Dinâmica da desigualdade de renda no mercado de trabalho brasileiro

Área Temática
14 - Desigualdade, pobreza e políticas sociais

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Dynamics of spatial inequality in the Brazilian labor market

Abstract
This paper aims to analyze the dynamics of wage inequality within and between Brazilian municipalities and highlight the important role of regional disparities on overall inequality. Results are based on inequality indicators, spatial data analysis and on a fixed effect model to identify elasticity coefficients between labor market characteristics and wage differences between municipalities. Overall, results stresses the high level of wage inequality between and within municipalities and that, independent of local labor market structures, unobserved regional characteristics still play a central role on the extreme wage inequality in Brazil. The panel data analysis also suggests that, independent of the dynamics of labor market structures, average wage reduced expressively in the period of analysis.

Key words: wage inequality; regional disparities; spatial data analysis;

Resumo
O objetivo principal deste artigo é analisar a dinâmica da desigualdade de rendimentos entre e dentro dos municípios brasileiros, destacando a importante contribuição das disparidades regionais para a desigualdade total na população. Os resultados baseiam-se em indicadores de desigualdade, análise de dados espaciais e em um modelo de efeitos fixos para identificar as elasticidades entre as características do mercado de trabalho e os diferenciais de rendimentos entre os municípios. De maneira geral, os resultados destacam o elevado grau de desigualdade dos rendimentos do trabalho entre e dentro dos municípios e que, independente das características estruturais dos mercados de trabalho locais, características regionais não observáveis cumprem ainda um papel central na delimitação do extremo grau de desigualdade no Brasil. A análise dos dados em painel sugere ainda que, independente da dinâmica das características dos mercados de trabalho, o rendimento médio reduziu expressivamente no período de análise.

Palavras chaves: desigualdade; disparidades regionais; análise de dados espaciais.

JEL: J31; J24; R12

1. Introduction

Brazil is widely known by its high levels of poverty and inequality (VELEZ et al., 2004), which is strictly related to its historical process of socioeconomic development (FURTADO, 1986). Since colonization Brazil witnessed a huge accumulation of lands by a restricted number of owners and even socioeconomic development experienced in last decades has not been able to attenuate such disparities (HOFFMANN, 2001). Actually, huge inequality can be witnessed by innumerous socioeconomic dimensions, such as those related to income, healthy, infra-structure or labor market characteristics (MAIA, 2009). Distribution of wages in the labor market play a central role in this dynamic because, besides representing the major portion of total income in Brazil, it also determines expected income and quality of life for most individuals and, thus, influences prospect of socioeconomic development.

Among the determinants of the high wage inequality in Brazil, it can be highlighted those related to regional labor market characteristics, such as labor force participation, employment conditions and economic structure. For instance, regional distribution of economic activities influences productivity and the spatial distribution of wage, as well as labor force qualification and worker’s experience. Similarly, unemployment tends to debilitate worker’s bargaining power and compels them to accept lower wages, in addition to different levels of segregation and discrimination they are submitted in the labor market.

Immeasurable regional characteristics are also responsible for huge socioeconomic disparities in the territory and determine different patterns of spatial distribution of employment and wages. As well as historical, cultural and environmental events influence on socioeconomic development level, different levels of regional development determine distinct socioeconomic structures, playing an important role in the geographic distribution of people and income.

In order to understand the dynamics of wage inequality in the Brazilian territory and how regional characteristics can affect it, this paper aims to analyze the wage distribution between and within Brazilian groups of municipalities. To reach such purposes, results are based on inequality measures, spatial data analyses and econometric modeling. Municipalities are the lower autonomous territorial units inside the political-administrative division in Brazil. Understanding their relation in the territory is essential to plan and make decisions concerning implementation of economic activities, public and private consumption, as well as providing ways to understand emerging social relations and spatial patterns of inequality.

This paper’s results are presented in two major parts, besides this introduction and final conclusions: i) patterns of spatial inequality: measures for the spatial distribution of inequality between and within municipalities in Brazil; ii) determinants of spatial inequality: spatial data modeling to analyze the determinants of wage inequality between municipalities. Overall, results allow inferring the high level of inequality between and within municipalities and the important role of regional disparities, independent of labor market structures, on the extreme wage inequality in Brazil. The territorial dynamics stills highlight the contradictory trends between income and wage inequality between and within municipalities.

