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Do local civil servants capture intergovernmental transfers? The different wage determinants between the public and private sector

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This article examines the intergovernmental transfer effects on wage differences between local civil servants and private sector employees. The sample was composed of 5,449 Brazilian municipalities, working with data from 2000 to 2016 clustered in 5,344 minimum comparable areas (MCA). The methodological procedures were quantitative and developed in two steps. The first step was to assess the median wage difference between local civil servants and private sector employees through unconditional quantile regression. The second was the analysis of different wage determinants through multiple regression with panel data, fixed effects, and additional estimations such as cluster-robust standard errors, temporal correlation, and spatial correlation. The results demonstrated that when per capita intergovernmental transfers increase by 1%, the wage difference between local civil servants and private sector employees increases by 0.067%. Besides that, when per capita GDP increases by 1%, the wage difference decreases by 0.036%. Furthermore, the paper observed that populational size increases and electoral competition decreases wage differences between the public and private sectors in Brazilian municipalities.
Keywords: wage difference; intergovernmental transfers; municipalities.

Transferências intergovernamentais são capturadas pelos servidores municipais? Os determinantes da diferença salarial entre o setor público e o setor privado

Esta pesquisa tem por objetivo investigar o efeito das transferências intergovernamentais na diferença salarial entre os servidores municipais e os funcionários do setor privado. A amostra foi formada por 5.449 municípios durante o período de 2000 a 2016, agrupados em 5.344 áreas mínimas comparáveis. Os procedimentos metodológicos quantitativos foram desenvolvidos em duas etapas. Na primeira, mediu-se a diferença salarial mediana entre os servidores municipais e os funcionários do setor privado por meio da regressão quantílica incondicional. Na segunda, a análise dos determinantes da diferença salarial foi realizada por meio de regressão múltipla com dados em painel, efeitos fixos e estimações adicionais com erros robustos a cluster, correlação temporal e correlação espacial. Os resultados indicaram que o aumento de 1% das transferências intergovernamentais *per capita* resulta em aumento de 0,067% na diferença salarial nos municípios brasileiros entre os servidores municipais e os funcionários do setor privado. Além disso, a elevação de 1% no Produto Interno Bruto (PIB) *per capita* resulta numa redução de 0,036% da diferença salarial. Por último, a pesquisa observou que o tamanho populacional aumenta enquanto a competição eleitoral reduz a diferença salarial nos municípios brasileiros.
Palavras-chave: diferença salarial; transferências intergovernamentais; municípios.

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¿Las transferencias intergubernamentales son captadas por servidores municipales? Los determinantes de la brecha salarial entre los sectores público y privado

Esta investigación tuvo como objetivo investigar el efecto de las transferencias intergubernamentales en la diferencia salarial entre los servidores municipales y los empleados del sector privado. La muestra estuvo conformada por 5.449 municipios durante el período 2000 a 2016, agrupados en 5.344 áreas mínimas comparables. Los procedimientos metodológicos cuantitativos se desarrollaron en dos etapas. En la primera, la mediana de la diferencia salarial entre los empleados municipales y los del sector privado se midió utilizando la regresión por cuantiles incondicionales. En la segunda etapa, el análisis de los determinantes de la brecha salarial se realizó mediante regresión múltiple con datos de panel, efectos fijos y estimaciones adicionales con errores robustos por clúster, correlación temporal y correlación espacial. Los resultados indicaron que un aumento del 1% en las transferencias intergubernamentales per cápita resulta en un aumento del 0,067% en la brecha salarial en los municipios brasileños entre los servidores municipales y los empleados del sector privado. Además, identificó que un aumento de 1% en el PIB per cápita se traduce en una reducción de 0,036% en la brecha salarial. Finalmente, la investigación observó que el tamaño de la población aumenta mientras la competencia electoral reduce la brecha salarial en los municipios brasileños.
Palabras clave: brecha salarial; transferencias intergubernamentales; ayuntamientos.

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1. INTRODUCTION

This research focuses on the relation between intragovernmental transfers and the appropriation of local government resources by public employees through the wage difference between city employees and private sector employees. Brazil has expanded in these last few decades the process of decentralization by increasing the participation of municipalities in public expenditures and in the provision of public services (Arretche, 2003; Souza, 2007). Nonetheless, the local use of resources is not free of manipulation by political interests, since Brazilian local governments have administrative, financial, and political autonomy.

Therefore, the presence of groups of interest can influence the decisions made by local governments (Abrucio, 2006), given that politicians aim to meet the expectation of groups of interest to hold their support in the elections (Buchanan & Tullock, 1962). Therefore, the research aimed to investigate the effect of intragovernmental transfers on wage differences between city employees and private sector employees.

The classic theory of fiscal federalism ensures that closer proximity between public expenditures and the needs of the citizens improves efficiency (Oates, 1972, 2005). However, due to the autonomy of local governments, public resources can be captured by the city groups of interest according to the Public Choice Theory (Buchanan & Tullock, 1962; Dougan & Kenyon, 1988), so the expected gains from decentralizing cannot be reached. The decentralization gains require from local governments physical structure and minimal human resources, and that management

is not focused on the interests of political and economic elite (Abrúcio, 2006; Sellers & Lidström, 2007; Sow & Razafimahefa, 2015).

Intragovernmental transfers can contribute to the capture of resources by groups of interest because, by indirectly paying for services, citizens are not provided with the correct perception of the resources for public expenditure, that is, the fiscal illusion, which consists in the underestimated perception of a government's expenditure (Araujo & Siqueira, 2016; Dollery & Worthington, 1996, 1999).

Therefore, the asymmetry in information favors the pressure of groups of interest on politicians. Since public employees have greater access to information regarding the workings of public institutions, they are better able to exercise political pressure. For example, bureaucrats have more information and a better understanding of the budget and of the financial processes of the government, hence they can interfere more with decisions made by politicians (Niskanen, 1971; Tullock, 2005). This is one possible explanation for the salaries of public employees to be superior to the salaries of employees in the private sector (Becker & Stigler, 1974).

