0,482 | 28,57 | 0,244 | 21,70 | 0,409 | 52,23 | 0,556 | 39,46 |
| Clerical Support | 0,156 | 11,06 | 0,138 | 14,31 | 0,129 | 7,73 | 0,105 | 9,97 | 0,125 | 16,91 | 0,155 | 11,58 |
| Sellers-retail Workers | 0,028 | 1,80 | 0,094 | 8,87 | 0,257 | 14,42 | 0,023 | 1,94 | 0,097 | 11,37 | 0,262 | 17,16 |
| Rural Workers | –0,102 | –2,92 | –0,028 | –1,12 | –0,001 | –0,02 | –0,296 | –10,74 | –0,111 | –4,47 | –0,044 | –0,87 |
| Plant, Machine Oper. | 0,114 | 8,82 | 0,104 | 11,75 | 0,118 | 7,80 | 0,080 | 7,82 | 0,110 | 15,31 | 0,128 | 9,93 |
| Manufacturing | 0,248 | 7,31 | 0,205 | 8,23 | 0,077 | 1,94 | 0,110 | 4,07 | 0,058 | 2,36 | –0,007 | –0,14 |
| Construction | 0,336 | 9,56 | 0,231 | 8,94 | 0,064 | 1,53 | 0,172 | 6,17 | 0,086 | 3,45 | –0,005 | –0,09 |
| Commerce, Retail, Rep. | 0,191 | 5,54 | 0,135 | 5,35 | 0,045 | 1,12 | 0,026 | 0,94 | –0,020 | –0,82 | –0,076 | –1,52 |
| Lodging and Food | 0,162 | 4,35 | 0,130 | 4,83 | 0,090 | 2,07 | 0,008 | 0,27 | –0,012 | –0,49 | –0,050 | –0,96 |
| Transport-comunic. | 0,346 | 9,69 | 0,346 | 13,25 | 0,333 | 7,91 | 0,126 | 4,45 | 0,135 | 5,39 | 0,185 | 3,61 |
| Public Administ. | 0,396 | 11,08 | 0,344 | 13,24 | 0,242 | 5,83 | 0,264 | 9,31 | 0,283 | 11,30 | 0,278 | 5,48 |
| Education–Health | 0,361 | 10,23 | 0,228 | 8,84 | 0,065 | 1,56 | 0,147 | 5,25 | 0,065 | 2,63 | –0,054 | –1,07 |
| Domestic Services | 0,175 | 4,81 | 0,089 | 3,38 | –0,048 | –1,12 | –0,004 | –0,14 | 0,019 | 0,75 | –0,027 | –0,53 |
| Other Collective Serv. | 0,236 | 6,41 | 0,236 | 8,81 | 0,223 | 5,16 | 0,081 | 2,76 | 0,088 | 3,45 | 0,104 | 2,02 |
| Other Services | 0,354 | 10,02 | 0,296 | 11,43 | 0,183 | 4,37 | 0,154 | 5,51 | 0,123 | 4,95 | 0,078 | 1,54 |
| Family size (3–4) | 0,047 | 6,00 | 0,059 | 10,75 | 0,073 | 7,63 | 0,012 | 2,18 | 0,014 | 3,42 | 0,013 | 1,72 |
| Family size (more than 4) | 0,007 | 0,73 | 0,024 | 3,77 | 0,030 | 2,70 | –0,014 | –1,97 | –0,017 | –3,21 | –0,015 | –1,55 |
| Northeast | –0,306 | –28,61 | –0,246 | –33,12 | –0,258 | –19,90 | –0,279 | –33,39 | –0,228 | –37,93 | –0,230 | –20,92 |
| Southeast | 0,131 | 12,34 | 0,152 | 20,77 | 0,096 | 7,54 | 0,076 | 9,00 | 0,080 | 13,43 | 0,031 | 2,83 |
| South | 0,115 | 9,41 | 0,109 | 13,05 | 0,049 | 3,37 | 0,120 | 12,59 | 0,114 | 16,80 | 0,063 | 5,11 |
| Center-West | 0,089 | 7,33 | 0,100 | 12,01 | 0,097 | 6,79 | 0,083 | 8,82 | 0,121 | 18,02 | 0,133 | 10,95 |
| Constant | –0,369 | –9,65 | 0,327 | 11,80 | 1,151 | 25,53 | 0,140 | 4,62 | 0,805 | 30,68 | 1,474 | 27,90 |

Sample weight used. Individual working at least 20 hours per week.

