

The Brazilian wage gap between teachers in the public and private sectors across education levels

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Abstract

The two stage wage gap decomposition proposed by Firpo, Fortin, and Lemieux (2009) permits measuring the contribution of observable and unobservable characteristics of the wage gap formation and evolution comparing teachers earnings in the public and private sectors from 2006 to 2016. We found that teachers from the public sector earn more than the ones from the private sector at mean, median and quantile 10 due to the composition effect. The analysis across education levels shows that the composition effect is important to explain the wage gap in Early Childhood Education, while the structure effect is more relevant in the wage gap decomposition in Elementary and High School Education.

Key-words: wage gap decomposition; private and public sectors; teachers' wage

Resumo

Para analisar a diferença salarial entre professores do setor público e privado atuando na Educação Básica realizamos um método de decomposição em dois estágios proposto por Firpo, Fortin, and Lemieux (2009). A análise cobre o período de 2006 a 2016 para a média, mediana e 10º e 90º quantis. Os resultados mostram que há um crescimento da diferença salarial a favor do setor público em todos os pontos da distribuição, com exceção do quantil 90. Essa diferença se dá pela diferença de composição de características. Abrindo a análise para os níveis de educação em que os professores atuam, encontramos que a composição das características também é um componente importante para explicar a diferença salarial na educação infantil, já no ensino fundamental a diferença a favor do setor público se dá pelas taxas de retorno assim como no ensino médio.

Palavras-chave: decomposição do diferencial salarial; setores público e privado; salário do professor

JEL Codes: J31, J44, J45, I29

Área 13: Economia do Trabalho

1. Introduction

What is the difference between teacher's earnings in the private and public sector in Brazil? What are the most important explanations accounting for pay differences between them? Has this wage gap increased or decreased in the past 10 years? Is there any difference in wage gap across education levels? To answer these questions, we use a two-stage procedure to decompose differences and changes in the distribution of wages between sectors: Recentered Influence Function (RIF) proposed by Firpo, Fortin, and Lemieux (2009), a generalization of the Oaxaca-Blinder decomposition.

Many studies compare public and private sector earnings in Brazil and find that workers in the public sector earn higher salaries (FOGUEL et al., 2000; MACEDO, 1985; MARCONI, 2003; TANNEN, 1991; TENOURY; MENEZES-FILHO, 2017). Bender and Fernandes (2006), for instance, explore schooling differential and wage inequality in the public and private sectors using PNADs from 1992 to 2004. The main results show a systematic and significant increase in public-private wage differential, there is a decrease in public employment, inequality is larger in the public sector, and there is a convergence of the average worker's quality between the public and the private sectors.

Braga (2007) analyzes the determinants of the public-private wage gap for different levels of qualification for Brazilian employees. Workers with no education or low educational level earn less in the private sector, while workers with high human capital earn less in the public sector. The author also finds that there is some heterogeneity according to occupational choice. Specifically, he finds that workers from education careers earn more in the private sector.

Machado and Scorzafave (2016) compare the wage gap between teachers and non-teachers in careers typically related to the teaching profession. The results suggest the existence of a wage differential favoring teachers, both in average and also at quantiles 10 and 50 in 2010. At quantile 90, there is no wage gap between teachers and non-teachers. Wage differentials are mainly explained by differences in returns associated with characteristics that determine wages. For instance, at quantile 50, being a public-sector employee is associated with a higher wage for teachers than for non-teachers.

Belluzzo, Anuatti Neto and Pazello (2005), using a quantile regression method, find that the wage gap is larger at the bottom of the distribution. Although the wage gap favoring the public sector is reversed in some specific moments of the distribution, it is observed that it continually decreases as we go from the bottom to the top of the distribution.

When decomposing wage gaps, the most common method used is the standard Oaxaca-Blinder decomposition. In order to study the public-private wage gap, we take one step further and, in addition to explaining differences in means, we analyze the wage gap using other distributional statistics. The method proposed by Firpo, Fortin and Lemieux (2009) allows one to decompose wage differentials at any quantile of the wage distribution.

Also, our research innovates by doing an analysis over time with census data. Finally, we also investigate if the wage gap has a different behavior across education levels in which teachers are employed over time. As the state and local government shares the provision of education levels with the federal government, there are potential differences that may arise due to different contexts.

The main results show that the evolution of the wage gap has favored the public sector between 2006 and 2016. While at the mean, median and 10th quantile the wage gap increased, at quantile 90, where the wage gap was negative in 2006, the difference has been reduced over time. The decomposition analysis shows that this is because of the composition effect. Further dividing the composition effect to investigate the contribution of each single covariate, we found that tenure is mainly responsible for the wage gap path observed in the period.

We also found that there are large differences across education levels. While the Early Childhood Education is the level in which teachers' features are more important to the formation of

the wage gap, in Elementary Education, the wage gap increase favoring the public sector is due to the wage structure effect. However, in High School, the wage structure effect favors the private sector.

The remainder of the paper is structured as follows. Section 2 describes census data used with sample restrictions and definitions adopted. Section 3 presents teachers' characteristics by sectors, while section 4 analyzes wage distribution over time. Section 5 outlines our empirical strategy. Section 6 discusses wage gap decomposition between sectors, while Section 7 discusses wage gap decomposition between sectors across education levels. Finally, Section 8 presents our main conclusions.

2. Data source, sample restrictions and definitions

This paper uses census data assembled by the Ministry of Labor as data source. RAIS (*Relação Anual de Informações Sociais*) is an annual dataset containing individual information about all workers employed in the formal sector. It is the employer who provides information on worker's age, gender, race, schooling, tenure at the firm, monthly wage, and number of (weekly) hours in contract. There are two wage variables: the average wage received during the year, and the wage received in December.

Also, there is information about the job executed by workers that is comparable to ISCO-88 (four-digit level), which is used to identify teachers. On the firm side, RAIS provides information on plant size, sector of activity (comparable to ISIC/CIU¹, used to identify the education sector firms), public-private ownership categories, and firm location (municipality).

To identify teachers in the database, to separate teachers employed in the public sector from those ones employed in private sector and to restrict the sample to teachers teaching in Basic Education we follow a technical report from the National Institute of Educational Studies (INEP, 2017), an agency linked to the Ministry of Education. The occupation classification previously mentioned allows us to identify teachers as well as the grade each one teaches: Early Childhood Education (which includes pre-school and kindergarten), Elementary Education (1st grade to 9th grade), High School Education (10th grade to 12th grade), or others (which includes Vocational Education, Special Education for disabled children in need of special attention and teachers from High Education working in areas of practice within teaching)².