In addition to the power of bargain of public employees and the union (Córdoba, Pérez, & Torres, 2012; Gregory & Borland, 1999), research indicate other factors as determinants for the wage differences between public and private sectors, such as the difference in the sectors final functions (Depalo, Giordano & Papapetrou, 2015), professional qualification (Rattsø & Stokke, 2018) and experience (Vaz & Hoffman, 2007) among other features of the labor force. Therefore, the existence or lack thereof of wage premium of public employees has been investigated by national and international research, considering observed variables, and the unexplained part is attributed to the public sector.

In Holland, Biesenbeek and Werff (2019) have identified a positive wage difference for low-wage public employees whereas high-wage employees earn more in the private sector. Ramos, Sanromá, and Simón (2013) have observed that in Spain, female employees hired permanently have a positive premium. However, the premium is negative for highly qualified employees. These results are corroborated by Rattsø and Stokke (2018), who also identified negative premium for highly qualified employees in Norway.

In Brazil, the wage differences between the public and private sectors have been investigated through different methods and variables. Foguel, Mendonça, and Barros (2000) have verified that wage differences are heterogeneous in Brazil and depend on geographic location. Marconi (2003) has observed that wage differences derive from the characteristics of the labor force and the public sector labor force is more qualified than the private sector. In general, Brazilian research confirms the positive premium specially for less qualified employees (Braga, Firpo, & Gonzaga, 2009). Recently, Mattos, Sonoda, and Wink (2020) have measured the premium of the public sector at approximately 6%.

Regarding fiscal decentralization, Marconi, Arvate, Moura, and Palombo (2009) have investigated the wage differences between state public employees and private sector employees. They identified that intragovernmental transfers stimulate employees to appropriate public resources. In the state, there is a greater distance between politicians and citizens, which can

favor the opportunistic behavior of groups of interest since social control becomes more difficult. Therefore, one of the aims of the present investigation is to analyze whether the theoretical indicatives of greater proximity of expenses with the population reduces the appropriation of groups of interest in local governments, since wage differences are heterogeneous in the territory (Foguel et al., 2000) and city employees represent the majority of labor force in the public sector (Mattos et al., 2020).

Moreover, in local governments, the competition of elections for mayor can also put on pressure to increase public expenditure, since local governments aim to preserve the power in the hands of their political group eventually co-opting public employees through raises. In other words, when elections for mayor are intensely competitive it is expected a greater difference in the salaries of employees from the public and the private sectors. On the other hand, the wage differences can be reduced since, in highly competitive disputes, mayors are requested more information regarding the management of funds, which can inhibit the capture by groups of interest (Anzia, 2011, Tausanovitch & Warshaw, 2014).

For that reason, this research has measured the premium of city employees and private sector employees in local governments from 2000 to 2016, considering the observable characteristics of professional qualification, experience, gender and age through Unconditional Quantile Regression (UQR) with panel data (Firpo, Fortin, & Lemieux, 2009). The main results have shown that the average premium in the city was positive at 16.1% with positive effects on population size and intragovernmental transfers, whereas GDP and electoral disputes for mayor have negative effects on the premium of local governments public employees.

In addition to this introduction, the article is divided into section 2, which contains the theoretical background, section 3 to describe the method, section 4 to present the results, section 5 to discuss the findings and section 6 summarizes our findings.

2. THEORETICAL BACKGROUND

2.1 Labor remuneration and decision making in the public sector

Labor remuneration has been investigated both in the public and the private sector over time. Research on wages in the private sector have neglected subjects such as gender and race wage discrimination (Mattei & Baço, 2017), precarization of labor (Pialarissi, 2017) and wage inequality (Bastos, 2018). On the other hand, the research on public sector wages have mostly focused on the value of teaching (Barbosa, Pessôa, & Afonso, 2009), on the need to define a standard wage (Teixeira & Nunes, 2019) and wage differences between the private and the public sectors (Marconi et al., 2009; Vaz & Hoffmann, 2007). This article concentrates specifically on the latter to identify the determinants of the wage differences between public and private sectors in city governments.

Positive wage differences are not exclusive to public employees in Brazil, however, some of the differences depend on the characteristics of the labor force in each sector. Therefore, research has employed econometric techniques to observe the wage difference between public and private

employees in terms of their profile, that is, wages are analyzed according to observed variables, mostly age, gender, and professional qualification. Hence, part of the wage differences is explained by observable variables whereas another part is interpreted as the premium of public service, which might be positive or negative.

International research has avoided positive premium for public employees, despite the different results according to observed variables, econometric techniques and the countries investigated. In general, the literature indicates determining factors for positive premium in the public service, which are the employee's and the union's power of bargain (Córdoba et al., 2012; Gregory & Borland, 1999), the differences in the main functions of each sector (Depalo et al., 2015), professional qualification (Rattsø & Stokke, 2018) and the workers experience (Vaz & Hoffman, 2007).

International research has also indicated a positive premium for public employees with lower salaries (Biesenbeek & Werff, 2019), lesser qualifications (Rattsø & Stokke, 2018) as well as gender bias and work schedule (Ramos et al., 2013). In Brazil, the positive premium for the public sector has been verified. Recently, Mattos et al. (2020) have measured the premium for the public sector at approximately 6%. Other investigations have indicated positive premium, such as Belluzzo, Anuatti-Neto, and Pazello (2005), Braga et al. (2009), Foguel et al. (2000), and Vaz and Hoofman (2007).

Moreover, research has already verified that the amount of the premium depends on the characteristics of the employees, for example, lesser qualification (Braga et al., 2009) and lower salaries (Belluzzo et al., 2005), which favor positive premium. Contrary to the private sector, public employee wages require approval by act of law through a democratic and legislative process proposed by the Executive Power and voted by representatives in the city council. Thus, it is noted the evident force of the political nature of wages and their greater access to information and to politicians to reclaim rights and demand raises. Notwithstanding, the wages of public employees assigned to the same position are no different in terms of sex and race.