2. Methodology of analysis

2.1. Data source

Analyses were based on microdata sample of Demographic Census 1980 and 2000. Demographic Census is the major household survey sponsored by the IBGE (Instituto Brasileiro de Geografia e Estatística) and it is conducted decennially over most Brazilian territory, except
for those rare and inaccessible indigenous tribes. Because new municipalities had been created between 1980 and 2000, spatial analyses were based on Minimum Comparable Areas (MCA). Sponsored by the Brazilian Institute of Geography and Statistics (IBGE) and the Institute of Applied Economic Research (IPEA), MCA represent 3,569 groups of municipalities which allow historical comparison between common areas in the Brazilian territory (RANGEL et al., 2007).

Employed were considered those persons 10 years old or more who, during the reference week, performed any work for wage, salary or profit in cash, or those persons who, having already worked in their present job or with an enterprise, were temporarily not at work during the reference week for any specific reason. Although unpaid workers could play an important role in labor force composition, especially on developing countries (HUSSMANNS, 2009), they have not been considered in order to avoid overestimation of wage inequality due to methodological concerns.

To simplify denominations, wages, salaries and profits were referred, in this paper, basically as wages, representing monthly payments for labor or rendered services. All values were deflated to July 2004 using INPC (Brazilian National Consumer Price Index) from IBGE and converted to dollars considering the Purchasing Parity Power (PPP) proposed by United Nation Statistical Division.

2.2. Measuring inequality

The distribution of wage and employed persons among municipal average wage deciles allowed to understand more precisely what happened in the extremes of spatial distribution, namely the share of wage and population in the poorest and the richest Brazilian groups of municipalities. Such analysis was enhanced by Theil’s T index and its decomposition property, which allowed verifying the share of total inequality due to differences between municipalities. Because municipalities can be arranged in states and administrative regions, it also enabled evaluating the contribution of each of these areas to total inequality in the labor market.

Suppose a population with \( n \) members and the total wage equal \( Y \), where \( Y_i \) is the wage shared by the \( i \)-th individual. Theil’s T, which varies between 0 and natural logarithm of \( n \), can be written by (HOFFMANN, 1998):

\[
T = \frac{1}{n} \sum_{i=1}^{n} \ln \frac{Y_i}{Y}
\]

(1)

Theil’s T index also allows total inequality measuring as a weighted average of inequality within and between subgroups. Thus, the total wage inequality could be decomposed into differences within and between groups of municipalities. Supposing \( k \) subgroups, each one with \( n_g \) members and total wage equal \( Y_g \), Theil’s T decomposition will be given by (HOFFMANN, 1998):

\[
T = \sum_{g=1}^{k} \left( \frac{n_g}{n} T_{gw} + \frac{1}{n_g} T_{gb} \right)
\]

(2)

\[\text{Conversion based on 1.2 reais (R$) for each dollar (US$) in July 2004 (Data source: UNSD. Available at <http://unstats.un.org/unsd/default.htm>, Accessed April 2009).} \]
2.3. Spatial patterns

Choropleth maps are the most usual and intuitive way to analyze spatial areas. They permit an initial visualization of wage distribution between MCA and to identify apparent patterns of inequality in the Brazilian territory.

In order to support the graphical analysis, Moran’s autocorrelation index was used to measure the spatial dependency level for average wages between municipalities. Moran’s \( I \) is a measure of spatial autocorrelation which allows verifying if adjacent values of the same phenomenon are correlated. Suppose \( X \) the value of such phenomenon in a population with \( k \) spatial elements, Moran’s \( I \) will be given by (BAILEY & GATRELL, 1995):

\[
I = \frac{\sum_{i=1}^{k} \sum_{j=1}^{k} w_{ij}(X_i - \bar{X})(X_j - \bar{X})}{\left( \sum_{i=1}^{k} (X_i - \bar{X})^2 \right) \left( \sum_{i=1}^{k} \sum_{j=1}^{k} w_{ij} \right)}
\]  

(5)

Where \( \bar{X} \) is the average of \( X \) and \( w_{ij} \) the \( ij \)-th element of the proximity matrix \( W_{k \times k} \) indicating if two areas \( A_i \) and \( A_j \) are adjacent. There are various approaches to compute \( w_{ij} \), being most usual the following:

\[
\begin{align*}
\text{if } A_i &\text{ and } A_j \text{ are adjacent} \\
\text{otherwise } w_{ij} &\text{ not adjacent}
\end{align*}
\]

