Decomposing public-private teachers' wage gap: Evidence from Brazil[*]

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Abstract

A two-stage wage gap decomposition 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 2017. 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 levels of education shows that the composition effect is important in explaining the wage gap in early childhood education while the structure effect is more relevant to the wage gap decomposition in primary and high school education.

1   Introduction

The education sector is labour intensive, being teachers the primary human resources. Table 1 shows more than 2.5 million teachers in 2006 in basic education in Brazil, and this amount increases 33% over a decade, achieving a substantial number of teachers in 2017 (3.4 million). Differently from many occupations, the public sector concentrates most teachers. However, in ten years, private sector participation rose from 16% up to 19%. Many students are enrolled in private institutions (nine million or almost 20% of students in 2018),[1] making the private sector big enough to be relevant to Brazil's teachers' labour market.

In this context, some questions about teachers' wage might emerge. What is the difference between teachers' earnings in the private and public sector? What

[1] According to the Brazilian School Census of Basic Education.

Table 1. Teachers by sector, 2006 and 2017.

Sector	2006	2017
Public	2,126,187 84%	2,727,322 81%
Private	394,141 16%	635,012 19%
Total	2,520,328 100%	3,362,334 100%

Source: RAIS, 2006 and 2017.

are the most important explanations accounting for pay differences between them? Has this wage gap increased or decreased over time? Is there any difference in the wage gap across the levels of education taught: early childhood, primary, or high school? The answers to these questions may have important implications for designing the teacher's career in both sectors and for teachers' labour market. To shed some light on these topics, this paper analyses differences and changes in the distribution of teachers' wages between sectors over time. Using a two-stage procedure—Recentered Influence Function (RIF) proposed by Firpo, Fortin, and Lemieux (2009)—we decompose the public-private teacher wage gap using data from 2006 to 2017. This method, which is a generalisation of the well-known Oaxaca–Blinder method, allows us to decompose the wage gap at different percentiles of the wage distribution, not only at the mean.

The main results show that the wage gap favour the public sector between 2006 and 2017. While at the mean, median, and 10th quantile, the wage gap increases, at quantile 90, where the wage gap is negative in 2006, there is a reduction of the difference 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 covariate, we find that tenure is mainly responsible for the wage gap path observed in the period.

We also find a large difference among levels of education. While early childhood education is the level in which teachers' characteristics are more important to the formation of the wage gap, in primary education, the wage gap increase over time favouring the public sector is due to the wage structure effect. Finally, in high school, the wage structure effect favours the private sector.

The paper speaks to the literature on teachers' labour market, which analyses hiring practices, wage structure, tenure and turnover. There is a consensus that teacher quality plays a key role in student performance (Chetty, Friedman, &

Rockoff, 2014; Hanushek, Piopiunik, & Wiederhold, 2019). Therefore, a relevant issue is how to attract and retain good teachers.

Schools eligible for Title I program[2] or serving minorities tend to present higher turnover rates in the US (Carver-Thomas & Darling-Hammond, 2017). It is consistent with the finding that salary and working conditions are less important than students' characteristics in the urban-suburban teacher transition (Hanushek, Kain, & Rivkin, 2004). In turn, Hanushek, Kain, O'Brien, and Rivkin (2005) show that teachers moving to suburban schools are not better teachers than those who stay in urban areas (they tend to be worse, actually). This finding suggests that teacher's quality is not relevant when hiring because urban schools are the ones who claim that they are adversely affected by the transition of teachers to suburban schools. Evidence shows that performance-based dismissal programmes might induce low-performing teachers to leave (Dee & Wyckoff, 2015; Jacob, 2013). So, teacher compensation may not be the only nor the most important factor that matters for teacher quality. Nevertheless, our results suggest that the Brazilian public sector policy is highly based on compensation since tenure is becoming more important in explaining the public-private wage gap over time. Indeed Camelo and Ponczek (2021) showed that financial incentives reduce turnover in public schools in Brazil.

Teacher compensation in Brazil is considerably distinct between sectors. In the public sector, teachers cannot bargain their salaries during the hiring process. Each education agency (local, state or federal) is in charge of hiring and determining wages through a centralised public tender, such that schools do not choose the staff and cannot set up wages. There is a national minimum wage (*Piso Salarial*) specifically designed for teachers working in the public sector based on a 40-hour workweek contract.[3] Throughout the teacher career, wages vary according to credentials and especially tenure.[4] Labour rules specify that up to one-third of contracted work hours must be allocated to out-of-classroom activities, such as lesson planning, elaboration of homework, and correction of students' exams. Thus, teachers earn even when they are not teaching in the classroom. Although there are no official statistics, it is very unusual to lay off

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[2] A federal program that provides financial assistance to local educational agencies and schools with high numbers or high percentages of children from low-income families to help ensure that all children meet challenging state academic standards.

[3] In the case of a less than a 40-hour workweek contract, the minimum wage is proportional.

[4] In fact, a case study of a teacher's paycheck reported by Fernandes, Fernandes, and Campo (2020) shows that credentials and tenure are the only factors influencing teacher remuneration, performance-based indicators (such as absenteeism and student performance) have no influence at all at any time in the teacher's career.

teachers (or any public servant) in Brazil, even probationary teachers (usually those with less than three years of experience).

On the other hand, labour supply and demand jointly determine wages in the private sector. The labour rules (*Consolidação das Leis Trabalhistas*, CLT) guide all workers with a formal labour contract in the private sector. Hourly wages are set up at the individual level after teacher-school bargaining. They must respect the minimum wage, which is lower than the *Piso Salarial*.[5] Schools do not have to pay teachers for extra-classroom activities, but they are free to negotiate the terms and conditions provided that the agreement follows CLT rules. All these aspects detail the institutional context in which we analyse the wage gap between sectors.

The paper also contributes to the large body of research regarding earning differences between the public and private sector. Previous investigations embrace several countries and periods. In general, the wage gap favours the public sector, especially at the lower end of the wage distribution. There is evidence of this pattern in Zambia (Nielsen & Rosholm, 2001), Pakistan (Hyder & Reilly, 2005), France, Great Britain and Italy (Lucifora & Meurs, 2006), Ireland (Kelly, McGuinness, & O'Connell, 2009), Spain (Rahona-López, Murillo-Huertas, & Salinas-Jiménez, 2016), and Australia (Mahuteau, Mavromaras, Richardson, & Zhu, 2017).