In a democracy, politicians are elected by popular vote and oftentimes political interests interfere with the decision-making process. In other words, the politicians need to make decisions that meet the public demands. However, due to the difficulties in meeting social demands and to find agreement among groups of interest, politicians choose what best favors them as supported by the public choice theory (Buchanan & Tullock, 1962; Dougan & Kenyon, 1988).

Several countries have chosen to increase fiscal decentralization to increase efficiency by better allocating resources, since local governments are closer to citizens and naturally dispose of more information regarding local demands (Oates, 1972, 2005). However, the transfer of resources of supranational governments to local governments can increase waste, since it is more difficult for local governments to keep qualified technical personnel; in addition, the segmentation of resources into many units hinders coordination and control, prevents scale gains, and favors the rise of local oligarchies that appropriate public resources (Martínez-Vázquez, Lago-Peñas, & Sacchi, 2017).

Public employees are one of the groups of interest that withhold great political power capable of influencing politicians. Politicians, in turn, demand support from those groups which concede excessively to meet the workers' demands (Ahlquist, 2017; Anzia, 2011). Marconi et al. (2009) have

found that the increase of intragovernmental transfers implicates higher wages for state employees compared to the private sector. In Brazilian cities, the political system favors the rise of political oligarchies and employees have great political power both to address wage interests and to potentialize or hinder the improvement of public service.

Public administration has sought to use instruments that inhibit opportunistic behavior from administrators and groups of interest, the main ones are accountability (publishing and accounting) and improving public governance. However, one should always remember that the political character influences the administration decision-making process strongly. Therefore, aligning the administrators' political interests can be one way to improve the public administration and the quality of democratic systems (Behn,1998).

Political-electoral elements, in this context, can stimulate improvements in public administration, since politicians need to account for their actions and results. At each election, politicians must present their achievements and methods, that is, periodical elections favor accountability. The stronger the competition over a position, the greater the need for politicians to account and justify their actions. Society, then, exercises greater social control and politicians make decisions to better serve the social interests rather than particular groups (Castro & Nunes, 2014; Pinho & Sacramento, 2009).

After the promulgation of the Federal Constitution in 1998, cities have become more participative in the public expenditures and more responsible in the provision of public services. Since then, cities have received more financial resources through intragovernmental transfers (Arretche, 2003; Souza, 2007). Given the political, administrative and contexts as well as the role of local governments, it is necessary to investigate whether intragovernmental transfers influence the wage difference in Brazilian local governments.

3. METHOD

The research relied on econometric qualitative techniques developed into two stages: i) measuring the wage difference; and ii) identifying the determinants of wage difference. In the first stage, the measure of wage difference between city employees and private employees was conducted through unconditional quantile regression estimated through *Recentered Influence Function* (RIF), developed by Firpo et al. (2009). RIF is defined by the equation 1:

$$RIF(Y; q_\tau, F_y) = q_\tau + \left\{ [\tau - 1(Y \leq q_\tau)] \Big/ f_Y(q_\tau) \right\} \quad (1)$$

In the equation, Y is the response variable, τ is the quantile, q_τ is the value of variable Y in the quantile τth, $f_Y(q_\tau)$ is the density of Y in q_τ, F_y is the accumulated distribution function of Y and 1 has the indicative function of a dummy variable, created to indicate whether the value of the variable Y is below the quantile τ analyzed, when it assumes value 1, otherwise it assumes value 0. Since salaries have positive asymmetric distribution, the means is not the best wage representation of the sample.

Therefore, the RIF choice is adequate since it allows the estimation of quantiles in the distribution, choosing the mean, that is, $\tau = 0{,}50$. The model of the wage difference estimated by the RIF assumed the form defined by equation 2:

$$ln\left(\frac{Wage_{im}}{Hours_{im}}\right) = \alpha + \beta_1 Age_{im} + \beta_2 Age_{im}^2 + \beta_3 TimeWork_{im} + \beta_4 TimeWork_{im}^2 + \beta_5 Sex_{im} + \beta_6 PrimSchool_{im} + \beta_7 MiddleSchool_{im} + \beta_8 HighSchool_{im} + \beta_9 HigherEd_{im} + \beta_{10} PostGrad_{im} + \beta_{11} Sector_{im} + \varepsilon_{im} \quad (2)$$

In the equation, $Wage_{im}$ is the mean of salaries in a year for both city or private sector employees (heretofore called worker) *i* in the city *m*. $Hours_{im}$ is the total of worked hours weekly for workers *i* in the city *m*, multiplied by 5, under the premise that months have five weeks. Age_{im} is the age of workers *i* in the city *m*. Sex_{im} is the sex of workers *i* in the city *m*. $PrimSchool_{im}$ is a dummy variable if workers *i* in the city *m* have only finished primary school, in which case it assumes value 1, otherwise, value 0.

Moreover, $MiddleSchool_{im}$ is a dummy variable if workers *i* in the city *m* have finished middle school, in which case it assumes value 1, otherwise, value 0. $HighSchool_{im}$ is a dummy variable if workers *i* in the city *m* have finished high school, in which case it assumes value 1, otherwise, value 0. $HigherEd_{im}$ is a dummy variable if workers *i* in the city *m* have completed higher education, in which case it assumes value 1, otherwise, value 0.

Similarly, $PostGrad_{im}$ is a dummy variable if workers *i* in the city *m* have post-graduation. If positive, it assumes value 1, otherwise, value 0.

These variables were inserted in the model to control observed factors that determine salaries, according to the indications of Belluzzo et al. (2005), Braga et al. (2009), Foguel et al. (2000), Mattos et al. (2020), and Vaz and Hoofman (2007).

$Sector_{im}$ is a dummy variable that identifies whether worker *i* in the city *m* is a city employee, in which case it assumes value 1, otherwise, if it means the private sector, the variable assumes value 0.