Moran’s \( I \) can also be generalized to estimate spatial autocorrelation at different spatial lags. Since \( W^{(l)} \), the proximity matrix for lag \( l \), is known, Moran’s \( I^{(k)} \) will be given by (BAILEY & GATRELL, 1995):

\[
I^{(l)} = \frac{\sum_{i=1}^{k} \sum_{j=1}^{k} w^{(l)}_{ij}(X_i - \bar{X})(X_j - \bar{X})}{\left( \sum_{i=1}^{k} (X_i - \bar{X})^2 \right) \left( \sum_{i=1}^{k} \sum_{j=1}^{k} w^{(l)}_{ij} \right)}
\]  

(6)
2.4. Econometric model

In order to analyze the determinants of spatial inequalities, a fixed effect model was adjusted for the natural logarithm of average wage using covariates related to the main labor market conditions (such as participation, unemployment and informality ratio), labor force composition (such as qualification, experience, gender and race) and other municipal economic characteristics (such as sectoral structure). Such model can be expressed by:

\[
\ln(Y_i) = \beta_0 + \sum_{j=1}^{k} \beta_j X_{ij} + A_i + e_i
\]

(7)

Where \( \ln(Y) \) represents the natural logarithm for MCA’s average wage, \( X_j \) is the \( j \)-th covariate, \( A_i \) is a dummy variable containing 1 for year 2000 and \( e \) is the unpredicted random error. Thus, \( \beta_j \) represents the impacts on the natural logarithm related to a unitary variation on \( X_j \). In other words, given a unitary variation on \( X_j \), percentage variation on \( Y \) will be given by \( \beta_j \% \) (GUJARATI, 1995). For its time, because \( A_i \) is a dummy variable, the variation on average wage between 1980 and 2000, independent of labor market characteristics, will be given by \( (e^\theta - 1)\% \) (Halvorsen & Palmquist, 1980).

It was considered 15 covariates to represent 3 major groups of analysis:

**Labor market conditions**

i) Participation rate (0..1): the ratio of labor force (employed and unemployed population) to working age population (10 years old or more);

ii) Unemployment rate (0..1): the ratio of unemployed population to labor force;

iii) Informality rate (0..1): the share of employed population covered by social security;

iv) Underemployment rate (0..1): the share of employed population working less than 35 hours a week;

**Labor force composition**

v) Participation of young people (0..1): the share of young persons (less than 25 years old) in the employed population

vi) Elder participation (0..1): the share of elderly persons (60 years old or more) in the employed population;

vii) Secondary participation (0..1): the share of those with secondary degree attainment in the employed population;

viii) Women participation (0..1): the share of women in the employed participation;

ix) White participation (0..1): the share of white or yellow color persons in the employed population;

**Sectoral structure**

According to main economic activities suggested by United Nation Statistics (UNSD, 2009), it was considered the share of employed population (0..1) in the following economic sectors (agriculture sector was used as reference of analysis):

x) mining, manufacturing and utilities (electricity, gas and water supply);

xi) Construction;

xii) wholesale, retail trade, restaurants and hotels;

xiii) transport, storage and communication;
xiv) other activities (financial intermediation, real state, renting, business activities, public administration, defense, education, health, social work, social services, personal activities, private households and others services).

Given that all covariates are ratios varying between 0 and 1, regression coefficients will represent marginal elasticity on average income given a percentage variation on the desirable explanatory index.

3. Patterns and dynamics of spatial inequality

Brazilian economic literature provides several empirical analyses for trends of regional inequality. FERREIRA & DINIZ (1995), for instance, suggest a continuous and absolute convergence of per capita income for Brazilian states between 1970 and 1985. Analyzing the period of 1981 to 1996, AZZONI et al. (2000) also suggest a quick conditional convergence of incomes between states, this means, controlling for geographical characteristics, human capital and local infra-structure. For its time, RANGEL et al. (2007) analyze the relation between economic growth, inequality and socioeconomic indicators and also suggest a convergence trend on the long run, highlighting that higher and sustainable economic growth could be achieved improving human capital and reducing inequalities. On the other hand, MAGALHAES & MIRANDA (2008), analyzed differences between municipal per capita income during ages 1970 and 2000 and suggest a process of regional divergence, although identifying some groups of regional convergence, this means, regions with reduction of inequality between their municipalities.