Brazil (among others, Silveira Neto and Campelo, 2003; Ferreira *et al.,* 2006, Rocha, M. *et al.,* 2010), However, as far as we know, the study of the relationship between the urban premium and inequality in the Brazilian context represents an original contribution to the literature.

We performed three quantile regressions, estimated at the 10th, 50th and 90th percentiles, controlling for all covariates used in the OLS estimations. The results are presented in table 6.

As a first remark, it is interesting to note that urban intensity returns increase along the wage distribution. For instance, in 2002, the returns to being in a MA are equal to 17% at the 10th percentile and to 25.2% at the 90th percentile. This finding is consistent with those of Matano and Naticchioni (2012): returns to agglomeration are not uniformly distributed and increase along the wage distribution. Another interesting remark concerns the dynamics of such returns. Quantile regressions confirm that returns to being in a medium size area or in a MA decreases in the period 2002-2009. In particular, the returns to being in a MA range, at the 90th percentile, from 25.2% in 2002 to 17.5% in 2009; that is, –7.7 p.p. Similar findings are derived at the 50th percentile: returns to being in MA decreased from 22.2% to 13.8% (–8.4 p.p.). Interestingly, the reduction is smaller when considering the 10th percentile, for which the returns to being in MA ranged from 18% to 14.4% (–3.6 p.p).

These differences provide a first insight concerning the consequences on inequality issues. In 2002, the difference in the returns to being in a MA between workers at the 90th percentile and workers at the 10th percentile was equal to 7.2 p.p. (25.2 minus 18.0), whereas in 2009, it was equal to 3.1 p.p.; the reduction in the urban wage premium brings the wages of unskilled and skilled workers closer together, reducing inequality.

With regard to the returns to living in a medium city area, the reduction between 2002 and 2009 is flatter along the distribution, being equal to 3.1 p.p. at the 90th percentile, to 4.1 p.p. at the median and to 2.7 p.p. at the 10th percentile. Furthermore, as observed for the OLS case, the penalisation for being in rural areas decreases over time, by 2.9 p.p. at the 10th percentile, 1.6 p.p. at the median, and 3.9 p.p. at the 90th percentile.

Putting together the fall in the urban premium in MAs and the decrease in the penalisation for being in rural areas, it is found that at the 90th percentile, the difference in wages between workers in rural areas and those in MAs was equal to 34.5 p.p. (25.2 plus 9.3) in 2002 and decreased to 22.9 p.p. (–11.6 p.p.) by 2009, suggesting that wage differentials at the 90th percentile due to urban intensity decreased strongly over time. A similar finding applies for the median, where the distance between workers in MAs and rural areas decreased from 29.7 p.p. in 2002 to 17.4 p.p. in 2009 (–12.3 p.p.). Interestingly, for the 10th percentile, this difference is only 7.1 p.p. This finding indicates that along the wage distribution, there is a strong compression due to the fall in the urban wage premia, which has a negative effect on wage differentials across regions. Further, this compression is much stronger for skilled workers at the 90th percentile and for the median worker, reinforcing the compression effect on inequality.

## 4. Conclusions

In this paper, we investigate the trends in the urban wage premium in Brazil as well as the consequence on the reduction in inequality in the first decade of the 21st century. We find, using both OLS and quantile regressions, a decreasing urban wage premium over the period 2002-2009. Second, we show that the decrease in the urban wage premium is stronger at the 90th percentile than at the 10th percentile. These findings suggest that the falling urban wage premium have contributed to the reduction in inequality observed in Brazil in the last decade. We also note that for any given percentile of the distribution, the wage differential between workers in the most agglomerated areas and those in the least agglomerated areas (rural) strongly dampened over time, reinforcing the reducing impact on inequality.