The value of the coefficient B_{11} estimated by the regression of equation 2 considers the wage difference in city *m* ($diffwage_m$) in case statistics *t* has value *p* inferior to 5% the significance level, that is, the premium of the public sector. On the other hand, α is the intercept coefficient, are the angular coefficients estimated by the regression and is a random error. The regression model of equation 2 was estimated with transversal data, that is, an estimation was conducted for each year and for each city in the research.

After the wage difference ($diffwage_m$) was measured for each year *i* and each city *m*, the research continued to the second stage to identify the determinants of wage difference through data panel multiple regression and fixed effects, according to equation 3:

$$ln\,(diffsal_{mt}^{T}) = \alpha_t + \beta_1 ln\,(Population)_{mt} + \beta_2\, ln(CityGPD/Population)_{mt} + \beta_3\, ln(Transfpercapita)_{mt} + \beta_4 ln\,(ElectoralComp)_{mt} + \eta_m + v_{mt} \quad (3)$$

In it, the variable $diffwage_{mt}$ measured in the second stage (equation 2) to the city *m* and time *t* was transformed into $diffwage^{T}_{mt} = \ln(diffwage_{mt}+1)$ with the purpose of obtaining a log-log model and its elasticities. $Population_{mt}$ is the population living in the city *m* in the year *t*. $CityGDP/Population_{mt}$ is the revenue per inhabitant regarding intragovernmental transfers in the city *m* in the year *t*. Finally, the variable $ElectoralComp_{mt}$ is the variable of electoral competition measured by the difference of votes between the first and second places in city elections for mayor in the city *m* in the year *t*. Finally, α is the intercept coefficient, are the angular coefficients estimated by the regression, η_m is the individual effect for city *m* and is the idiosyncratic effect.

The adjustment analysis of the econometric model was first conducted through the Hausman test, which did not reject the null hypothesis, that is, there is no inadequate model between the fixed effects and the random models. Therefore, the fixed effect model was chosen to ensure greater consistency for the coefficients, since the random effect requires $E(x_{it}|)=0$, and because it follows the works already developed about the issue, such as Marconi et al. (2009) and Mattos et al. (2020). Next, the F test between fixed effect panel data models and pooling ensured the preference of the first. Later, the choice of the unobserved effect was defined by the application of the F test between models estimated for each individual through time or both. The results of the test F indicated the preference for the model of two effects (individual and time). Therefore, the econometric model of equation 3 was estimated two-ways through fixed effect and unobserved effect for individual and time.

The test of non-observed effects in residues *à la Wooldrige (* rejected the null hypothesis, that is, it identified the non-independence of the error, which turned into a challenge knowing the form of violation to this premise, that occurs mainly by the existence of clusters, the correlation of the time series or the spatial correlation of cities in the sample. Hence, with the purpose of reaching greater robustness in the results, three additional models were estimated considering the treatment of error by clusters (Arellano, 1987), serial correlation of Newey-West (Newey & West, 1987), and spatial correlation of Driscoll and Kraay (Driscoll & Kraay, 1998).

A robustness analysis was conducted through Monte Carlo simulation on the estimations for wage difference between city and private sector employees followed by fixed effects panel regressions and error treatment by clusters (Arrelano, 1987), serial correlation of Newey-West (Newey & West, 1987), and spatial correlation of Driscoll and Kraay (Driscoll & Kraay, 1998). In the Monte Carlo simulation, wage differences for each city and each year were chosen randomly given the estimated interval.

The research was conducted with 5.449 samples from 2000 to 2016 (17 years). The cities were grouped in 5.344 minimal comparable areas (MCA) according to Ehrl (2017), with the purpose of minimizing the distortions derived from the foundation of new cities during that time. The data formed an unbalanced panel for the estimation of equation 3 with 79.002 observations (n=5.344,

T=1-17). Despite using MCA, in the description of the results, the term city was preserved to facilitate the reader's understanding. The wage difference was measured by regression of the cities with at least 30 observations for employees in each sector.

The variables used in the research were briefly described in Box 1 below:

BOX 1 DESCRIPTION OF THE STUDY VARIABLES

Description	Definition	Source
Wage	Mean wage of workers in a year.	RAIS[1]
Hours	Number of hours worked weekly.	RAIS[1]
Age	Age of workers.	RAIS[1]
WorkedTime	Time workers have on the job.	RAIS[1]
Sex	This variable identifies the sex of workers, male=0 e female=1.	RAIS[1]
PrimSchool	This variable indicates workers completed primary school (5 years) (*dummy*).	RAIS[1]
MiddleSchool	This variable indicates workers completed Middle school (9 years) (*dummy*).	RAIS[1]
HighSchool	This variable indicates workers completed high school (*dummy*).	RAIS[1]
HigherEd	This variable indicates workers completed higher education (*dummy*).	RAIS[1]
PostGrad	This variable indicates workers completed post-graduation (*dummy*).	RAIS[1]
Sector	This variable identifies whether workers belong to the city public service (1) or to the private sector (0). (*dummy*)	RAIS[1]
Population	The number of city inhabitants.	IBGE[2]
City GDP	It is the gross domestic product deflated to the year 2000 by the IGP-M of the Fundação Getulio Vargas – FGV.	IBGE[2]
Transfpercapita	It is the amount received as intragovernmental transfers divided by the city's population deflated to the year 2000 by the IGP-M of the Fundação Getulio Vargas – FGV.	FINBRA[3]
Electoral competition	Difference between the 1st and 2nd candidates in the elections for mayor divided by the total of valid votes.	TSE[4]

Note:
[1] Annual List of Social Information (RAIS): Ministry of Labor and Employment.
[2] Brazilian Institute of Geography and Statistics (IBGE): Census databases and estimations.
[3] Finances in Brazil (FINBRA): Report of the Secretary of the National Treasure.
[4] Superior Electoral Tribunal (TSE): Electoral repository.
Source: Elaborated by the authors with data from FINBRA (2021), IBGE (2000, 2010, 2021), RAIS (2021) and TSE (2021).