To identify whether a teacher works in the public or the private sector, we use the legal status of the school. RAIS provides this information through a classification from the Brazilian Census Bureau (*Instituto Brasileiro de Geografia e Estatística*, IBGE) that organizes entities according to its legal status. There are five categorical groups: Public Administration, Business Entities, Non-Profit Organizations, Individuals and International Organizations, and Other Extraterritorial Institutions. We define public sector as the one composed by Public Administration and Public and Semi-public Companies from Business Entities, while Business Entities and some Non-Profit Organizations³ are defined as private sector. The other categorical groups are dropped off from the sample. Besides, to ensure we are selecting the correct entities, we look for companies doing specific activities. Using the entity's sector of activity, we restrict the sample to individuals working in Education and other activities related to Public Administration, as defined in the INEP report.

Our research covers the Brazilian job market from 2006 to 2016. The 2006 wave is first one that contains all the variables that allow us to have the same set of control variables until 2016, the most recent dataset available. We focus on workers who were employed on December 31st of each year, which means that we exclude individuals who were employed during the year but lost their jobs

¹ CNAE (National Classification of Economics Activities).

² According to INEP this occupation could include teachers from Federal Institutes teaching in Basic Education.

³ Specifically, we use these codes from Non-Profit Organizations: 3069 Private Foundation, 3077 Independent Social Service, 3220 Religious Organization and 3999 Private Association.

at some point. In order to have wages measured at the same point in time and not to have wage variation due to the fact the workers present different periods of employment over the year, we use the wage earned in December to calculate the individual hourly wage instead of using the average annual wage⁴. We use a sample of workers aged between 18 and 70 with positive earnings. The age range is restricted because the public sector has a compulsory retirement rule and a minimum age for admission to employment. The next section presents some descriptive statistics on our sample.

3. Teacher's characteristics

This section describes teachers' characteristics using the 2006 and 2016 waves (the starting and final time points of our sample). Table 1 shows that we had more than 2.1 million teachers in 2006, and this number increased 17% over a decade, reaching 2.5 million in 2016. While 86% of teachers were in the public sector in 2006, in 2016 the percentage decreased to 81%.

Table 1 – Teachers by sector, 2016

Sector	2006	2016
Public	1,852,684 86%	2,041,814 81%
Private	305,105 14%	478,147 19%
Total	2,157,789 100%	2,519,961 100%

Table 2 presents some descriptive statistics of teachers' characteristics by sector in 2006 and 2016. As one can see, both average wage and number of hours are larger in the public sector. On the other hand, while wage dispersion is higher in the public sector, the standard deviation of working hours is larger in the private sector. We will discuss wage data in further details in the next section.

The typical teacher in the public sector in 2006 is a non-white woman aged 40 with a college degree teaching elementary school students. A decade later, the characteristics are almost the same, except for the fact that the percentage of teachers with a college degree increased 28 percentage points. It should be noticed that since 1996, all teachers must have a college degree to be eligible for admission as a teacher. The ones who were hired before 1996 are allowed to work regularly, that is why there are some teachers without a college degree.

In the private sector, teachers are younger, and there is a larger percentage of men (around one quarter). Schooling distribution is similar, but distribution across grades which they teach is a little bit different, with a higher percentage in early education. The biggest difference between teachers in the public and private sector is race: 65% in the private sector are white in 2016, against 5% in the public sector.

As expected, tenure at firm is longer in the public sector where teachers in 2006 were employed in the same firm for 10.6 years on average and it increases up to 11.7 years in 2016, while in the private sector tenure was 4.8 years in 2006 and 4.9 years in 2016.

⁴ According to General Register of Employee and Unemployed [CAGED], December is the month of the year presenting the lowest net rate of job creation. However, this is not a big issue in the present context because the month of analysis is fixed.

Table 2 – Descriptive statistics by sector, 2006 and 2016

Variable	Public				Private			
	2006		2016		2006		2016	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Wage	2402	2174	3552	2696	1717	1879	2167	2046
Number of hours	32.1	9.5	32.0	9.3	27.3	14.6	28.5	14.2
Tenure (months)	127.4	104.0	140.3	104.8	57.9	62.8	59.0	65.1
Age	40.5	9.9	43.5	9.4	35.6	9.5	37.2	9.8
Man	0.17	0.38	0.19	0.39	0.26	0.44	0.25	0.43
White	0.04	0.20	0.05	0.21	0.72	0.45	0.65	0.48
Schooling								
Under Elementary	0.02	0.13	0.00	0.05	0.01	0.09	0.00	0.06
Elementary	0.06	0.25	0.01	0.1	0.03	0.17	0.02	0.13
High School	0.37	0.48	0.17	0.37	0.34	0.47	0.25	0.43
College	0.54	0.50	0.82	0.38	0.63	0.48	0.73	0.44
Education Level								
Early Childhood	0.06	0.24	0.14	0.35	0.2	0.4	0.29	0.45
Elementary	0.71	0.45	0.67	0.47	0.53	0.5	0.48	0.50
High School	0.17	0.38	0.16	0.37	0.18	0.38	0.14	0.35
Other	0.06	0.23	0.03	0.16	0.09	0.29	0.09	0.29

4. Wage distribution

As we are performing a wage decomposition analysis using data from 2006 to 2016, this section presents teachers' wage distribution by sector for the whole period. The idea is to highlight differences and similarities in wage distribution to support the following wage gap analysis. As shown in the previous section, there are differences concerning the number of working hours, so from now on, when we talk about wages we are referring to (log of) hourly wage.

Figure 1 plots mean and median wages for the whole period by sector. First of all, mean and median wages are larger in the public sector even after taking into account the number of hours in contract. Second, one can see that public sector wages increased more than wages in the private sector throughout the decade. The period from 2006 to 2012 is particularly important for wage gap increase. The mean wage of teachers in the public sector increased 15% (in terms of log points), while private sector wage increased 7.8% in the same period. Third, statistics show that median wage trajectories across sectors are even more different. The figure shows that the median wage path in the private sector is flatter than in the public sector, which means that the wage gap increased more in terms of median wage over the period in comparison to average wages.