Trying to understand more precisely which lead regional dynamics in last decades, MAIA & THERY (2009) exhibit how recent reduction of income inequality between municipalities in Brazil was straightly related to wider pensions covers. Thus, reduction of municipal inequalities was not specifically due to economic growth, but especially due to effects of public policies implemented on the retirement and pension system on Constitution in 1988. In order to improve such analysis, this paper wants to highlight what happened specifically on labor market, where wages are more straightly related to the dynamics of economic development.

Measured by Theil’s $T$, both individual wage and per capita income inequalities exhibit extreme values in Brazil (Table 1). Per capita income inequality is slightly superior than wage inequality, probably due to the facts that: i) socio-demographic tends to increase inequality provided that low-wage workers usually live in families with more dependents; ii) asymmetric distribution of income from pensions (richest persons attaining highest shares of pensions) tends to increase per capita income inequality in Brazil, particularly in metropolitan regions (HOFFMANN, 2003).

Theil’s $T$ decomposition also allows estimating the contribution of regional differences to overall inequality in Brazil. Differences among MCA represented 12% of total wage inequality and 18% of income inequality in 2000. Although these values seem inexpressive contributions, they represent average wage differences among 3,569 MCA over almost 170 million Brazilian and, thus, can be considered a relevant contribution of regional differences to overall inequality in Brazil. Differences between Federal Units and Regions also contribute significantly to total inequality, although in lower level due to reduced number of groups.

Evolution of Theil’s $T$ between 1980 and 2000 suggest that Brazilian dynamics of economic development did not reach success reducing individual inequalities and differences between richest and poorest persons increased substantially. On the other hand, regional

7
disparities followed a particular trend, showing semi-stability or even reducing in the same period. For instance, Theil’s T for wage inequality between MCA remained close to 0.10, while Theil’s T for income inequality between MCA reduced 17%.

Table 1 – Theil’s T decomposition according to geographical areas – Brazil 2000

<table>
<thead>
<tr>
<th>Region</th>
<th>Wage Theil</th>
<th>Wage %</th>
<th>Income Theil</th>
<th>Income %</th>
<th>Wage Theil</th>
<th>Wage %</th>
<th>Income Theil</th>
<th>Income %</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCA (3,569)</td>
<td>0.0935</td>
<td>13.2</td>
<td>0.1923</td>
<td>25.5</td>
<td>0.1012</td>
<td>12.0</td>
<td>0.1595</td>
<td>18.3</td>
</tr>
<tr>
<td>Federal Units (27)</td>
<td>0.0458</td>
<td>6.5</td>
<td>0.1028</td>
<td>13.6</td>
<td>0.0442</td>
<td>5.3</td>
<td>0.0761</td>
<td>8.7</td>
</tr>
<tr>
<td>Regions (5)</td>
<td>0.0338</td>
<td>4.8</td>
<td>0.0767</td>
<td>10.2</td>
<td>0.0303</td>
<td>3.6</td>
<td>0.0600</td>
<td>6.9</td>
</tr>
<tr>
<td>Total</td>
<td>0.7070</td>
<td>100.0</td>
<td>0.7544</td>
<td>100.0</td>
<td>0.8403</td>
<td>100.0</td>
<td>0.8693</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Data source: Demographic Census, microdata, IBGE

In order to understand more precisely such contradictory trends, next analysis will highlight the dynamics of wage differences in the Brazilian territory. Although per capita income used to be a more accurate measure of individual purchase power, wages play a central role in the Brazilian inequality. Besides representing the most expressive portion of total income in Brazil, especially in richest regions (Table 2), current wages also determine expected income and quality of life for most individuals and allow a stricter analysis of personal differences, such as those related to segregation, discrimination and human capital.

First of all, it must be stressed the high level of wage and employment inequality between MCA, which means that just few municipalities accumulate most significant share of employed population and total wage in the labor market. For instance, the 10% richest Brazilian municipalities, arranged according to average wage, shared 48% of employed population and 66% of total wage in 2000. On the other hand, the share of the poorest MCA was almost inexpressive: the 40% poorest municipalities shared 14% of employed population and just 4% of total wage.