The first stage of the wage difference estimation involved millions of observations from the RAIS databases. Given the amount of data that hindered the estimation of wage difference estimation, the estimations for São Paulo and Rio de Janeiro used a random sample of 25% of the records in the databases, similar to the procedure employed by Rocha, Silveira, and Gomes (2011) and by Biesenbeek and Werff (2019). It is noteworthy that despite the rigor of the method, the results for wage difference estimations were clearly distorted. Therefore, we excluded from the sample 1.235 observations of cities with wage difference superior and inferior to three standard deviations from the mean (Howell, Rogier, Yzerbyt, & Bestgen, 1988; Miller, 1991).

4. RESULTS

4.1 Wage difference between city workers and private sector workers

The estimation of the regression model defined in equation 2 through the RIF for each city and year resulted in the wage differences between city employees and private sector employees. Table 1 shows the descriptive statistics of the wage difference between city workers and private sector employees. It shows that the mean for wage difference was at 16.1% in the cities in the sample from 2000 to 2016. In addition, it is possible to observe that the standard deviation of 22.4% is superior to the mean, that is, the cities in the sample display great heterogeneity. A positive wage difference means a positive premium for public employees, or that city employees earn higher salaries than private sector employees, whereas a negative wage difference means a negative premium for public employees since private sector employees earn higher salaries.

Table 1 also shows that the number of cities with a positive wage difference increased from 3.189 (81.3%) in 2000 to 4.134 (84.5%) in 2016. In general terms, 83.4% of the cities pay their employees mean salaries superior to those of the private sector.

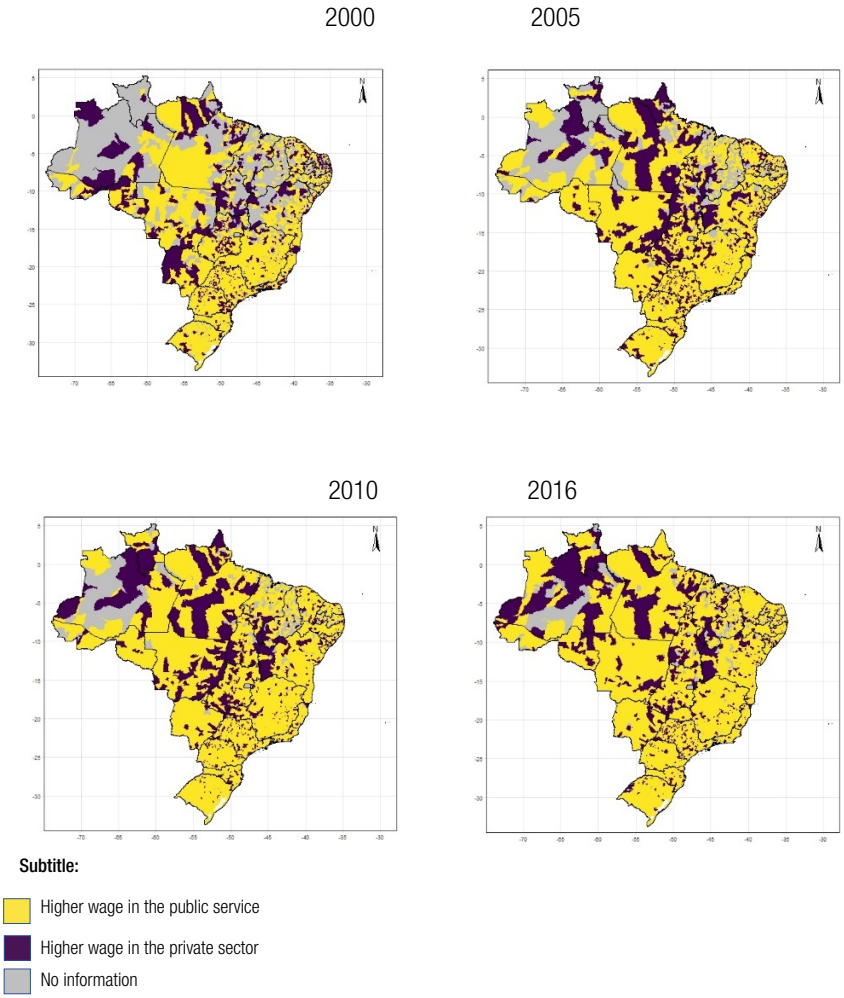
TABLE 1 **MEAN DESCRIPTIVE STATISTICS, STANDARD-DEVIATION, MINIMUM AND MAXIMUM VALUES OF WAGE DIFFERENCE BETWEEN CITY AND PRIVATE SECTOR EMPLOYEES (2000 TO 2016)**

Year	Wage Difference				Number of cities by wage difference			
	Mean (%)	Standard deviation (%)	Minimum (%)	Maximum (%)	Positive (diffwage ≥ 0)		Negative (diffwage < 0)	
					n	%	n	%
2000	19.3	28.1	-62.7	96.0	3.189	81.3	732	18.7
2001	17.6	26.4	-62.8	96.4	3.355	81.1	782	18.9
2002	17.4	25.7	-63.2	95.6	3.502	81.3	805	18.7
2003	15.8	24.1	-62.9	96.2	3.560	81.2	824	18.8
2004	14.6	24.3	-62.4	96.3	3.493	78.7	948	21.3
2005	15.5	23.3	-62.9	95.5	3.618	81.7	813	18.3
2006	15.0	21.6	-63.1	94.6	3.921	82.5	832	17.5
2007	14.4	22.2	-61.5	95.3	3.909	81.4	893	18.6
2008	16.4	21.9	-63.0	96.2	4.022	83.8	780	16.2
2009	16.2	21.1	-62.3	95.9	4.154	85.0	733	15.0
2010	15.8	20.7	-63.0	95.9	4.170	84.8	749	15.2
2011	16.0	20.7	-61.4	94.7	4.164	85.3	716	14.7
2012	17.3	20.6	-62.4	96.0	4.105	86.9	620	13.1
2013	16.0	19.9	-62.0	94.0	4.248	85.2	737	14.8
2014	16.5	19.8	-62.7	93.0	4.092	86.4	645	13.6
2015	16.4	19.9	-62.9	95.9	4.291	85.9	706	14.1
2016	15.8	20.0	-63.0	95.8	4.134	84.5	760	15.5
Total	16.1	22.4	-63.2	96.4	3.878	83.4	769	16.6

Source: RAIS (2021).