Different patterns, according to gender, exist. In Germany, decomposition results show that wages are higher in the public sector for women but lower for men (Melly, 2005). In Turkey, on the other hand, results are similar by gender: public administration employees earn higher wages than those in the private sector, except at the university level, where the wages are at par for men. Moreover, state-owned enterprise wages are higher than private-sector wages (Tansel, 2005).

In addition, Lucifora and Meurs (2006), by comparing wage gaps across countries, find that where pay formation is more regulated (as in France and Italy), the pay gap is smaller, whilst where market factors play a larger role in pay determination (as in Great Britain), the pay gap is larger.

In Brazil, the literature refers to general comparisons between public and private sector earnings showing that workers in the public sector earn higher salaries (Macedo, 1985; Tannen, 1991; Foguel, Gill, Mendonça, & Barros, 2000; Marconi, 2003; Belluzzo, Anuatti-Neto, & Pazello, 2005; Bender & Fernandes, 2006; Tenoury & Menezes-Filho, 2017). Despite that, there are two papers more

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[5] The minimum wage is defined every year by the Federal Government and valid for all workers.

closely related to ours. Machado and da Silva Scorzafave (2016) analyse the wage gap between teachers and non-teachers in careers typically related to the teaching profession using data from 2010. Results suggest the existence of a wage differential favouring teachers, both on average and at quantiles 10 and 50. 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 determining wages. In turn, Braga (2007) analyses the determinants of the public-private wage gap for the different levels of schooling completed by Brazilian employees. In a heterogeneity analysis regarding the occupational choice, the author finds that workers with careers in education earn more in the private sector.

Although public-private wage differentials have been analysed extensively, there is a surprising yet considerable lack of evidence specifically related to the teachers' wage gap between the public and private sectors. Therefore, this paper intends to fill, contributing to the literature.

The most common method used when decomposing wage gaps is the standard Oaxaca–Blinder decomposition. However, to study the public-private teacher wage gap, we take one step further and, beyond explaining differences in means, we analyse the wage gap using other distributional statistics. Firpo et al. (2009) proposed the method to decompose wage differentials at any quantile of the wage distribution.

Also, our research innovates by analysing over time with census data. Finally, we also investigate whether the wage gap behaves differently by the level of education teachers are employed (across the levels of education taught) over time. As the state and local governments share the provision of levels of education with the federal government, there are potential differences that may arise due to different contexts.

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 analyses 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 levels of education. Finally, section 8 presents some discussion about the reasons for the wage gap constitution and section 9, our main conclusions.

2   Data source, sample restrictions, and definitions

This paper uses census data assembled by the Ministry of Labour as a data source. RAIS (*Relação Anual de Informações Sociais*) is an annual dataset containing individual information about all workers in the formal sector. The employer provides information on the worker's age, gender, race, schooling, tenure at the firm, monthly wage, and number of (weekly) hours in the contract. There are two wage variables: the average wage received during the year and the wage received in December. RAIS also includes information about the job executed by workers comparable to ISCO−88 (four-digit level), which is used to identify teachers in the sample.[6] On the firm side, RAIS provides information on plant size, sector of activity (comparable to ISIC/CIIU,[7] 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 employed in the 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 used to identify teachers is also used to identify the grade each one teaches: early childhood education (which includes preschool and kindergarten), primary education (1st grade to 9th grade), high school education (10th grade to 12th grade), or others (which includes vocational education, and special education for disabled children in need of special attention).

To identify whether a teacher works in the public or the private sector, we use the school's legal status. RAIS provides this information through a classification from the Brazilian Census Bureau (*Instituto Brasileiro de Geografia e Estatística*, IBGE) that organises entities according to their legal status. We define the public sector as composed of Public Administration and Public and Semi-public Companies from Business Entities. On the other hand, Business Entities and some Non-Profit Organisations[8] defined the private sector. Other categorical groups—Individuals, International Organizations, and Other Extraterritorial Institutions—are dropped from the sample. Moreover, to ensure we are selecting the correct entities, we restrict the sample further using sector of activity:

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[6] Even if teachers are subcontractors, they will appear in the database because we identify teachers based on their occupation code.

[7] CNAE (National Classification of Economic Activities).

[8] Specifically, we use these codes from Non-Profit Organisations: 3069 Private Foundation, 3077 Independent Social Service, 3220 Religious Organisation, and 3999 Private Association.

only individuals working in education and other activities related to Public Administration, as defined in the INEP report, are kept in the final database.

The Brazilian legislation[9] sets the responsibility for the public provision of education according to the level of education. Local governments are the main entities responsible for providing primary and early childhood education, while state governments are mainly responsible for high school education. It does not mean that no state schools provide primary education, for instance. It means that local governments should focus on primary and early childhood while state governments should focus on high school. Thus, we analyse the wage gap between teachers from local public schools and private schools for early childhood and primary education. For high school, we analyse the wage gap between state public schools and private schools.[10]

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[11] and a minimum age for employment admission. Our research covers the Brazilian job market from 2006 to 2017. The 2006 wave is the first one that contains all the variables that allow us to have the same set of control variables until 2017.[12] 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 left their jobs at some point for any reason (separation, retirement, death, among others). Non-employed workers on December 31st represent around 15% of the sample waves (Appendix A, Table A2, columns 5 and 6).[13] To measure wages at the same time reference and avoid wage variation—once workers present different periods of employment over the year—we use the wage earned in December instead of the average annual wage to calculate the individual hourly wage.[14] Appendix A, Table A3, shows that teachers employed on December 31st have larger mean wages over the period than teachers who

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[9] Federal Constitution and the Law nº 9394/1996.

[10] Appendix A, Table A1, presents the distribution of teachers across levels of education by sector in 2017. These restrictions cause a reduction of 26% in the sample of primary teachers and 19% of high school teachers, as shown in Appendix A, Table A2. We also decomposed the wage gap between sectors without these sample restrictions, and results—available from the authors upon request—are similar.

[11] The maximum age for compulsory retirement has changed to 75 years old since 2015; however, we will drop out those older than 70 to keep the equivalence over the period.

[12] The most recent wave available when this paper was written.

[13] Considering the sample after the restriction by levels of education.

[14] According to the General Register of Employed 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.

were not employed on that date (except for the first two years, 2006 and 2007). More importantly, since we conduct wage decompositions at different quantiles of the wage distribution, wages of non-employed on December 31$^{\text{st}}$ are noisier than wages of employed, which already present a considerable variation. Thus, excluding non-employed on December 31$^{\text{st}}$ should lead to more conservative results.[15] Finally, we use observations with complete information regarding covariates. As seen in Appendix A, Table A3, the mean wage for observations with any missing information varies considerably over time, suggesting that those observations would introduce more noise in the results if included in the analysis. Also, missing information causes a small reduction in the sample, on average (2% according to Appendix A, Table A2), so a possible bias coming from this sample selection should not be a first-order issue. The next two sections present descriptive statistics.