Figure 1 – Log hourly wage mean and median, by sector

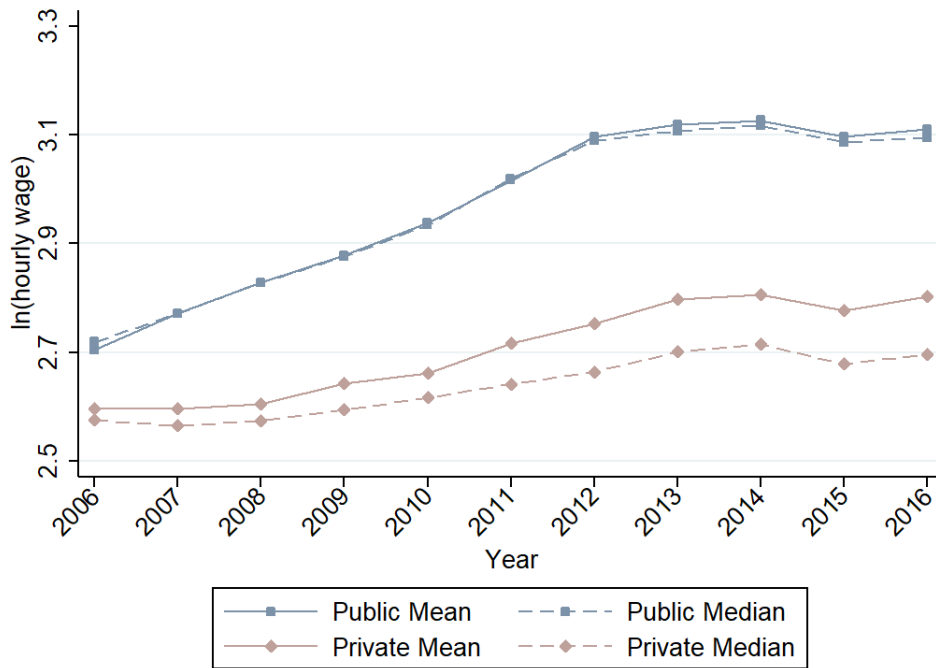
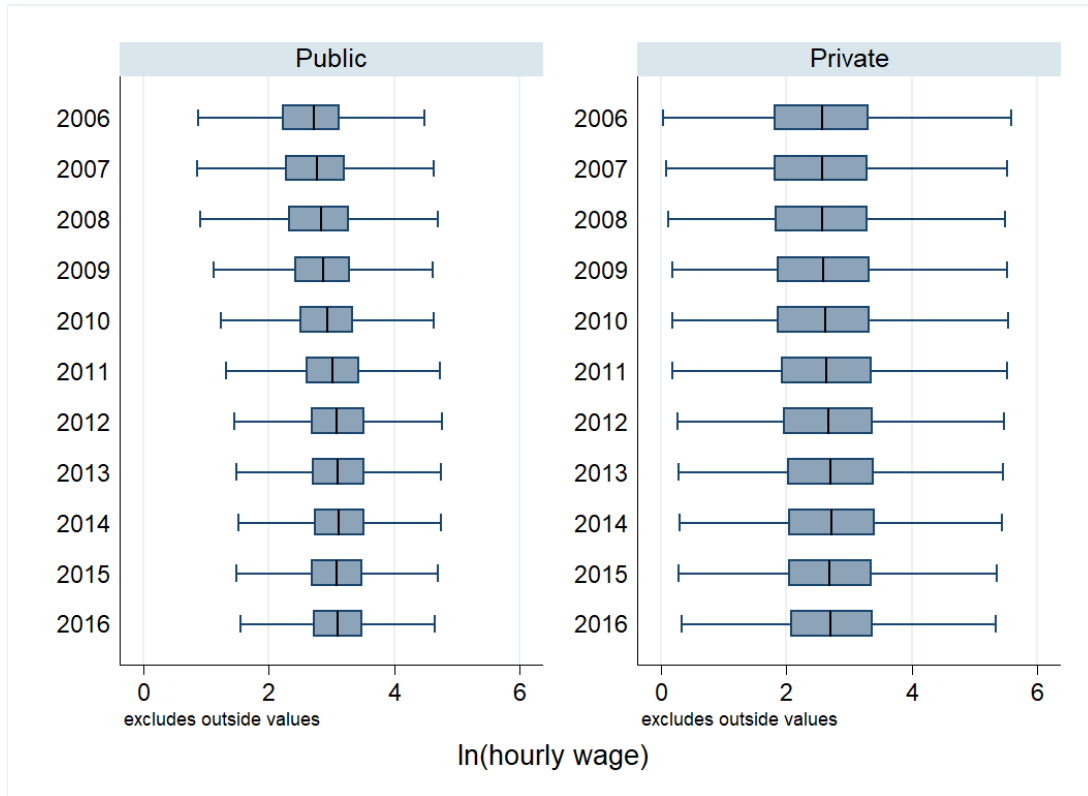


Figure 2 presents teachers' wage distribution by sector and year. The figure confirms that the wage distribution in the public sector is symmetric around its mean in the entire period, a feature that was expected since average and median wages are practically the same. On the other hand, it is shown that the private wage distribution is right-skewed, meaning that there are more top salaries in the private sector.

Also, it is clear that the wage dispersion is higher in the private sector. Although we observe that the private sector's wage variability was getting smaller since 2006, at the end of the period the interquartile interval was still lower in the public sector. In spite of that, we observe a slight decrease in dispersion throughout the period for both sectors.

Figure 2 – Log hourly wage frequency distribution by sector, 2006-2016



This section and the previous one showed that there are important differences in teachers' characteristics between public and private sectors. This is expected since i) admission to the public sector is different from admission to a private school, and ii) wages in the public sector are set by strict rules and regulations by the government which, in general, do not take into account teacher performance. In the next section, we present the methodology we use to analyze the wage gap between sectors over the last ten years.

5. Methodology

To understand which factors are driving the changes in teachers' wage gap in recent years, we implement a decomposition analysis based on Oaxaca (1973), Blinder (1973) and Firpo, Fortin and Lemieux (2009). The method allows us to measure the contribution of observable and unobservable characteristics to the wage gap formation and evolution. Also, the method goes beyond the traditional analysis of the difference in the means of wages by allowing us to evaluate the wage gap at different points of the wage distribution, which is precisely the goal of this paper. The main hypothesis supporting this goal is that wage gap decomposition could present different patterns when performed at different points of the distribution from the conclusions one could obtain by explaining the difference in the means.

The standard Oaxaca-Blinder decomposition can be interpreted as a specific case of the decomposition method proposed by Firpo, Fortin and Lemieux (2009). We are interested in decomposing the wage gap, Δ^τ , where τ represents the mean or any other quantile of the wage distribution. As in the standard case, the wage gap can be decomposed in two parts as shown in the following equation:

$$\Delta^\tau = \Delta_S + \Delta_X \quad (1)$$

where Δ_S is the change in the wage structure while keeping the distribution of the vector of characteristics X constant (wage structure effect), and Δ_X is the change in the distribution of X while keeping the wage structure constant (composition effect). Under linearity and identification assumptions, Equation (1) reduces to the standard components of the Oaxaca-Blinder method when explaining mean values.

The decomposition is implemented in two stages. The first stage is the estimation of the weighting function used to reweight the mean wage (or median or other quantile) of each group, a step necessary to identify the parameters of interest (the two parts of the wage gap in Eq. 1). The distributional statistics can be computed using a plug-in approach; then, they are used to compute the wage structure and composition effects. The second stage is the estimation of the contribution of each covariate to each effect. This is implemented using a Recentered Influence Function (RIF) that linearly approximates a non-linear functional of the distribution. Using this transformed variable as the dependent variable in OLS regressions, one can estimate the regression coefficients used in the decomposition analysis.