Figure 1 displays the map of Brazilian cities that pay salaries to public employees both superior and inferior to the private sector. It is evident that the decrease in the number of city employees whose salaries are inferior (in purple) to the private sector salaries is homogeneous and no region stands out. Moreover, it was not possible to identify any territorial pattern of distribution for wage differences through a quantitative analysis of the map. In the map, the cities whose wage differences were not identifiable are marked in gray, notably they concentrate in the states of the North.

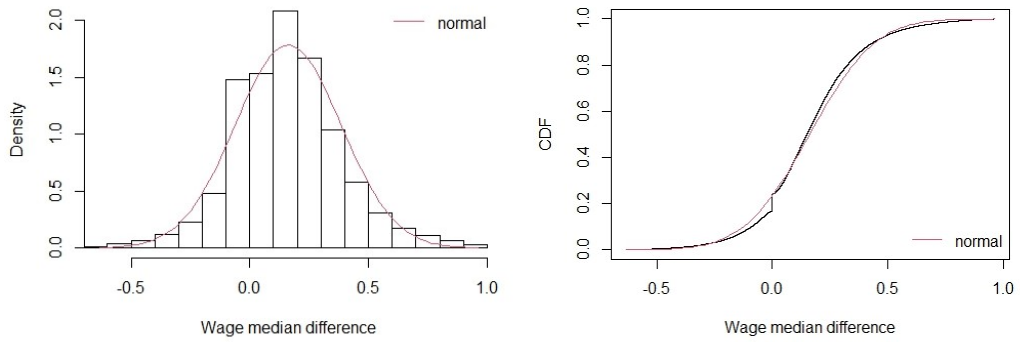
FIGURE 1 **MAP OF BRAZILIAN CITIES THAT PAY HIGHER SALARIES TO CITY EMPLOYEES COMPARED TO PRIVATE SECTOR EMPLOYEES (2000, 2005, 2010 AND 2016)**



Source: RAIS (2021).

Figure 2 shows the accumulated distribution function and the theoretical and empirical density of the variable wage difference in the cities. The graphs display that the dependent variable wage difference (*diffwage*) presented normality, with no limitations regarding the estimation strategy described in section 3 for equation 3.

FIGURE 2 **ACCUMULATED DISTRIBUTION FUNCTION AND THEORETICAL AND EMPIRICAL DENSITY OF THE VARIABLE WAGE DIFFERENCE IN BRAZILIAN CITIES. 2000 A 2016**



Source: RAIS (2021).

4.2 Determinants of wage difference

Table 2 displays the descriptive statistics of independent variables for the estimation of determinants of wage differences in Brazilian cities. Analysis of Table 2 reveals that cities have great heterogeneity regarding the four variables used in the multiple regression model of equation 3.

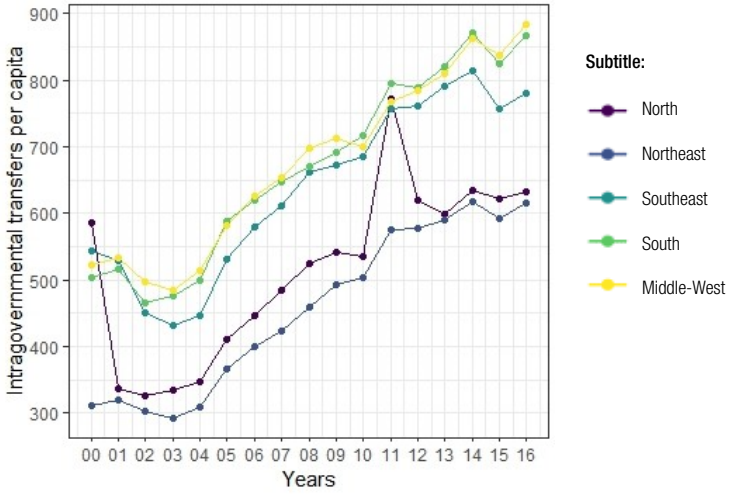
TABLE 2 **DESCRIPTIVE STATISTICS OF INDEPENDENT VARIABLES FOR THE ESTIMATION OF DETERMINANTS OF WAGE DIFFERENCE IN BRAZILIAN CITIES (2000 TO 2016)**

Variables	Mean	Standard deviation	Minimum	Maximum
Population	37,873	216,397	789	11,967,825
City GDP (in thousands R$)[1]	309,088	3,120,387	1.527	218,175,165
Intragovernmental transfers *per capita*[1]	595,69	452,99	0.55	59,961.19
Electoral competition	0.18	0.20	0.00	1.000

Note: Deflated to 2000 by the IGP-M of the Fundação Getulio Vargas – FGV.
Source: Elaborated by the authors with data from FINBRA (2021), IBGE (2000, 2010, 2021), RAIS (2021) and TSE (2021).

Figure 3 presents the graph of intragovernmental transfers *per capita* of cities per macrorregion from 2000 to 2016. The graph shows that the level of intragovernmental transfers *per capita* received by the cities in the Northeast and in the North are inferior to those received in the Southeast, South and Middle-West. This shows a difference in the capacity of paying for city employee salaries. In addition, it was noted the increase in intragovernmental transfers *per capita* in the five macrorregions, as indicated by the increase in the participation of cities in public expenditures and the provision of public services.

FIGURE 3 **GRAPH OF INTRAGOVERNMENTAL TRANSFERS *PER CAPITA* OF CITIES BY MACRORREGION 2000 TO 2016**



Source: FINBRA (2021).