3   Teachers' characteristics

This section presents teachers' characteristics using 2006 and 2017 waves (the starting and final time points of our sample). Table 2 presents some descriptive statistics of teachers' characteristics by sector. As one can see, both average wage and number of hours in the contract are larger in the public sector, but, on the other hand, both present lower dispersion in the public sector as measured by the coefficient of variation (not shown). 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 primary school students. A decade later, the characteristics are almost the same, except that the percentage of teachers with a college degree increased 26 percentage points. It should be noted that since 1996, all teachers in Brazil must have a college degree to be eligible for admission as a teacher, but the ones who were hired before 1996 are allowed to work regularly.

In the private sector, teachers are younger, and there is a larger percentage of men (around one quarter) than in the public sector. The schooling distribution is similar, but the grades they teach are slightly different, with a higher percentage of teaching in early education. The most significant difference between teachers in public and private sector is race: 58% in the private sector are white in 2017, against 5% in the public sector.

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[15] A large percentage of temporary workers are employed on December 31$^{\text{st}}$, as seen in Appendix A, Table A4. Thus, we know their wages on December 31$^{\text{st}}$, which means they are included in the analysis. Although the share of temporary workers in the sample tends to increase over time, they represent less than 4% of the sample in 2017.

Table 2. Descriptive statistics by sector, 2006 and 2017.

	Public				Private			
	2006		2017		2006		2017	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Wage (BRL)	2,594	2,218	3,622	2,275	1,835	1,939	2,273	2,103
Number of work hours	32.0	9.5	30.6	9.4	27.5	14.4	28.3	14.1
Tenure (in months)	130.0	103.1	140.9	104.0	57.8	62.6	61.4	65.9
Age	40.6	9.7	43.4	9.2	35.5	9.4	37.5	9.8
Man	0.17	0.38	0.16	0.37	0.26	0.44	0.24	0.43
White	0.04	0.20	0.05	0.22	0.72	0.45	0.58	0.49
Schooling								
Under Primary	0.02	0.13	0.00	0.05	0.01	0.09	0.00	0.05
Primary	0.06	0.25	0.01	0.11	0.03	0.17	0.02	0.12
High School	0.37	0.48	0.17	0.38	0.34	0.47	0.24	0.42
College	0.55	0.50	0.81	0.39	0.62	0.48	0.75	0.44
Level of Education								
Early Childhood	0.06	0.25	0.20	0.40	0.21	0.40	0.30	0.46
Primary	0.71	0.45	0.61	0.49	0.53	0.50	0.48	0.50
High School	0.17	0.38	0.15	0.36	0.18	0.38	0.14	0.35
Other	0.06	0.23	0.04	0.20	0.09	0.28	0.08	0.27
Observations	1,207,875		1,471,805		293,602		481,335	

Source: RAIS, 2006 and 2017.

As expected, tenure at firm is longer in the public sector. In 2006 teachers were employed in the same firm for 130 months, while the average in the private sector was only 57.8. A decade later, the average tenure in the public sector increases up to 140.9 months, remaining stable in the private sector (61.4).

Given all those changes throughout the years, it would be surprising to find no change in the wage distribution. Moreover, as the changes were heterogeneous across sectors, it is expected the wage distribution to have changed accordingly. The next section provides the first set of evidence in this direction.

4   Wage distribution

As we perform a wage decomposition analysis using data from 2006 to 2017, 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 working hours, so from now on, when we talk about wages, we are referring to the (log of) hourly wage.

Figure 1 plots mean and median wages for the whole period by sector (in 2017 Brazilian currency). First of all, mean and median wages are higher in the public sector, even after considering the number of hours in the contract. Second,
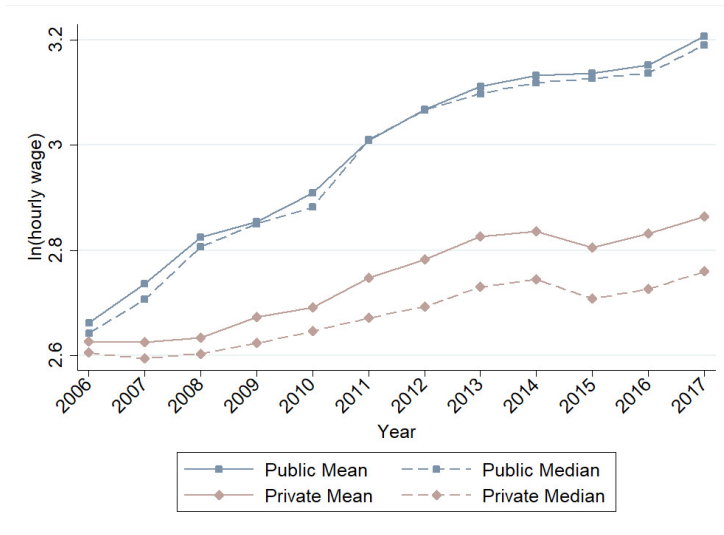
Figure 1. Log hourly wage mean and median, by sector.

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 interesting for analysing the wage gap increase. Teachers' mean wage in the public sector increased by 20.5% (in terms of log points), while the private sector wage increased by 9.1% 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 2 presents the box-plot teachers' wage distribution by sector and year. The figure confirms that wage distribution in the public sector is symmetric around the 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, wage dispersion is higher in the private sector. Although we observe that the private sector's wage variability is growing smaller since 2006, the interquartile interval is still lower in the public sector at the end of the period. Despite this, we observe a slight decrease in dispersion throughout the period for both sectors.
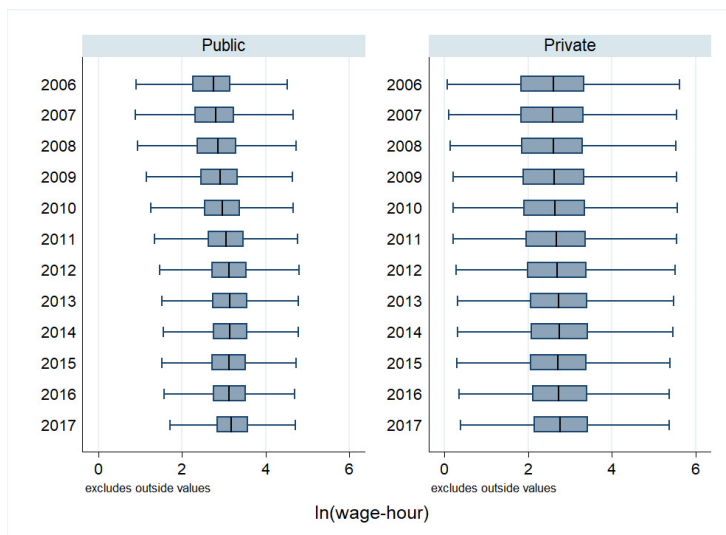
Figure 2. Log hourly wage frequency distribution by sector, 2006–2017.