The OLS regression is a Mincerian equation as the following:

$$w_{is}^{RIF} = \alpha_s + X_{is}\beta_s + \varepsilon_{is} \quad (2)$$

where w_{is}^{RIF} is the transformed hourly wage of teacher i working in sector s (value 0 for public sector and 1 for private sector); X_{is} is a vector of teacher's characteristics, which includes schooling (four categories – under elementary education omitted), age (as proxy for work experience, with a quadratic relation with the dependent variable), current job tenure in months, a dummy for gender (indicating men), a dummy for race (indicating Whites), dummy variables for geographic regions (North omitted), and a categorical variable indicating to which grade the teacher teaches to (Other omitted). β_s is the vector of parameters to be estimated and ε_{is} represents the unobserved characteristics ($E(\varepsilon_s|X_s) = 0$).

In sum, the idea is to reweight the dependent variable at the distribution point τ through the RIF and then perform the standard Oaxaca-Blinder decomposition. We are going to perform two decompositions. In the first one we decompose the wage statistic to analyze the differences between the public and private sectors, our main exercise. In the other we further investigate the differences between sectors by decomposing the wage statistic separately for each educational level. In addition to present the decomposition results to explain differences in the means, we perform the decomposition analysis at three quantiles: 10th, 50th and 90th.

6. Decomposition by sector

This section presents the results of teachers' wage gap decomposition. As highlighted before, the analysis covers the period between 2006 and 2016, and it is performed to explain differences in means as well as at three difference quantiles: 10th, 50th and 90th. The question underlying the analysis is: how much would teachers in the private sector be paid if they were rewarded according to the wage structure for teachers in the public sector?

Figure 3 summarizes the main results. Each panel reports the wage gap for each distributional statistic (connected line) as well as the contributions of the composition (gray bar) and the wage structure (white bar) effects for the formation of the wage gap. Notice that in each year the sum of the bars is equal to the wage gap.

In general, the decomposition results show that both composition and wage structure effects favor teachers in the public sector, meaning that public sector's teachers have more characteristics associated with higher wages and that these characteristics are better paid in the public than in the private sector. The exception is the decomposition of the 90th quantile, which will be analyzed below.

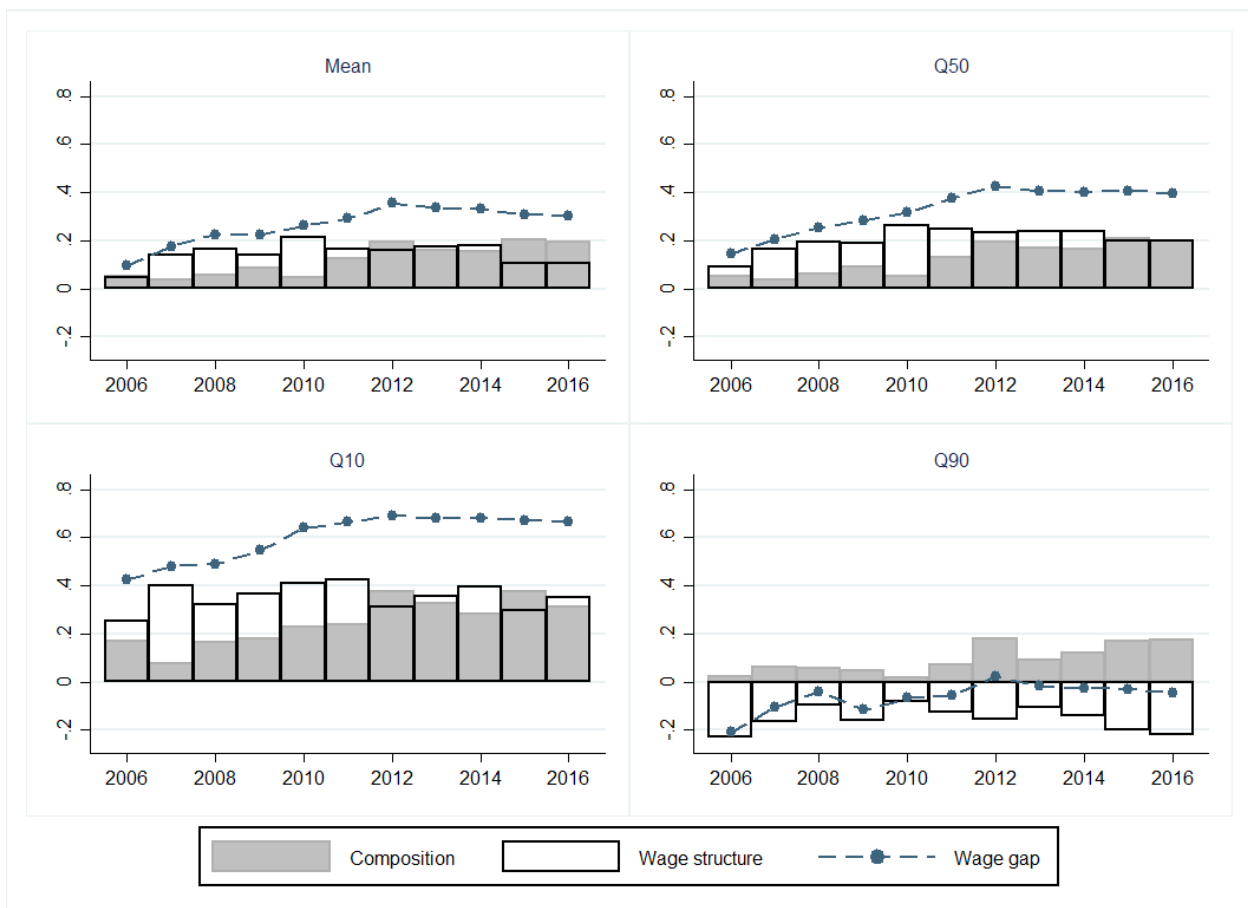
The decomposition of the mean shows that the contribution of the composition effect increases over the years until 2012, both in absolute and relative terms. As the wage gap follows a similar path,

it seems that the wage gap widening is associated with a change in the pool of teachers in the public sector related to teachers in the private sector. In the last two years, the relative importance of the composition effect increased although the wage gap remained the same. A similar pattern is observed for the decomposition of the median. The absolute contribution of the wage structure effect remained stable since 2007, while the relative contribution of the composition effect increased over time.