Territorial dynamics still increased the accumulation of employed persons and wages in richest MCA. Between 1980 and 2000, rose 2 percent points the share of employed population and 3 percent point the share of total wage in the 10% richest MCA. Overall, average wages rose slightly in the top poorest and richest municipalities and declined in the remaining intermediary municipalities, which could be responsible for the tenuous increase in the whole wage inequality.

Wages play also a more relevant role on the total income of intermediary and richest cities, which can be attributed to higher wages and activity rates in more developed areas. Overall, in the 10% richest MCA average wage is 5 times higher than that of the 10% poorest MCA and total wages represent 78% of total income, in contrast with just 65% of the 10% poorest municipalities. On the other hand, government benefits, such as pensions and financial aids, tend to play a more relevant role of poorest municipalities (MAIA & THÉRY, 2009).
Table 2 – Population, wage and income distribution according to tenth of municipalities’ per
capita income – Brazil 2000

<table>
<thead>
<tr>
<th>Tenth</th>
<th>% Pop</th>
<th>% Wage</th>
<th>% Wage / Income</th>
<th>Avg Wage (US$)</th>
<th>% Pop</th>
<th>% Wage</th>
<th>% Wage / Income</th>
<th>Avg Wage (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1°</td>
<td>2.9</td>
<td>0.7</td>
<td>84.3</td>
<td>196.1</td>
<td>2.3</td>
<td>0.6</td>
<td>64.4</td>
<td>206.3</td>
</tr>
<tr>
<td>2°</td>
<td>4.2</td>
<td>1.4</td>
<td>86.7</td>
<td>265.7</td>
<td>3.0</td>
<td>1.0</td>
<td>67.9</td>
<td>260.9</td>
</tr>
<tr>
<td>3°</td>
<td>4.2</td>
<td>1.7</td>
<td>87.8</td>
<td>317.4</td>
<td>3.2</td>
<td>1.2</td>
<td>70.7</td>
<td>297.9</td>
</tr>
<tr>
<td>4°</td>
<td>4.7</td>
<td>2.3</td>
<td>88.6</td>
<td>377.3</td>
<td>4.2</td>
<td>1.9</td>
<td>73.4</td>
<td>348.1</td>
</tr>
<tr>
<td>5°</td>
<td>4.2</td>
<td>2.3</td>
<td>88.7</td>
<td>432.6</td>
<td>3.5</td>
<td>1.8</td>
<td>76.3</td>
<td>408.0</td>
</tr>
<tr>
<td>6°</td>
<td>4.4</td>
<td>2.9</td>
<td>87.7</td>
<td>505.6</td>
<td>4.1</td>
<td>2.4</td>
<td>78.6</td>
<td>467.5</td>
</tr>
<tr>
<td>7°</td>
<td>5.7</td>
<td>4.3</td>
<td>87.7</td>
<td>573.5</td>
<td>6.8</td>
<td>4.6</td>
<td>79.2</td>
<td>535.8</td>
</tr>
<tr>
<td>8°</td>
<td>10.7</td>
<td>8.8</td>
<td>86.6</td>
<td>639.6</td>
<td>9.6</td>
<td>7.3</td>
<td>78.6</td>
<td>603.7</td>
</tr>
<tr>
<td>9°</td>
<td>13.3</td>
<td>12.4</td>
<td>85.4</td>
<td>717.9</td>
<td>15.0</td>
<td>13.2</td>
<td>79.5</td>
<td>696.4</td>
</tr>
<tr>
<td>10°</td>
<td>45.9</td>
<td>63.2</td>
<td>82.2</td>
<td>1,063.6</td>
<td>48.3</td>
<td>66.1</td>
<td>78.1</td>
<td>1,084.7</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>83.8</td>
<td>772.0</td>
<td>100.0</td>
<td>100.0</td>
<td>77.9</td>
<td>792.8</td>
</tr>
</tbody>
</table>

Data source: Demographic Census, microdata, IBGE
Values of July 2004 (US$ PPP)

Besides high wage and employment disparities between richest and poorest MCA, there are also wide patterns of spatial inequalities (Figure 1). Those few MCA accumulating the most significant share of wage are located in the state of São Paulo, South region and east side of Shoutheast region, in addition to narrow areas on the coast border of Northeast region. Only the MCA of São Paulo, the biggest in Brazil, held 13% of total wage in 2000. On the other hand, large areas in central-north regions are expressive on territory but practically inexpressive in reference to share of total wage.