Table 3 shows the results of estimations for the model of determinants of wage difference of city employees and private sector employees (equation 3). The four distinct estimations (fixed effect, fixed effects with robust errors by cluster, fixed effects with robust error to serial correlation and fixed effects with robust error to spatial correlation) confirm the increasing effect of intragovernmental transfers *per capita* in the wage differences of city employees and private sector employees.

In other words, the increase of 1% in intragovernmental transfers *per capita* leads to an increase of 0.0667% in the wage difference between city and private sector employees in Brazilian cities, *ceteris paribus*. In addition, it is noted that wage premium is less sensitive to intragovernmental transfers in the cities than in the states, since Marconi et al. (2009) have identified that a 1% increase in governmental transfers leads to an increase of 0.40% in wage premium, whereas in that work, the increase is only of 0.067% of the city employees wage premium.

Furthermore, the results, which were statistically confirmed in the four estimations, have identified that electoral competition has a negative effect on the wage difference in the cities in the sample.

The variables population and GDP *per capita* were statistically significant and increased and decreased wage differences in the cities, respectively. In other words, a 1% increase in the population leads to a wage difference over 0.05%, whereas a 1% increase in the GDP *per capita* leads to a decrease of 0.036% in the wage difference provided that the other variables remain constant.

TABLE 3 **RESULTS OF THE ESTIMATION FOR THE MODEL OF DETERMINANTS OF WAGE DIFFERENCES BETWEEN CITY EMPLOYEES AND PRIVATE SECTOR EMPLOYEES IN BRAZILIAN CITIES (2000 TO 2016)**

Variables	Fixed Effects			
	(a)	(b)	(c)	(d)
Population (ln)	0.032*** (0.007)	0.021*** (0.007)	0.050*** (0.007)	0.050*** (0.007)
GDP *per capita* (ln)		-0.024*** (0.003)	-0.036*** (0.003)	-0.036*** (0.003)
Transfer *Per capita* (ln)			0.067*** (0.004)	0.067*** (0.004)
Electoral competition (ln)				-0.002*** (0.001)
Constant	-0.169*** (0.064)	-0.032 (0.066)	-0.711*** (0.076)	-0.720*** (0.076)
	Robust error by cluster (Arrelano, 1987)			
Population (ln)	0.032*** (0.013)	0.021 (0.014)	0.050*** (0.014)	0.050*** (0.014)
GDP *per capita* (ln)		-0.024*** (0.006)	-0.036*** (0.006)	-0.036*** (0.006)
Transfer *per capita* (ln)			0.067*** (0.009)	0.067*** (0.009)
Electoral competition (ln)				-0.002*** (0.001)
Constant	-0.169*** (0.128)	-0.032 (0.136)	-0.711*** (0.165)	-0.720*** (0.164)
	Robust error to serial correlation (Newey & West, 1987)			
Population (ln)	0.032*** (0.010)	0.021** (0.010)	0.050*** (0.010)	0.050*** (0.010)
GDP *per capita* (ln)		-0.024*** (0.004)	-0.036*** (0.005)	-0.036*** (0.005)
Transfer *per capita* (ln)			0.067*** (0.007)	0.067*** (0.007)
Electoral Competition (ln)				-0.002*** (0.001)
Constant	-0.169** (0.091)	-0.032 (0.094)	-0.711*** (0.123)	-0.720*** (0.123)

Continue

Variables	Fixed Effects			
	(a)	(b)	(c)	(d)
	Robust error to spatial correlation (Driscoll & Kraay, 1998)			
Population (ln)	0.032** (0.012)	0.021 (0.016)	0.050*** (0.015)	0.050*** (0.015)
GDP *per capita* (ln)		-0.024** (0.010)	-0.036*** (0.005)	-0.036*** (0.008)
Transfer *per capita* (ln)			0.067*** (0.007)	0.067*** (0.009)
Electoral competition (ln)				-0.002*** (0.001)
Constant	-0.169* (0.113)	-0.032 (0.165)	-0.711*** (0.208)	-0.720*** (0.207)
N	5.344	5.344	5.344	5.344
T	1-17	1-17	1-17	1-17
Observations	79.002	79.002	79.002	79.002
R^2	0.0003	0.001	0.005	0.006
R^2 Adjusted	-0.072	-0.071	-0.067	-0.67
F	22.211***	46.526***	132.47***	102.898***

Note: *p<0,10; **p<0,05; ***p<0,01.
Source: Elaborated by the authors with data from FINBRA (2021), IBGE (2000, 2010, 2021), RAIS (2021) and TSE (2021).

4.3 Robustness analysis

Table 4 presents the results of robustness analysis by Monte Carlo simulation of data panel regressions, fixed effects, and robust error by cluster (Arrelano, 1987), serial correlation (Newey & West, 1987) and spatial correlation (Driscoll & Kraay, 1998). In practical terms, the independent variables of the regression model displayed results too similar to the ones in Table 4 (difference in the third decimal house), which means that the results of the estimated wage differences from stage 1 are robust.

TABLE 4 **RESULTS OF THE ROBUST ANALYSIS VIA MONTE CARLO SIMULATION OF THE MODEL FOR THE DETERMINANTS OF WAGE DIFFERENCE BETWEEN CITY EMPLOYEES AND PRIVATE SECTOR EMPLOYEES IN BRAZILIAN CITIES (2000 TO 2016)**

Variables	Fixed Effects (a)	Robust Error		
		Cluster (b)	Serial correlation (c)	Spatial correlation (d)
Population (ln)	0,051*** (0,007)	0,051*** (0,015)	0,051*** (0,010)	0,051*** (0,015)
GDP *per capita* (ln)	-0,036*** (0,003)	-0,036*** (0,006)	-0,036*** (0,005)	-0,036*** (0,008)
Transfer *per capita* (ln)	0,068*** (0,004)	0,068*** (0,009)	0,068*** (0,007)	0,068*** (0,010)
Electoral Competition (ln)	-0,002*** (0,001)	-0,002*** (0,001)	-0,002*** (0,001)	-0,002*** (0,001)
Constant	-0,734*** (0,079)	-0,734*** (0,164)	-0,734*** (0,123)	-0,734*** (0,210)
N	5.344	5.344	5.344	5.344
T	1-17	1-17	1-17	1-17
Observations	79.002	79.002	79.002	79.002
R^2	0,005			
R^2 Adjusted	-0,067			
F	98,479***			

Note: *p<0,10; **p<0,05; ***p<0,01; (a) Fixed Effects; (b) Robust Error by cluster (Arellano, 1987); (c) Robust error to serial correlation (Newey & West, 1987); (d) Robust error to spatial correlation (Driscoll & Kraay, 1998).
Source: Elaborated by the authors with data from FINBRA (2021), IBGE (2000, 2010, 2021), RAIS (2021) and TSE (2021).