The wage gap at the 10th quantile also favors teachers in the public sector, but it is larger in comparison to the mean and median. In addition, the same increase in the wage gap observed for the previous distributional statistics for the 2006-2012 period occurs for teachers at this quantile. A relative increase of the composition effect in explaining the wage gap is also observed. In the end of the period, its relative importance is similar to the importance of the wage structure effect. Thus, even for low-paid teachers, the public sector used to pay more than the private sector because of the wage structure effect and not due to differences in observable characteristics. However, in the last few years the composition effect became more important to explain the wage gap than the unexplained factor.

At the top of the wage distribution, results differ from previous ones. As one can see in the panel for the 90th quantile, the wage gap is negative, which means that teachers in the private sector earn higher wages than teachers in the public sector. This is explained by the rules that regulate wages in the public sector and impose a wage cap (the same is true for the other extreme of the distribution, where rules set a minimum wage called “piso salarial”). The contribution of each effect for wage gap formation also differs at the top of the distribution in comparison to other distributional statistics. While the wage structure contributes to increase the wage gap in favor of the private sector, if only the composition effect was taken into account, the wage gap would favor the public sector. This is valid for the whole period, but, again, the composition effect became more important over time.

Figure 3 – Wage gap decomposition



In order to understand the changes better, one can look at the contribution of each single covariate to the composition and wage structure effects. Figure 7 and 8 in the Appendix show these contributions for each case, respectively. In relation to the composition effect, we see that tenure is the variable that contributes the most to the positive difference in favor of public sector, which is probably related to the job stability the public sector offers to its employees. Age comes second, followed by schooling after 2011. It is interesting to observe that schooling had its signal changed in the period, suggesting that the pool of teachers in the private sector was better qualified before 2012. The pattern is similar for all distributional statistics.

The wage structure effect (Figure 8) presents a very distinct scenario. In the decomposition of the mean and median, age and schooling have a negative effect, i.e. the return to age and schooling is higher in the private sector. On the other hand, at quantile 10, both have a positive effect. And at quantile 90, while schooling loses relative importance over the period, age effect changes from positive to negative. Also, tenure does not contribute for the wage structure effect at all. Finally, the education levels, which was not that important for the composition effect (except for the 90th quantile), has an important contribution to the wage structure effect, except for quantile 10. Conditional on other covariates, the positive contribution means that teachers in the public sector are better paid in their respective education level.

This section presented evidence that the higher the salary, the larger the importance of the wage structure effect relative to the composition effect for the formation of the wage gap. This is particularly true at the 90th quantile, where the wage structure effect is negative, favoring the private sector. There is also evidence that the education level plays an important role in the wage structure effect; for this reason, we will further investigate the public-private wage gap by performing a decomposition analysis across education levels.

7. Decomposition across education levels

This section presents the results of the decomposition analysis of the teachers' wage gap according to the education levels which they tutor. According to the Brazilian Federal Constitution and the Law n° 9,394 1996, local governments are mainly responsible for providing the Elementary and Early Childhood Education while state governments are responsible for High School Education. Therefore, for Early Childhood Education and Elementary Education we analyze the wage gap between teachers from local public schools and private schools, and for High School, we analyze the wage gap between state public schools and private schools.

Table 3 shows observable characteristics separately for each education level by sector in 2006 and 2016. As we can observe, like the overall statistics by sector presented in Section 3, the public sector pays better wages and has older teachers with longer tenure at firm and a smaller percentage of Whites than the private sector in all education levels. The number of hours in contract in Early Childhood Education is similar between sectors, but in Elementary and High School Education teachers work less hours in the private sector. Over time, one can see that the average age and the percentage of teachers with a college degree increased in both sectors, with mean wage increasing as well.

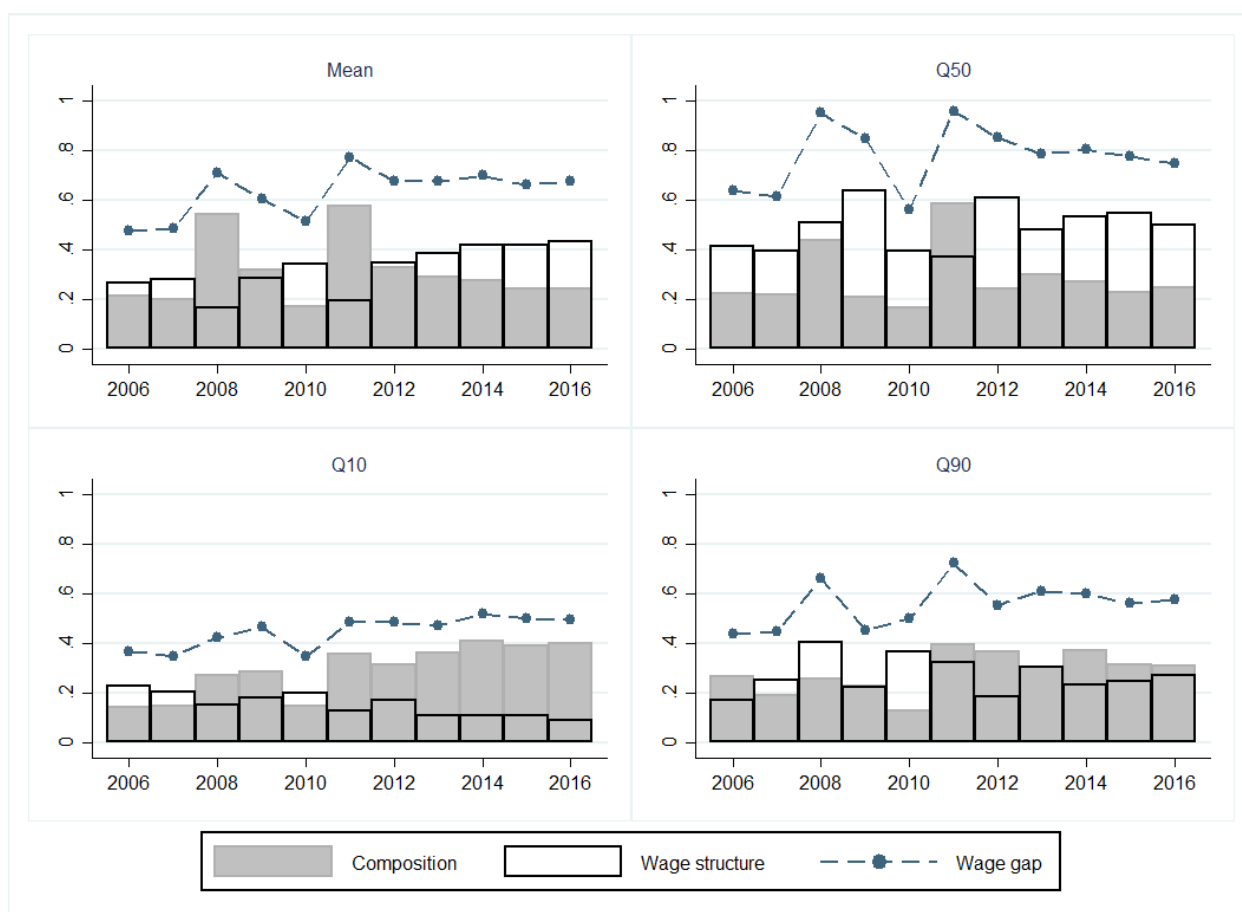
In 2006, teachers teaching preschool children had more schooling than the elementary school teachers in the public sector, a pattern that was not observed in the private sector. Actually, as mentioned previously, there was a big change in terms of formal schooling. Teachers from public schools closed the schooling gap observed in 2006 for elementary and high school grades.