In addition to lower productivity, labor markets in underdeveloped regions are usually disorganized and of limited scope, giving rise to lower wages and employment opportunities. Low-wage and unpaid jobs, such those with persons working for family gain or self-subsistence, prevail in less developed areas, especially in the rural areas of Northeast region (MAIA, 2009). Moreover, migratory movements, especially of young and adult workers, tend to reduce labor force supply in less developed and raise it in more developed areas. In Brazil, such movement was observed in the last decades from rural to urban areas; from less developed areas on Northeast region to more developed areas on Southeast; and, recently, from South and Northeast regions to Central-West and North regions, following the new agricultural borders of development (THÉRY & MELLO, 2006).

Between 1980 and 2000, the share of total wage accumulated by the two more populous and richest cities, São Paulo and Rio de Janeiro, fell 2 points percent. On the other hand, accumulation of wage rose more significantly in other important cities, such as Brasília, Curitiba and Goiânia. Overall, it remains patterns of extreme spatial inequality, with almost 30% of total wage accumulated by the seven richest Brazilian MCA.
The spatial distribution of MCA according to average wage reinforces previous analysis and allows identifying patterns and dynamics of labor remunerability. To reach such purpose, six class intervals have been defined using amplitudes equivalent to US$ 150 PPP, which approximately discriminate, in the whole period, the 25% lowest average wages, next 25%, 20%, 15%, 10% and 5% highest average wages (Figure 2).

Overall, results exhibit a continuous extension of richest MCA spreading in the states of São Paulo, Rio de Janeiro, south of Minas Gerais, South region and in the new border of agricultural development in the Central-West region. Besides a higher proportion of relatively richest MCA in 1980, there are no evident changes in the patterns of spatial inequality between 1980 and 2000.

The level of spatial dependence for MCA’s average wage can still be examined by Moran’s autocorrelation coefficient. High values of Moran’s coefficient for MCA’s average wages suggest a strong and positive relation among neighbors, which means that MCA with higher average wages tend to be close to each other. Persistence of high level of Moran’s coefficient even for different lags, namely for differences between MCA farther from each other, also suggests the heterogeneity of spatial distribution and the prevalence of strong spatial patterns in the territory. This result can also be testified visualizing the huge accumulation of the poorest municipalities in the large areas of Northeast region and the richest ones on the South, Southeast and some parts of Central-West region.

Nevertheless, spatial distribution in the central-north areas must be analyzed carefully, because they are expressive on territory but inexpressive on wage and employment accumulation.
4. Determinants of wage inequality between municipalities

A fixed effect model allowed analyzing the determinants of MCA’s average wages (equation 7). Overall, 73% of total variability of the natural logarithm of MCA’s average wage was explained by all covariates, which shows the relevant contribution of such labor market factors to explain regional disparities. Most variables are also significant, which means they have relevant independent contributions to explain wage variability (Table 3).

Participation rate reflects both employment and unemployment situations and it is strongly and positively related to MCA’s average wages, which suggests that average wages are higher in those Brazilian localities where the share of labor force in working age population is more expressive. Overall, higher participation rates in Brazil tend to prevail in localities where: i) economies are more dynamics, which allow higher employment rates; ii) channels for the exchange of labor market information exist and are more widely used, reducing the number of discouraged workers; iii) seasonal agricultural activities are inexpressive and hence reduce the participation of off-season workers.

On the other hand, unemployment, informality and underemployment rate are approximation to inappropriate labor market conditions and exhibit negative relations with MCA’s average wage. For example, underemployment elasticity point out that average wages are lower where the participation of employed persons with insufficient hours of work is higher. Although there is no accurate information concerning availability and willingness to work additional hours for these workers, results may reflect an underutilization of their productive capacity, including underutilization that arises from a deficient economic system, with negative impacts on wages of the labor market. In Brazil, underemployment has a particular relevance in agricultural and underdeveloped regions, where most workers cannot afford being unemployed even for a short period of time and, in order to survive, must engage themselves in some economic activity in spite of its inadequate conditions, limited hours and low remuneration.
Table 3 – Least squared estimation for natural logarithm of municipal average wage – Brazil 1980 and 2000