This section and the previous one showed essential differences in teachers' characteristics between the public and private sectors. These differences are 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 that, in general, do not take into account teacher performance. In the next section, we present the methodology we use to analyse the wage gap between sectors over the last twelve years.

5   Methodology

To understand which factors are driving the changes in the teachers' wage gap in recent years, we implement a decomposition analysis based on Oaxaca (1973), Blinder (1973), and Firpo et al. (2009). The method is used to estimate 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 by allowing evaluating the wage gap at different points of the wage distribution. These additional decompositions will bring new evidence on the teachers' wage gap patterns, allowing us to analyse whether and how teachers' characteristics interact with the wage gap according

to different points of the wage distribution and whether and how the relationship has changed over time.

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

$$\Delta^\tau = \Delta_S + \Delta_X, \tag{1}$$

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 estimates the weighting function used to reweight the mean wage (or median or other quantiles) of each group, a step necessary to identify the parameters of interest (the two parts of the wage gap in equation (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 function 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 follows:

$$w_{is}^{\text{RIF}} = \alpha_s + X_{is}\beta_s + \varepsilon_{is}, \tag{2}$$

where w_{is}^{RIF} is the transformed hourly wage of teacher i working in sector s (value 0 for the public sector and 1 for the private sector); X_{is} is a vector of teacher's characteristics, which includes schooling (four categories—under primary education omitted), age (as proxy for work experience, with a quadratic relationship 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 ($\mathbb{E}(\varepsilon_s \mid X_s) = 0$).

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. Our main exercise is to decompose the wage statistic by analysing the differences between the public and private sectors. Next, we further investigate the differences between sectors by decomposing the wage statistic separately for each educational level. Furthermore, besides to present the decomposition results explaining differences in the mean, we perform the decomposition analysis at three quantiles: 10th, 50th, and 90th.

6   Decomposition by sector

This section presents the results of the teachers' wage gap decomposition. As highlighted before, the analysis covers the period between 2006 and 2017, and it is performed to explain differences in mean as well as at three different 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 observed for teachers in the public sector?

Figure 3 summarises the main results.   Each panel reports the wage gap for each distributional statistic (connected line) as well as the contributions of the composition (grey 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.

Overall, the decomposition results show that both composition and wage structure effects favour teachers in the public sector for the entire period. It means that public sector teachers have more characteristics associated with higher wages, and these characteristics are better paid than in the private sector. The exception is the decomposition of the 90th quantile, which will be analysed further on.

The decomposition of the mean shows that the composition effect's contribution increases over the years, 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. A similar pattern is observed for the decomposition of the median. The absolute contribution of the wage structure effect remained
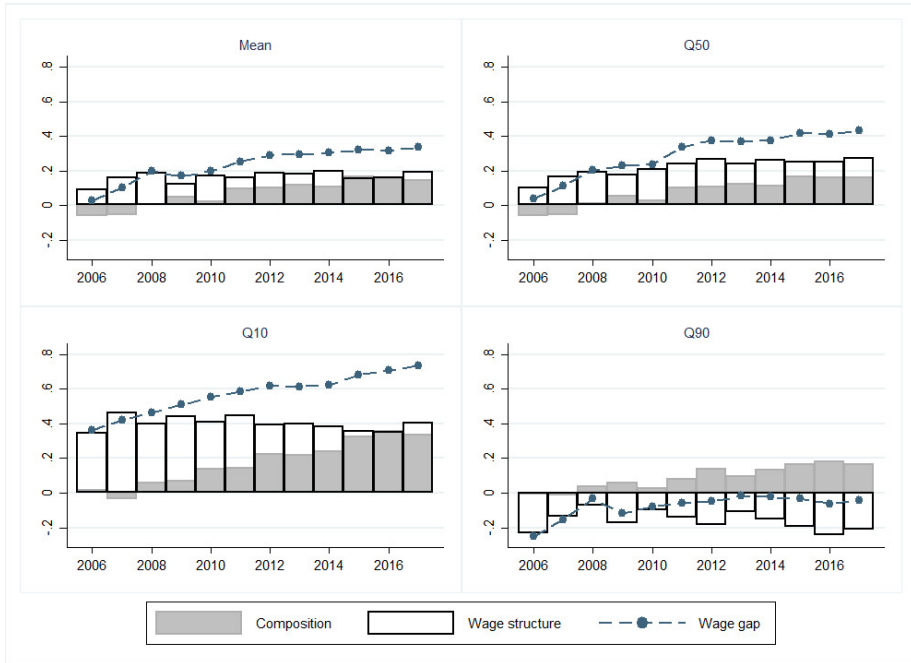
Figure 3. Wage gap decomposition.

relatively stable since 2011, while the composition effect's relative contribution increased over time.

The wage gap at the 10th quantile also favours teachers in the public sector, but it is larger than the mean and median. Also, the same increase in the wage gap observed for the previous distributional statistics for the 2006–2012 period occurs for teachers at this quantile—the difference is that the wage gap in the starting year was already high. A relative increase in the composition effect in explaining the wage gap is also observed. At 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. In the last few years, the composition effect became more important, explaining almost 50% of the wage gap in 2017.

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 teachers in the private sector earn higher wages than teachers in the public sector. This would be 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 the wage gap formation also differs at the top of the distribution compared to other distributional statistics. While wage structure contributes to increasing the wage gap favouring the private sector, if only the composition effect was taken into account, the wage gap would favour the public sector. This is valid for the whole period, and, again, the composition effect became more important over time.