Table 3 – Descriptive statistics across education levels by sector, 2006 and 2016

Variable	Public				Private			
	2006		2016		2006		2016	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Early childhood education								
Wage	2403	2138	3507	2343	1337	1132	1736	1305
Number of hours	32.8	9.4	33.1	7.9	32.8	11.9	34.4	11.2
Tenure (months)	106.2	84.5	112.5	95.9	49.1	54.8	45.7	52.8
Age	38.3	9.3	41.7	9.7	32.5	8.8	34.6	9.4
Man	0.06	0.24	0.08	0.27	0.06	0.23	0.06	0.23
White	0.12	0.32	0.06	0.24	0.71	0.46	0.65	0.48
Schooling								
Under Elementary	0.03	0.18	0.01	0.08	0.02	0.14	0.01	0.09
Elementary	0.07	0.25	0.02	0.14	0.06	0.24	0.04	0.18
High School	0.40	0.49	0.27	0.44	0.43	0.50	0.39	0.49
College	0.51	0.50	0.71	0.45	0.49	0.50	0.57	0.49
Elementary education								
Wage	2005	1685	3221	1970	1679	1705	2130	1970
Number of hours	30.5	9.9	29.8	9.9	26.9	14.2	27.4	13.7
Tenure (months)	117.4	92.5	148.2	104.2	60.8	64.1	64.8	69.2
Age	38.7	9.2	43.1	9.0	35.9	9.3	37.9	9.5
Man	0.12	0.33	0.14	0.35	0.22	0.41	0.22	0.41
White	0.05	0.22	0.05	0.22	0.70	0.46	0.64	0.48
Schooling								
Under Elementary	0.02	0.14	0.00	0.05	0.01	0.07	0.00	0.03
Elementary	0.04	0.19	0.01	0.11	0.02	0.14	0.01	0.10
High School	0.53	0.50	0.20	0.40	0.36	0.48	0.19	0.40
College	0.42	0.49	0.78	0.41	0.62	0.49	0.79	0.40
High school education								
Wage	2220	1370	3661	1921	1974	2601	2451	2646
Number of hours	30.0	9.8	33.7	8.7	22.0	15.7	21.7	15.2
Tenure (months)	143.3	109.6	150.8	107.8	62.5	65.2	67.8	72.6
Age	42.4	9.4	44.7	9.6	37.7	9.8	39.2	10.0
Man	0.22	0.41	0.27	0.44	0.49	0.50	0.52	0.50
White color	0.01	0.12	0.05	0.22	0.74	0.44	0.70	0.46
Schooling								
Under Elementary	0.00	0.07	0.00	0.04	0.00	0.06	0.00	0.04
Elementary	0.25	0.43	0.00	0.04	0.01	0.11	0.01	0.08
High School	0.18	0.39	0.09	0.29	0.17	0.38	0.11	0.32
College	0.56	0.50	0.91	0.29	0.81	0.39	0.88	0.33

The wage decomposition results for teachers in Early Childhood Education are presented in Figure 4. As one can see, the public-private wage gap for all distributional statistics is larger than the one we have been discussing so far for the whole sample. This is interesting by itself because it says that the top wages are in the public sector, something that is not expected due to the rules governing wages in public sector. There is some variation in the wage gap until 2012, but it remained relatively stable since then, being larger at the median in comparison to the tails.

Figure 4 – Wage gap decomposition in Early Childhood Education



In explaining differences in wages, it is shown that the contribution of each effect varies according to the distributional statistic. At the 10th quantile, earnings in the public sector are higher because teachers in this sector possess characteristics that are more associated with higher wages. On the other extreme, at quantile 90, the composition effect still prevails, although the importance of the rate of return have increased considerably. But it is at the median that the wage structure effect matters the most: on average, the characteristics included in the analysis are better paid in the public sector.

Further dividing the wage gap to investigate the contribution of each single covariate⁵, we found that tenure and schooling are the most important variables for the composition effect. For the wage structure effect, age presents the largest contribution, which means that the return to experience plays an important role. The return to schooling is also important, but only for the 10th quantile. It should be highlighted that age and schooling effect contributes to reduce the wage gap favoring the public sector. What drives the positive wage gap are omitted factors captured by the constant term (promotion rules, for instance).

Figure 5 presents the wage gap decomposition for Elementary Education teachers. As shown, the scenario is completely different from the one just analyzed. First of all, the wage gap is increasing in favor of the public sector over time (it is being reduced at the 90th quantile). Also, it is clear that the wage gap comes from the wage structure effect, although the composition effect plays an important role at the top of the distribution.