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\beta$</th>
<th>$S_{\beta}$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>6.07</td>
<td>0.047</td>
<td>130.0</td>
<td>***</td>
</tr>
<tr>
<td><strong>Labor Market Conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation rate</td>
<td>1.20</td>
<td>0.051</td>
<td>23.5</td>
<td>***</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>-0.53</td>
<td>0.071</td>
<td>-7.4</td>
<td>***</td>
</tr>
<tr>
<td>Informality rate</td>
<td>-0.52</td>
<td>0.027</td>
<td>-19.2</td>
<td>***</td>
</tr>
<tr>
<td>Underemployment rate</td>
<td>-1.02</td>
<td>0.059</td>
<td>-17.1</td>
<td>***</td>
</tr>
<tr>
<td><strong>Labor Force Composition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young participation</td>
<td>-0.40</td>
<td>0.075</td>
<td>-5.4</td>
<td>***</td>
</tr>
<tr>
<td>Elderly participation</td>
<td>-2.76</td>
<td>0.187</td>
<td>-14.7</td>
<td>***</td>
</tr>
<tr>
<td>Secondary degree participation</td>
<td>1.42</td>
<td>0.075</td>
<td>18.9</td>
<td>***</td>
</tr>
<tr>
<td>Woman participation</td>
<td>-1.21</td>
<td>0.064</td>
<td>-19.0</td>
<td>***</td>
</tr>
<tr>
<td>White participation</td>
<td>0.41</td>
<td>0.014</td>
<td>29.7</td>
<td>***</td>
</tr>
<tr>
<td><strong>Sectoral Structure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mining, manufacturing and utilities</td>
<td>-0.25</td>
<td>0.038</td>
<td>-6.4</td>
<td>***</td>
</tr>
<tr>
<td>Construction</td>
<td>-0.08</td>
<td>0.084</td>
<td>-0.9</td>
<td>0.342</td>
</tr>
<tr>
<td>Wholesale, retail trade, restaurants and hotels</td>
<td>1.40</td>
<td>0.073</td>
<td>19.2</td>
<td>***</td>
</tr>
<tr>
<td>Transport, storage and communication</td>
<td>1.14</td>
<td>0.201</td>
<td>5.7</td>
<td>***</td>
</tr>
<tr>
<td>Other activities</td>
<td>0.36</td>
<td>0.055</td>
<td>6.6</td>
<td>***</td>
</tr>
<tr>
<td><strong>Fixed Effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 2000</td>
<td>-0.24</td>
<td>0.014</td>
<td>-16.9</td>
<td>***</td>
</tr>
</tbody>
</table>

Data source: Demographic Census, microdata, IBGE
*** Significance at 0.1%

Other labor market conditions also affect worker’s bargaining power and, thus, municipal average wages. For instance, in municipalities with low unemployment rates, replacements are more difficult and, thus, employed persons have more bargaining power and higher wages. Informality might act in the same way, tending to be higher in less developed labor markets and hiding, in many cases, inappropriate employment situations. On the other hand, unemployment insurance provided by social security offers protection against eventual loss of employment and gives to formal workers more independence for wage negotiations.

Secondary school attainment is another important factor influencing average wages. As suggest LUCAS (1988), higher years of schooling, an approximation to human capital, leads to higher labor productivity. More useful approximation to human capital could be used instead of years of schooling, which does not complain for huge regional differences between schooling levels. For instance, COULOMBE et al. (2004) used data of the International Adult Literacy Survey to demonstrate how direct measures of human capital based on literacy scores outperform
measures based on years of schooling in growth regressions. Even so, years of schooling show by itself huge differences between educational attainments in Brazil and it is responsible for sensible variation on municipal average wage.

Labor force characteristics such as age structure, woman and white color participations also play important roles in determining wages in Brazil. Age structure is an approximation of the labor force experience and their coefficients suggest that wages are lower in municipalities with higher participation of young (less than 25 years old) and, especially, elderly (60 years old or more) workers. Young usually are employed in unskilled and low-paid jobs and can be replaced by employers at minimum costs. Elderly also have more difficulties to find a job and usually accept lower wages to avoid unemployment. In turn, woman and white participation reflect any segregation, discrimination or socio-cultural differences in the labor market. Women and non-white employees, for instance, tend to work in occupations with lower socio-occupational status and, either in similar occupational positions, these groups can still earn lower wages. Thus, the higher is their participations, the lower is the municipal average wage.