To understand the changes better, one can look at each covariate's contribution to the composition and wage structure effects. Tables B1 to B4 in Appendix B show these contributions for each distributional statistic. Concerning the composition effect, we see that tenure is the variable that contributes the most to the positive difference favouring the public sector, which is probably related to the job stability the public sector offers to its employees. Regional differences came second until recently, but their importance was reduced. Age comes third, followed by schooling, which also had its importance reduced over time. 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 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. Moreover, at quantile 90, while schooling does not play an essential role over the period, the regional effect plays a relatively large role compared to the other quantiles. Tenure does not contribute to the wage structure effect at all. Finally, the return to levels of education, which was not that important for the composition effect (except for the 90th quantile), has a significant 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 level of education in which they teach.

This section presented evidence that the higher the salary, the greater the wage structure effect relative to the composition effect in forming the wage gap. It is particularly true at the 90th quantile, where the wage structure effect is negative, favouring the private sector. There is also evidence that the level of education 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 by levels of education.

7 Decomposition by levels of education

This section presents the decomposition analysis of the teachers' wage gap according to the level of education in which they teach: early childhood, primary, or high school. As shown in Table 2, the distribution of teachers across these levels is somewhat different by sector and has changed over time. The reason for restricting the sample and performing independent decompositions is to analyse the composition and structure effects controlling for those differences.

Table 3 shows observable characteristics separately for each level of education by sector in 2006 and 2017. As the overall statistics presented in Section 3, the public sector pays higher wages, has older teachers with a longer tenure at the firm, and a smaller percentage of whites in all levels of education compared to the private sector. However, there are substantial differences between sectors at the cross-sections, and over time, that may lead to different results in the decomposition analysis. Schooling is a good example. In 2006 teachers teaching preschool children had more schooling than the primary school teachers in the public sector: the percentage of teachers with a college degree was 51% among preschool teachers and only 42% among primary ones. Also, the difference in the percentage of teachers with a college degree between the public and private sector was 24 percentage points among high school teachers (favouring the private sector) and only 2 percentage points in early education (favouring the public sector). Finally, over time, the difference in college degree by level of education evolved differently: while in early education, the gap goes from 2 to 12 percentage points favouring the public sector, in primary school, the gap goes from 20 percentage points favouring the private sector to zero in 2017. Relevant differences are not limited to schooling. For instance, the number of hours in the contract is similar between sectors in early childhood in both periods. However, it is higher in primary and high school education in the public sector.

The wage decomposition results for teachers in early childhood education are presented in Figure 4. The first thing to notice is that the public-private wage gap for all distributional statistics is larger than the one discussed so far for the whole sample (dashed line), even in the 90th percentile. This is interesting because it shows that the top wages are in the public sector, which is unexpected due to the rules governing wages in the public sector. There is some variation in the wage gap until 2012, but it remained relatively stable since then, being larger at the median than the tails.

In explaining the differences in wages, the structure and composition effects' contribution varies according to the distributional statistic. At the 10th quantile,

Table 3. Descriptive statistics by sector, 2006 and 2017.

	Public				Private			
	2006		2017		2006		2017	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Early childhood education								
Wage	2,541	2,192	3,667	2,439	1,411	1,16	1,823	1,238
Number of hours	32.8	9.4	33.2	8.0	32.8	11.8	34.5	11.1
Tenure (months)	106.8	84.5	113.6	95.2	48.9	54.5	48.0	53.7
Age	38.3	9.3	41.9	9.6	32.5	8.7	35.0	9.5
Man	0.06	0.24	0.09	0.28	0.06	0.23	0.05	0.23
White	0.12	0.32	0.06	0.23	0.71	0.46	0.55	0.50
Schooling								
Under Primary	0.03	0.18	0.01	0.08	0.02	0.14	0.01	0.08
Primary	0.07	0.25	0.02	0.14	0.06	0.24	0.03	0.17
High School	0.39	0.49	0.26	0.44	0.43	0.50	0.38	0.48
College	0.51	0.50	0.71	0.45	0.49	0.50	0.59	0.49
Observations	113,741		297,502		60,193		143,383	
Primary education								
Wage	2,121	1,723	3,393	1,924	1,788	1,753	2,29	2,185
Number of hours	30.5	9.9	29.8	9.7	27.0	14.0	26.8	13.7
Tenure (months)	118.1	92.4	149.2	104.8	60.7	63.9	67.6	70.0
Age	38.7	9.1	43.5	8.9	35.8	9.2	38.3	9.5
Man	0.12	0.33	0.15	0.35	0.21	0.41	0.22	0.42
White	0.05	0.22	0.05	0.21	0.70	0.46	0.57	0.49
Schooling								
Under Primary	0.02	0.14	0.00	0.05	0.01	0.07	0.00	0.03
Primary	0.04	0.19	0.01	0.11	0.02	0.14	0.01	0.09
High School	0.52	0.50	0.18	0.38	0.36	0.48	0.18	0.38
College	0.42	0.49	0.81	0.39	0.62	0.49	0.81	0.39
Observations	1,251,805		895,654		155,639		232,085	
High school education								
Wage	2,391	1,352	4,124	2,27	2,133	2,705	2,597	2,741
Number of hours	30.4	9.6	30.1	9.2	22.2	15.6	20.8	14.8
Tenure (months)	145.6	108.5	150.4	106.7	62.3	64.7	70.6	73.1
Age	42.6	9.2	44.8	9.5	37.7	9.6	39.6	10.0
Man	0.21	0.41	0.28	0.45	0.49	0.50	0.52	0.50
White	0.01	0.12	0.05	0.22	0.74	0.44	0.63	0.48
Schooling								
Under Primary	0.00	0.06	0.00	0.04	0.00	0.06	0.00	0.03
Primary	0.24	0.43	0.00	0.03	0.01	0.11	0.01	0.08
High School	0.18	0.39	0.07	0.25	0.17	0.38	0.11	0.31
College	0.57	0.49	0.93	0.25	0.81	0.39	0.89	0.32
Observations	299,801		218,209		51,641		67,071	