5. DISCUSSION

The research identified that in cities, the mean premium of public employees is positive at 16.1%, a result that is compatible with Marconi (2003) and close to the 13% found by Mancha and Mattos (2020) for public employees and positive, but also similar to the observed by Belluzzo et al. (2005), Braga et al. (2009), Foguel et al. (2000), Mattos et al. (2020), and Vaz and Hoofman (2007).

Regarding the determinants of wage differences, intragovernmental transfers *per capita* increased the wage difference between city and private sector employees. The findings confirm the indication that intragovernmental transfers can be used to prioritize the wages of city employees based on the criteria and the methods employed in the present study. In other words, the increase in public expenditure through intragovernmental transfers to local governments is correlated to higher local wages, similar to the findings of Marconi et al. (2009) for state employees.

This result indicated the need to improve fiscal rules destined to ensure the preservation and the improvement of public expenditure given that cities have little capacity to dispose of capital, since most of their revenue is committed to current expenses. In addition, the state governments investigated by Marconi et al. (2009) corroborates the theoretical suggestion that greater proximity between citizens and public expenditures can lead to better allocation of public resources (Oates, 1972, 2005).

On the other hand, electoral competition reduces the city's wage differences. This shows that accountability instruments, that is, when administrators need to publicize and account for their actions, the wage difference is reduced because mayors need to meet the demands of other groups to ensure their political support and win the elections. This shows that not only fiscal rules can be used to inhibit servers from capturing intragovernmental transfers, but the existence of democratic and public governance instruments that can and must help in the process (Behn,1998).

Results show that an increase in the city GDP leads to a decrease in wage difference. Despite the apparent contradiction, the effect can be explained by the increase in the private sector wages, since in times of economic growth, the demand for labor, qualified or not, tends to promote raises.

Therefore, salaries in the private sector are more sensible to economic behavior, whereas in the public sector, salaries are not much reduced since the legislation prevents that and termination can only come in effect in case of penalty after due legal process. It is noteworthy that salaries of private sector employees are also subjected to irreducibility, however, companies can replace employees for ones earning lower salaries. This result is similar to the ones obtained by Marconi et al. (2009) for industrial GDP regarding the wage premium of state employees in Brazil.

Concerning the population, the research has shown that population growth increases the wage difference. A possible explanation is that bigger cities tend to present: more employees organized into unions, which increases the pressures upon politicians (Córdoba et al., 2012; Gregory & Borland, 1999); greater distance between citizens and administrators (Oates, 1972, 2005); and better sources to fund higher salaries (Sakurai, 2014), that is, bigger cities often collect the conditions to make the pressure exercised by employees more effective, unlike small cities where employees barely have a career plan and alternative sources of funding.

Finally, it should be remembered that public functions are performed exclusively by public employees and their career must be designed differently from the other employees. Identifying and characterizing these functions, positions and employees seems relevant to establish a better remuneration and its limits (Campos, Depalo, Papapetrou, Pérez, & Ramos, 2017; Depalo et al., 2015). It is also noteworthy that employees are organized into subgroups of professional and sectorial categories. Therefore, searching for rules that protect the public administration from corporatism of politically powerful functional groups and identifying the careers that need incentives to improve the quality and the productivity of public employees seems healthy for local governments.

Another point to be highlighted is the wage difference identified by the comparison of salaries does not necessarily implicate the claim that labor force is more expensive in the public sector than in the private sector, since other expenses must be taken into account. In the private sector, for example, companies must collect 8% of the gross wage for the Fund to Guarantee for Time of Service (*Fundo de Garantia do Tempo de Serviço*, FGTS) and depending on the employment termination, as just cause, they are obliged to pay a termination fine of 40% of the amount deposited in the employee's FGTS

account. This is not the case of city public employees, most of whom abide by the Unique Juridical Regime. In other words, the identification of effective cost of labor both for the public and the private sector requires considering taxes and social security charges. In summary, the conclusions regarding the wage difference do not necessarily apply to the effective cost of labor in each sector.

6. CONCLUSION

This research analyzed the effect of intragovernmental transfers *per capita* on wage differences between city and private sector employees. The results indicate that intragovernmental transfers *per capita* increase wage difference, that is, the more resources cities receive through intragovernmental transfers, the greater is the wage of city employees compared to the private sector. Moreover, the GDP *per capita* and electoral competition decrease wage differences, whereas population growth increases it in Brazilian cities.

The present findings contribute to identifying the need for improvement of fiscal rules to prevent intragovernmental transfers from decreasing the quality of public expenditure. In addition, we observed that democratic instruments can be useful to align the interests of politicians and those of the citizens, that is, tools that expand the need for administrators' accountability prevent employees from capturing intragovernmental transfers. Therefore, in addition to fiscal rules, democratic instruments and public governance can be more effective.

The limitations we have identified in the present study amounts to: i) estimating the wage differences between city and private sector employees without considering the division into sectors and occupations, or the potential observed variables not included in the regression model for stage 1; ii) not considering taxes and social security charges in the different sectors nor their terms of employment; iii) comparing wages uniformly without emphasizing functions exclusive to the public sector.

This research has indicated opportunities to develop future investigations focused on comparing the cost of labor force, not only the wage, since there are additional taxes and social charges derived from employment conditions as well as to research the wage difference of occupations to identify the most and least benefited.

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