Sectoral structure reveals the status of regional economic development, with direct impacts on the wage structure. Developed regions tend to have higher employment participation on tertiary sector, which is especially discriminated, in Brazil, by the participation activities related to wholesale, retail trade, restaurants and hotels. On the other hand, as higher is the participation of agricultural, mining, manufacturing and construction activities, lower tends to be the municipal average wage.

Finally, time fixed effect coefficient suggests that, independent of labor market characteristics, average wage reduced 21% between 1980 and 2000. In other words, the tenuous increase on unconditional average wage (Table 2) would be especially due to the improvement of labor market characteristics in Brazil, such as higher participation rate, secondary degree attainment and reduction of low-productivity activities. If labor market had remained constant, MCA would have experienced expressive reduction of average wage.

Although explanatory variable explained the most significant share of average wage variability, unpredicted residues still represent one quarter of total variation. Positive residue means that MCA’s average wage is higher than expected by labor market characteristics and negative residues means that MCA’s average wage is lower than expected. Figure 2 exhibit spatial distribution of residuals in order to identify clusters of municipalities with positive and negative differences.

Both spatial distribution and moderate Moran’s coefficients exhibit high dependency of spatial patterns and suggest that, besides explanatory factors, regions still play a central role determining wages in the labor market. Because residues represent unobservable characteristics, these results may suggest that unobserved regional labor characteristics still make difference in determining average wages. It could be due to, for instance, human capital, historical and cultural differences.

Overall, positive residues tend to be higher, in both years, on central-north regions, where average wages are higher than expected by their labor market structures. On the other hand, negative residues tend to occur on Northeast region, especially in the poorest areas, which suggests that average wage is still lower than predicted by its low socioeconomic conditions (MAIA, 2009).
Figure 3 – Spatial distribution of residues (observable MCA’s average wages minus predicted values by model) – Brazil 1980 and 2000
Cartographic source: Philcarto
Data source: Demographic Census, microdata, IBGE

Conclusions

In balance, this paper aimed to analyze the dynamics of spatial distribution of wage in the Brazilian labor market. Overall, results have stressed the high level of wage inequality between and within municipalities and that, independent of local labor market structures, unobserved regional characteristics still play a central role on the extreme wage inequality in Brazil.

Wages and employment are extremely accumulated in few municipalities and their spatial distributions show evident patterns on the Brazilian territory. High autocorrelation indexes, either for one or more lags, also suggest an apparent heterogeneity of the wage distribution between municipalities, which means the prevalence of high patterns of inequality in the territory. Although the two biggest municipalities have lost participation in the share of total wage and employment, the dynamics of spatial distribution shows no expressive changes in the patterns of spatial inequality between 1980 and 2000. These results exhibit contradictory trends among wage and income inequality in the territory, which decreased in the same period, and highlight that the stationary scenario for the wage inequality between municipalities occurred simultaneously to an overall increase of individual inequality within municipalities.

In order to understand how labor market structure could explain such disparities between regions, a fixed effect model was adjusted to the municipal average wages using covariates related to labor market characteristics. Although such explanatory factors show significant and consistent relations, unobserved characteristics remained as an important factor determining average wages in the territory. The spatial distribution of residues and their autocorrelation indexes showed pertinent patterns of spatial dependency, corroborating the hypothesis that, independent of labor market structures, territory still plays a central role in the wage inequality.

Finally, time fixed effect coefficient on the econometric model suggests that, independent of the dynamics of labor market structures, average wage reduced expressively between 1980 and 2000. This means that improvement of labor market characteristics in Brazil, such as higher
participation rate, secondary degree attainment and reduction of low-productivity activities, played a central role on spatial dynamics of wage. If labor market had remained constant, Brazil would have experienced expressive reduction of regional average wages. Thus, this preliminary study suggest that economic development is fundamental to reduce regional inequalities, allowing, for instance, higher participation rates and reduction of unemployment and underemployment in less developed areas.

References


CEPAL. Panorama Social de América Latina. Santiago, 2005