Source: RAIS, 2006 and 2017.
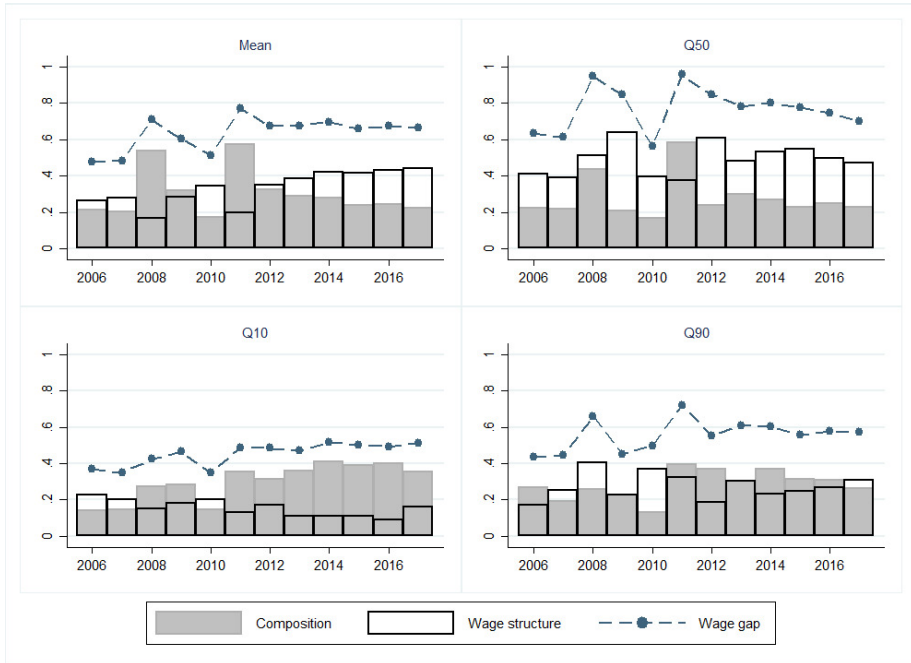
Figure 4. Wage gap decomposition in early childhood education.

earnings in the public sector are higher because teachers in this sector possess characteristics more closely associated with higher wages. At the other extreme, at quantile 90, the composition effect still prevails most of the time. Nevertheless, it is at the median that the wage structure effect matters the most where, on average, the characteristics included in the analysis have a greater return in the public sector.

By further dividing the wage gap to investigate the contribution of every single covariate, we found that tenure and schooling are the most important variables for the composition effect (tables B5 to B8 in Appendix B). For the wage structure effect, age presents the most considerable 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. Both age and schooling effect contribute to reducing the wage gap favouring the public sector. What drives the positive wage gap are omitted factors captured by the constant term (promotion rules and intrinsic motivation, for instance).

Figure 5 presents the wage gap decomposition for primary education teachers. As shown, the scenario is entirely different from the one just analysed. First of all, the wage gap is increasing, favouring the public sector over time, although
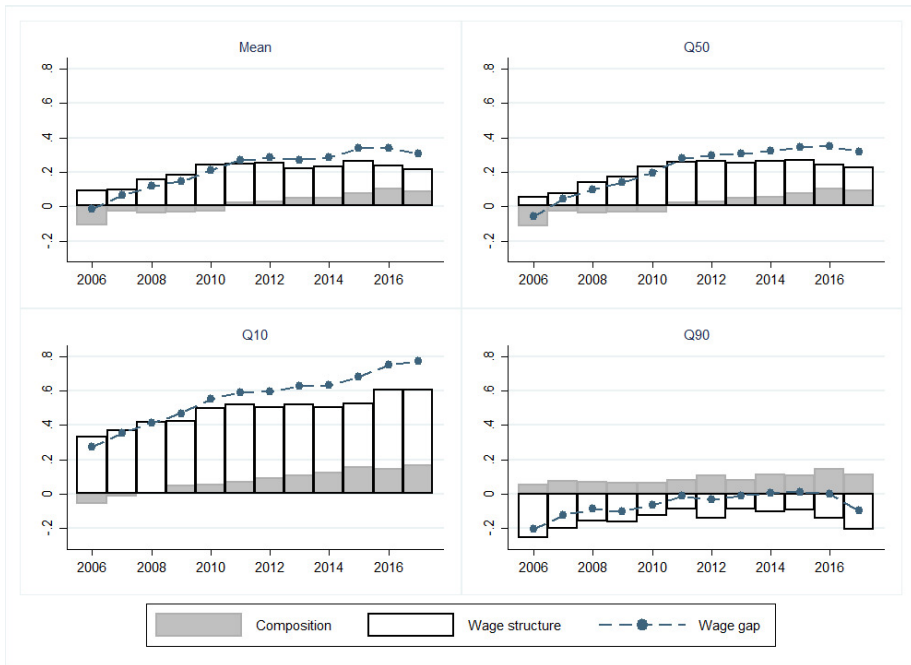
Figure 5. Wage gap decomposition in primary education.

there is an inflexion point in 2016. Secondly, the wage gap arises from the wage structure effect. Thirdly, at quantile 90, the wage gap favours the private sector in most years. In fact, besides this result, the scenario for the 90th quantile is somewhat different compared to the others: the wage gap is lower, and the relative importance of the composition effect is much higher. It suggests that teachers' characteristics in the public sector are improving in such a way that they are compensating for the lower rate of return.

Because the composition effect is generally small in terms of covariates contribution, we analyse the contribution of the wage structure effect only. What we found is that there is a significant part of the difference favouring the public sector that is due to omitted factors (tables B9 to B12 in Appendix B). Again, the return to experience (age) makes the difference in contribution favouring the private sector.

Last but not least, the wage gap decomposition for high school teachers is reported in Figure 6. The mean wage gap varies throughout the years and distributional statistic. While the wage gap is positive at the 10th quantile, teachers in the private sector present larger wages than teachers in the public sector at the other quantiles 50 and 90, and some variation is observed for the
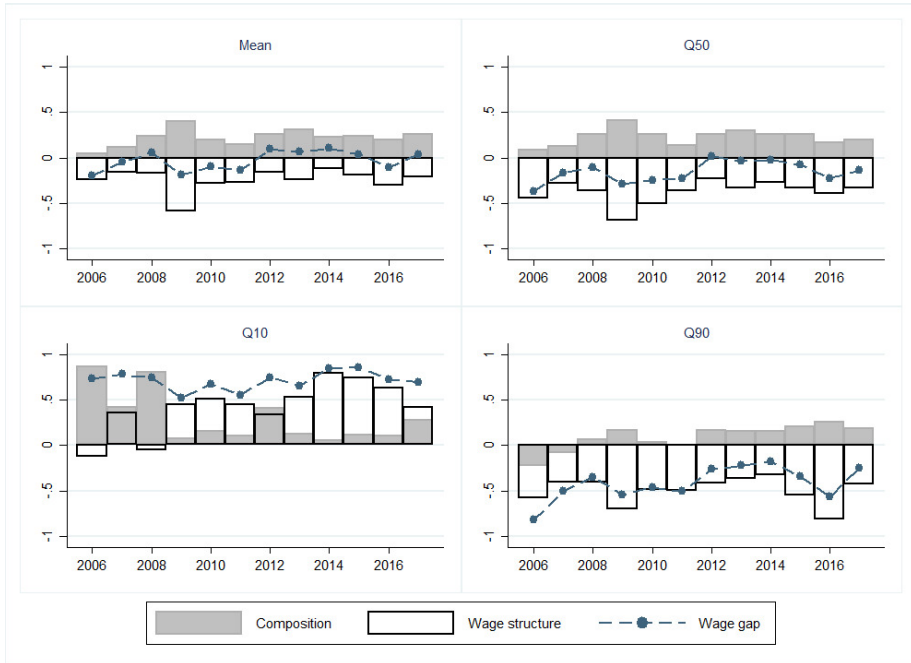
Figure 6. Wage gap decomposition in high school education.

mean wage.