Future research must propose explanations for the falling urban wage premia in Brazil and their impact on inequality. Moretti (2012) develops a general equilibrium model to explain the increasing inequality in the US, in which he disentangles demand from supply shocks, which affect the return to education, by region. Another strand in the literature, following the concept of New Economic Geography, stresses the importance of pecuniary externalities. Recent findings did not reject this hypothesis for European regions or for the US. The relative importance of each possible cause is, of course, an empirical matter (Redding and Schott, 2003; López-Rodriguez *et al.,* 2007, and Fallah *et al.,* 2011). Another possible extension is the potential use of spatial econometric techniques to control for spatial effects.

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# *Comment on «Falling urban wage premium and inequality trends: evidence for Brazil»,* by Bruno de Oliveira Cruz and Paolo Naticchioni

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The article «Falling urban wage premium and inequality trends: evidence for Brazil» aims to answer to what extent the evolution of the urban wage premium is a relevant factor behind the evolution of income inequality in Brazil from 2002 to 2009. The subsequent empirical examination is carried out on the basis of a household survey (PNAD) and the use of ordinary least squares and quantile regression econometric techniques to control for a rich set of covariates (region, gender, occupation, experience, race, sector and family characteristics). Two main results are derived. First, the urban wage premium has followed a decreasing path from 2002 to 2009. Second, the fall in the urban wage premium could have contributed to the reduction of inequality in Brazil in the last decade, given that the reduction in the wage premium over time is significantly higher at the top of the wage distribution ($90^{th}$ percentile) than at the bottom ($10^{th}$ percentile). Undoubtedly, this is the most relevant finding of the research.

In my opinion, the article offers interesting evidence for several reasons. First, it examines the urban wage premium, a highly relevant topic. Accordingly, it deserves much attention, both by regional and labour economists, who have tried to disentangle if the urban wage premium is mostly caused by urbanisation externalities or alternative reasons, such as those stated in «learning» and «coordination» hypotheses (*i. e.,* that in cities, human capital accumulation is faster and there is a higher probability of a better match between workers and firms). Second, whereas most of the literature on the urban wage premium concerns advanced economies (specifically, the US and European countries), the article investigates an emerging country with additional interesting characteristics (namely, very strong regional imbalances, significant differences in the degree of urban intensity and a distinctive pattern of falling wage inequality). Finally, the research is well motivated (the authors make an important effort to convince the reader about the relevance of the Brazilian case, stressing the reasons that justify the analysis of this particular country), and the technical approach, although quite standard, is well developed. As a consequence, the study certainly makes an interesting contribution to the general knowledge about the effect of the evolution of the urban wage premium in reducing inequality in Brazil.

However, it must be noted that the methodology used to examine this question has certain limitations. First, the independent variable in the empirical analysis is a measure of the urban level of agglomeration, whose definition, according to four

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urban intensity levels (rural areas, small city areas, medium city areas and metropolitan areas), is constrained by the dataset construction methodology. Unfortunately, it apparently implies that the actual size of the cities in each category (*i. e.,* the number of inhabitants that delimits each category) is unknown, which hinders an appropriate interpretation of the empirical findings and comparisons with existing evidence from other countries. Second, the employed methodology does not distinguish between the relative impact of the fall of the urban wage premium on the reduction of inequality and that of other relevant alternative factors with potentially significant contributions to the reduction of inequality (notably, a decrease in the returns on education and spatial and sectoral changes experienced in the Brazilian labour market). As a result, the empirical analysis would have benefited from the use of more sophisticated decomposition techniques (such as that of Firpo, Fortin and Lemieux, 2011; chapter 1, vol. 4, *Handbook of Labor Economics*) to disentangle the relative impact of the urban wage premium on the evolution of inequality. Finally, the use of spatial econometric techniques to control for spatial effects would have been appropriate. In any case, it must be concluded that, despite these concerns, the article provides interesting novel evidence on an exciting research topic.