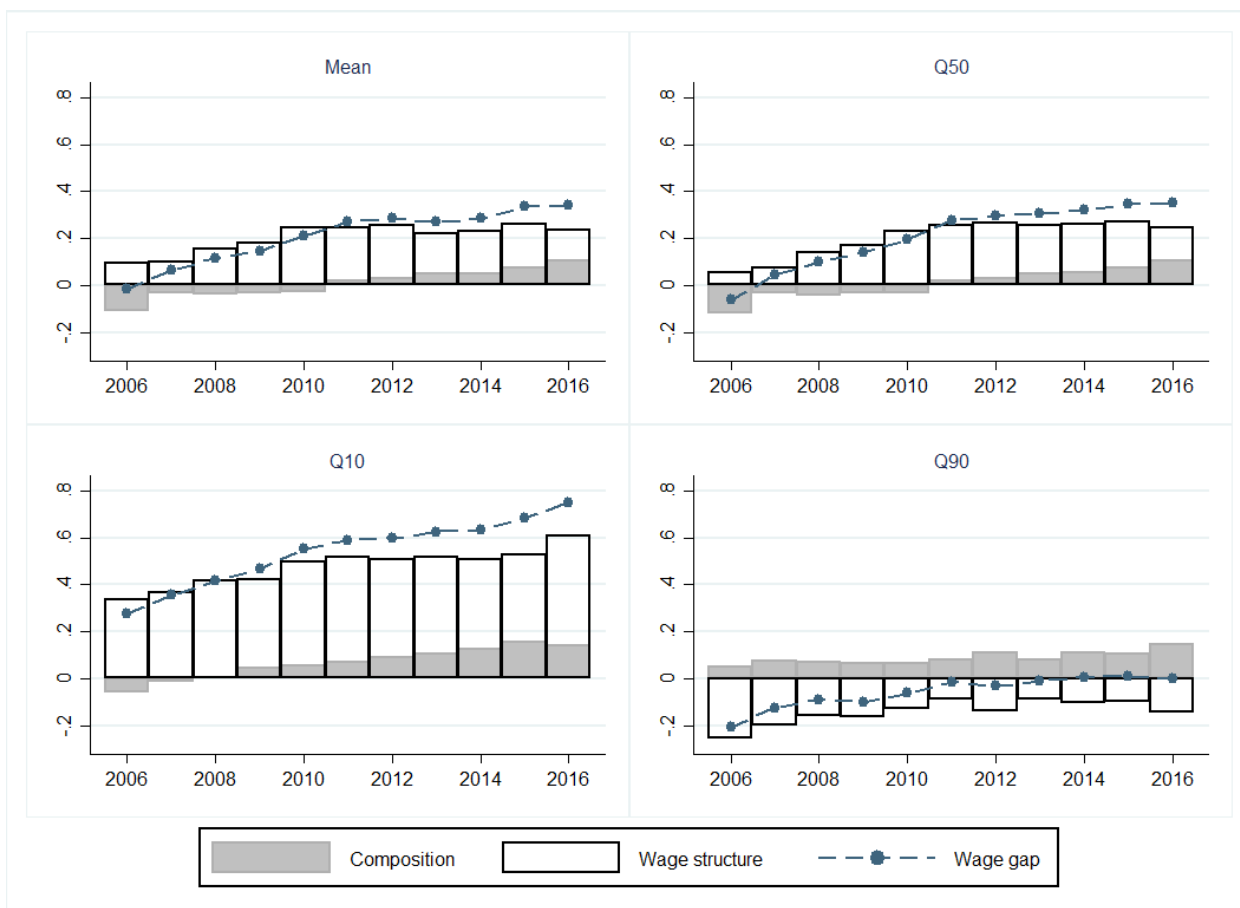
At quantile 90, the observed reduction in wage gap (favoring public sector) is associated with a relative decrease in the wage structure effect. In fact, it should also be noticed that the composition

⁵ Available upon request from the authors.

effect is increasing its share over time, meaning that the public sector is relatively improving teachers' characteristics. In spite of that, generally speaking, the public sector offers a larger rate of return.

As the composition effect is small, in terms of covariates contribution, we analyze the contribution to the wage structure effect. What we found is that the difference favoring the public sector comes from omitted factors. Again, the return to experience (age) is what makes the difference in terms of contribution favoring the private sector.

Figure 5 – Wage gap decomposition in Elementary Education

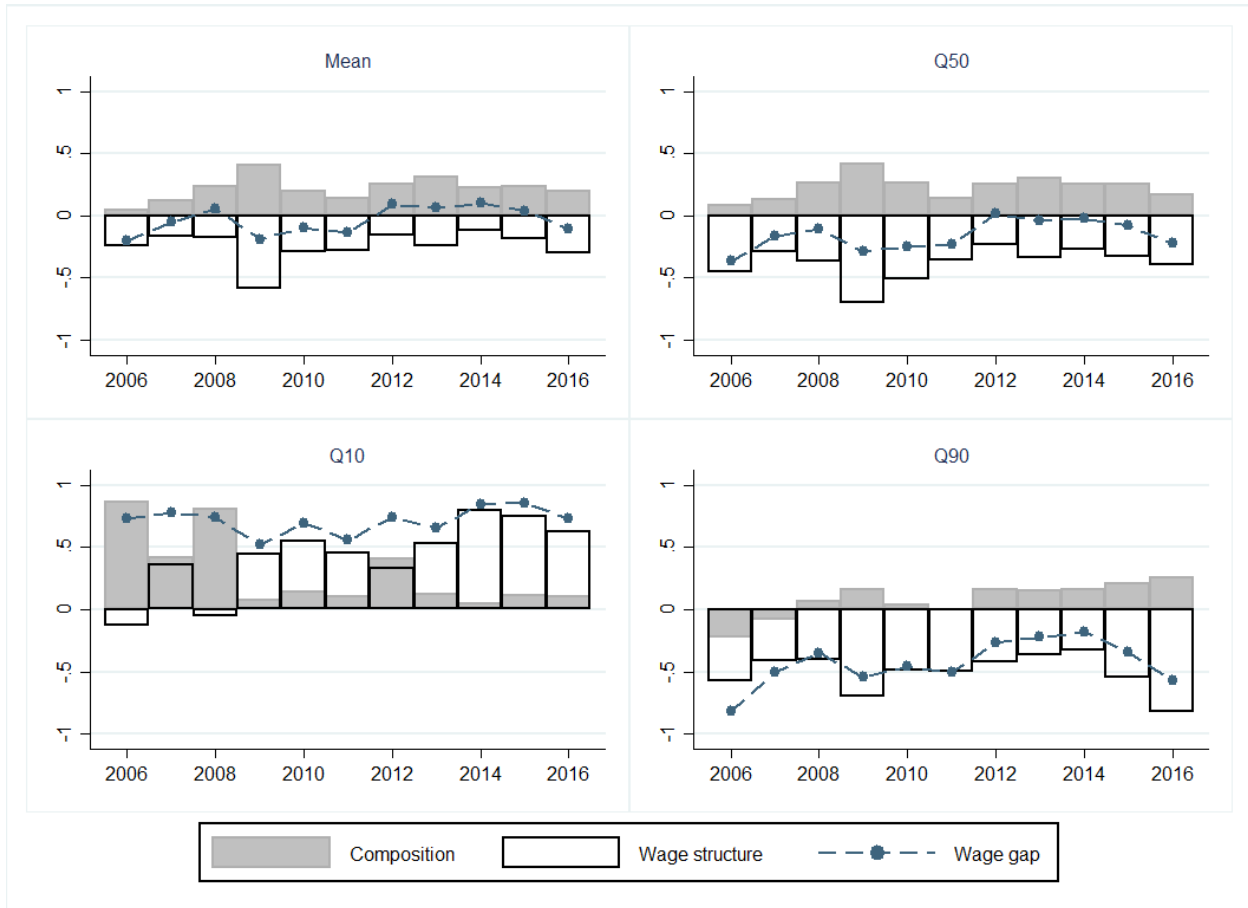


Last, but not least, the wage gap decomposition for High School teachers is reported in Figure 6. While wage gap is positive at the 10th quantile, teachers in private sector present larger wages than teachers in public sector at the other quantiles, while some variation is observed for the average wage.