The decomposition shows that the composition effect almost always favours teachers in the public sector, which 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 this case. At the 90th quantile, we observe regional effects contributing to increasing the wage gap and schooling favouring the private sector until 2011 (tables B13 to B16 in Appendix B). For the other distributional statistics, the main contribution comes from tenure in most years, but race also plays an important role. Again, the wage structure effect is composed of omitted factors (constant) favouring the public sector over the whole period. Still, its share is a little bit smaller than what was observed for the other levels of education. Age, schooling, and regional effects contribute to the formation of a negative wage gap.

This section showed that it is important to analyse teachers tutoring distinct grades separately. It provides a better understanding of the whole picture in terms of the public-private sector analysis. Early childhood education is where

teachers' characteristics are more important in forming the wage gap. On the other hand, in primary education, the wage gap favours the public sector due to the wage structure effect, while this effect favours the private sector in high school.

8   Discussion

This section provides an overview of the main results and discusses factors that may have contributed to the evolution of wages and the wage gap over time not highlighted before.

Firstly, it is important to notice that in Brazil, teachers from the public sector work fewer hours in the classroom than established in a contract since, by law, they cannot spend more than two-thirds of the contractual hours engaged in direct activities with students. The idea is that teachers need to spend some time to prepare the work plan and elaborate tests, among other extra-classroom activities. Therefore, the hourly wage of teachers working in the public sector is underestimated if we consider hours effectively worked in the classroom. On the other hand, private sector teachers work the exact number of hours established in a contract in the classroom. Thus, the analyse throughout the paper might be underestimated the wage gap.

Secondly, in 2009, a national minimum wage (*Piso Salarial*) was established by law: no teacher in the public sector can earn less than a specific amount, which is higher than the minimum wage (the reference value for a teacher in the private sector). It would explain the 2008–2009 change observed in the lower tails of the wage distribution in Figure 2 and why the structural effect is relatively more important at the bottom of the wage distribution since there is less room for endowments to play a role in the public sector.

On the other hand, the public sector rules prevent wage bargaining at the individual level, meaning there is a wage ceiling in practice. In the private sector, wages vary according to supply and demand, allowing higher dispersion and unlimited wages. That is probably why the structural effect contribution is larger than the composition effect at quantile 90.

Thirdly, another factor that can contribute to the wage gap is the high level of job security in the public sector, which leads to wage raises based on tenure. As discussed before, tenure is the main feature that contributes to the composition effect.

This section discussed possible mechanisms that may help explain the wage gap decomposition results. The conclusions are only suggestive and were not

based on sharp evidence on mechanisms. More research on the subject is needed.

9   Final remarks

This paper analysed the wage gap between teachers in public and private sectors in the 2006–2017 period. To explain how much of the wage gap is due to changes in individual characteristics (composition effect) and how much comes from market returns that cannot be explained by individual characteristics (structure effect), we implemented a decomposition methodology. Using a two-stage decomposition, we analysed the wage gap at mean and three quantiles of the wage distribution: 10th, 50th, and 90th.

Results show that the wage gap has favoured the public sector over the whole period. While at the mean, median, and 10th quantile, the wage gap increased; at quantile 90, where the wage gap was negative (favouring the private sector), the difference has been reduced over time. The decomposition analysis showed that this is because of the composition effect. Further dividing the composition effect to investigate the contribution of every single covariate, we found that tenure is mainly responsible for the wage gap path observed in the period. This finding raises concerns on the sustainability of the public budget because the wage compensation structure generates mandatory wage increases disregarding labour productivity.

Also, the lack of incentives to perform better could lead to an adverse selection problem in which the public administration cannot attract high-quality teachers. This paper presented evidence that the higher the salary, the larger the structure effect relative to the composition effect for forming the wage gap. It is particularly true at the 90th quantile, where the wage structure effect is negative, favouring the private sector.

We also found that there are large differences in the levels of education in which teachers teach. While early childhood education is the level in which teachers' observable characteristics are more important to the formation of the wage gap, in primary education, the wage gap increase favouring the public sector is due to the wage structure effect. Also, in high school, the wage structure effect favours the private sector.

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

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Appendix A

Table A1. Teachers' distribution by levels of education (%), 2017.

Educational system	Level of education			Total
	Early childhood	Primary	High school	
Federal	0.05	0.29	8.63	1.76
State	0.09	26.53	54.5	26.01
Local	66.57	56.3	19.45	51.16
Private	32.08	14.59	16.75	18.97
Public*	1.22	2.29	0.67	2.11
Total	100	100	100	100

Source: RAIS, 2017.

* Public includes teachers employed at Public Fund, Public Association, Public Company, and Semipublic Company. Teachers in this educational system are removed from the final sample. Percentages are calculated after removing missing control variables and null wage.

Table A2. Number of observations by sample restriction, 2006–2017.

Sample wave	Full sample	Restricting levels of education	% sample lost	Restricting employed on Dec 31st	% sample lost	Other restrictions	% sample lost	% full sample used
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2006	2,525,535	709,229	28%	264,630	10%	50,199	2%	59%
2007	2,496,466	690,689	28%	269,685	11%	57,550	2%	59%
2008	2,681,024	689,888	26%	366,909	14%	60,236	2%	58%
2009	2,842,492	740,219	26%	397,822	14%	57,639	2%	58%
2010	2,966,733	861,881	29%	396,806	13%	64,145	2%	55%
2011	3,221,055	787,536	24%	488,491	15%	66,130	2%	58%
2012	3,242,015	882,363	27%	508,672	16%	73,495	2%	55%
2013	3,308,330	886,954	27%	540,645	16%	68,979	2%	55%
2014	3,403,444	904,043	27%	567,590	17%	64,339	2%	55%
2015	3,329,319	750,037	23%	553,431	17%	65,712	2%	59%
2016	3,307,727	780,825	24%	529,403	16%	70,364	2%	58%
2017	3,385,058	791,515	23%	562,887	17%	77,516	2%	58%

Source: RAIS, 2006–2017.