The decomposition shows that the composition effect almost always favors teachers in the public sector, something that was also observed in early education. However, except for the 10th quantile, the wage structure effect is always negative and is relatively large, resulting in the negative wage gap, especially at the top of the wage distribution.

The contribution of covariates to the composition effect varies in the case of High School. At the 90th quantile, we observe regional effects contributing to increase the wage gap, and schooling favoring the private sector. For the other distributional statistics, the main contribution comes from tenure and sometimes gender. Again, there are omitted factors (constant) present in the wage structure effect favoring the public sector over the whole period, but its share is relatively smaller in comparison to what was observed for the other education levels. Age, schooling and regional effects contribute to the formation of a negative wage gap.

Figure 6 – Wage gap decomposition in High School Education



This section showed that it is important to analyze teachers tutoring distinct grades separately. This provides a better understanding of the whole picture in terms of public-private sector analysis. Early Childhood Education is the level in which teachers' features are more important to the formation of the wage gap. On the other hand, in Elementary Education, the wage gap increases favoring the public sector due to the wage structure effect, while this effect favors the private sector in High School.

8. Final remarks

Our aim was to estimate the wage gap decomposition between teachers from Basic Education in the public and private sectors to explain how much it comes from changes in individual characteristics (composition effect) and how much is based on market returns that cannot be explained by individual characteristics (structure effect). Thus, using a two-stage decomposition we estimated the wage gap at mean and three quantiles of the wage distribution: 10th, 50th and 90th.

The main results showed that the evolution of the public-private wage gap has favored the public sector. While at the mean, median and 10th quantile the wage gap increased, at quantile 90, where the wage gap was negative in 2006, the difference has been reduced over time. The decomposition analysis shows that this is because of the composition effect. Further dividing the composition effect to investigate the contribution of each single covariate, we found that tenure is mainly responsible for the wage gap path observed in the period.

This paper presented evidence that the higher the salary, the larger the importance of the wage structure effect relative to the composition effect for the formation of the wage gap. This is

particularly true at the 90th quantile, where the wage structure effect is negative, favoring the private sector. There is also evidence that the education level plays an important role in the wage structure effect; for this reason, we investigated the public-private wage gap by performing a decomposition analysis across education levels.

We found that there are large differences across education levels. While Early Childhood Education is the level in which teachers' features are more important to the formation of the wage gap, in Elementary Education, the wage gap increase favoring the public sector is due to the wage structure effect. However, in High School, the wage structure effect favors the private sector.

This analysis showed that it is important to analyze teachers tutoring distinct grades separately. This provides a better understanding of the whole picture in terms of public-private sector analysis.

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10. Appendix

Figure 7 – Composition effect by sector, 2006-2016

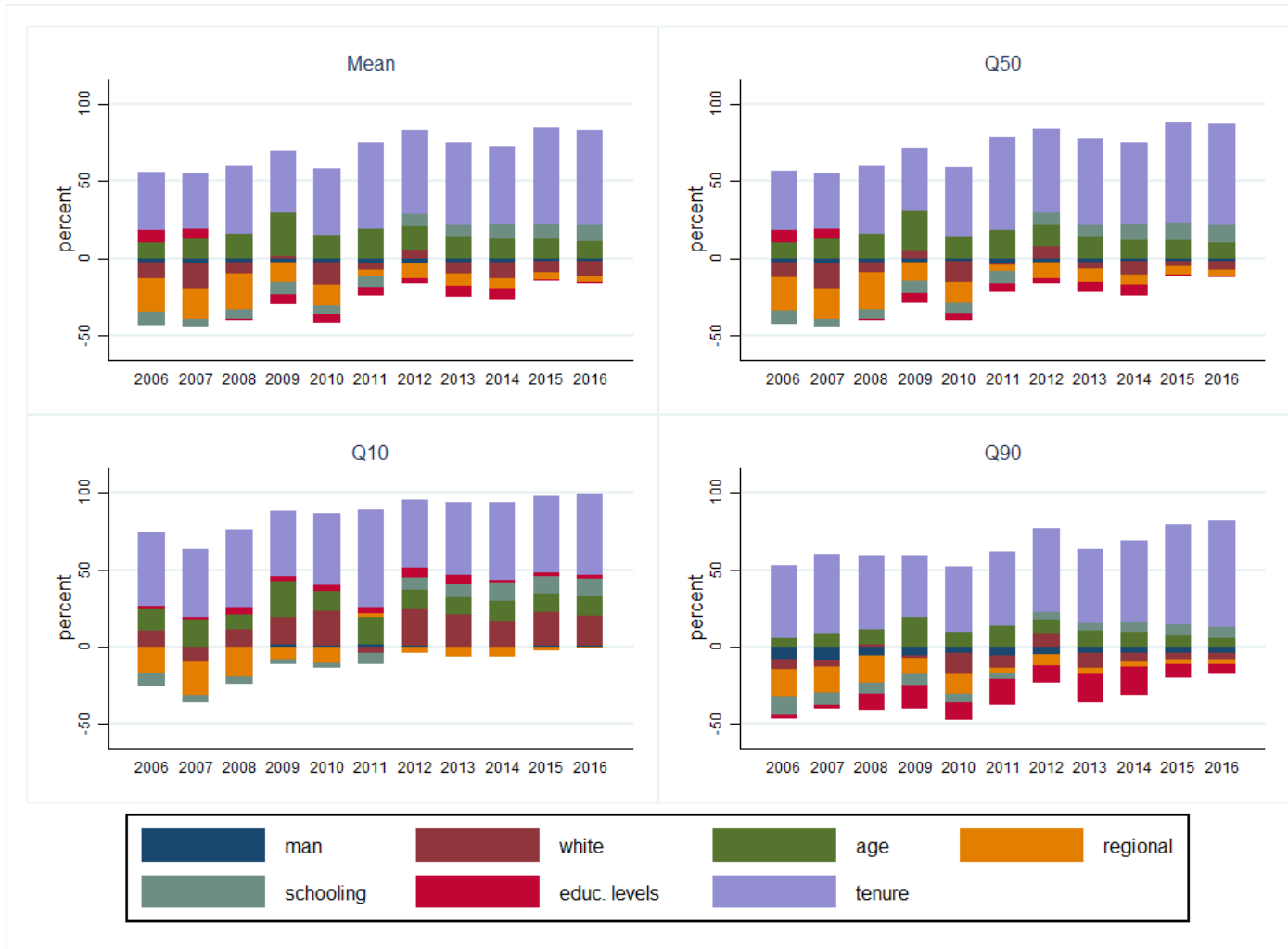


Figure 8 – Wage structure effect by sector, 2006-2016