Note: Teachers full sample includes all teachers in basic education following INEP report.

Table A3. Mean hourly wage by sample wave, 2006–2017.

Sample wave	Employment status on Dec. 31st*		Missing information on covariates**	
	Non-employed	Employed	No missing	Any missing
2006	21.32	18.76	20.43	27.61
	(112.38)	(26.51)	(32.29)	(49.62)
2007	20.62	20.14	21.63	19.33
	(57.01)	(30.09)	(39.72)	(32.87)
2008	19.34	21.10	23.27	23.53
	(65.32)	(33.31)	(42.45)	(49.95)
2009	18.96	21.79	23.31	25.34
	(55.11)	(34.61)	(45.61)	(46.20)
2010	20.13	22.66	24.39	20.24
	(66.72)	(35.27)	(46.40)	(58.17)
2011	20.29	24.77	27.17	49.10
	(65.89)	(52.68)	(60.31)	(104.19)
2012	21.29	27.43	28.36	17.15
	(79.08)	(53.01)	(66.17)	(35.77)
2013	22.02	28.50	29.49	24.80
	(77.31)	(56.48)	(67.32)	(58.52)
2014	26.76	29.13	29.94	79.96
	(208.18)	(52.04)	(67.82)	(237.67)
2015	25.02	28.64	29.41	16.89
	(83.03)	(46.31)	(62.80)	(26.19)
2016	22.89	28.49	29.46	21.44
	(71.56)	(50.69)	(64.47)	(37.88)
2017	24.94	29.65	30.46	19.57
	(83.78)	(49.96)	(57.89)	(26.79)

Source: RAIS, 2006–2017.
Notes: Standard deviation in parenthesis.   *Average hourly wage receive during the year.   **Hourly wage receive in December. Hourly wages in 2017 BRL after levels of education and age range restrictions.

Table A4. Number of observations by employment status on December 31st, 2006 and 2017.

	Employment Status on Dec. 31st			
	2006		2017	
Contract	Non-employed	Employed	Non-employed	Employed
Permanent jobs	106,845	2,011,014	185,798	2,448,711
Temporary jobs	30,473	46,662	113,925	88,733
Total	137,318	2,057,676	299,723	2,537,444

Source: RAIS, 2006 and 2017.

Appendix B

Table B1. Composition and Wage structure effects by covariates at mean (%).

Year	Composition effect							Wage structure effect							
	Man	White	Age	Regional	Schooling	Educ levels	Tenure	Man	White	Age	Regional	Schooling	Educ levels	Tenure	Constant
2006	−2.3	−11.8	6.6	−28.1	−13.6	5.5	32.2	−2.6	−1.8	−29.4	4.3	−10.1	9.3	−4.0	38.4
2007	−2.7	−3.6	8.6	−35.9	−14.1	0.8	34.2	−3.1	−3.5	−34.5	7.3	7.1	15.1	−4.4	25.0
2008	−2.5	5.7	10.8	−32.6	−13.7	−0.1	34.4	−5.0	−7.6	−22.9	12.4	9.0	13.4	−7.0	22.6
2009	−2.5	7.9	19.0	−23.2	−14.1	−2.1	31.1	−3.7	−4.2	−19.9	2.3	−12.8	8.4	−6.3	42.2
2010	−2.4	−8.7	11.6	−21.9	−13.6	5.0	36.8	−3.8	−0.6	−23.5	−0.8	−11.9	7.2	−5.0	47.2
2011	−4.0	2.2	14.6	−18.0	−6.4	−5.3	49.4	−5.2	−3.2	−26.9	−2.7	6.9	23.4	−6.7	25.0
2012	−5.0	−0.7	16.2	−20.7	0.7	−4.8	51.8	−3.2	−1.9	−17.9	0.7	−18.2	20.3	−4.5	33.4
2013	−4.8	−0.7	14.4	−18.4	3.2	−7.5	51.0	−3.5	−2.4	−14.4	−1.6	−19.8	21.8	−4.0	32.5
2014	−4.9	−6.6	12.8	−14.7	6.2	−7.6	47.2	−3.2	−2.4	−18.7	−2.2	−15.0	25.5	−3.9	29.1
2015	−5.0	−3.8	13.8	−13.7	6.5	0.6	56.5	−3.2	−2.9	−17.1	−6.1	−13.1	25.1	−3.9	28.7
2016	−5.0	−6.6	11.7	−12.7	7.3	1.8	54.8	−3.0	−2.4	−16.4	−4.7	−16.6	27.0	−3.3	26.7
2017	−4.5	−12.6	11.9	−9.6	8.5	3.2	49.6	−3.5	−1.9	−14.5	−4.7	−16.5	23.8	−3.8	31.2

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B2. Composition and Wage structure effects by covariates at quantile 50 (%).

| | Composition effect | | | | | | | Wage structure effect | | | | | | | |
Year	Man	White	Age	Regional	Schooling	Educ levels	Tenure	Man	White	Age	Regional	Schooling	Educ levels	Tenure	Constant
2006	-2.2	-12.1	6.5	-27.9	-13.7	5.5	32.1	-2.6	-1.6	-28.7	4.3	-10.7	9.0	-4.0	39.1
2007	-2.6	-2.9	8.6	-36.4	-14.2	0.9	34.4	-3.2	-3.9	-33.6	8.4	7.2	15.0	-4.5	24.2
2008	-2.4	6.2	10.5	-32.8	-13.6	0.0	34.5	-5.0	-8.0	-22.1	14.2	9.0	13.2	-7.0	21.6
2009	-2.0	10.3	18.1	-23.0	-13.7	-2.2	30.7	-3.6	-4.9	-18.0	2.8	-12.5	7.2	-6.3	44.8
2010	-2.2	-6.9	11.4	-22.7	-13.8	5.3	37.7	-3.6	-0.7	-22.9	-0.5	-12.1	6.2	-4.8	49.2
2011	-3.5	4.7	13.6	-17.8	-6.3	-5.1	49.1	-5.0	-3.8	-23.8	-2.1	6.7	21.9	-6.5	30.1
2012	-4.4	2.2	15.4	-20.6	0.7	-4.5	52.1	-2.8	-2.1	-16.8	1.8	-18.0	18.1	-4.0	36.3
2013	-4.3	2.2	13.6	-18.3	3.2	-6.9	51.6	-3.4	-2.7	-13.1	-0.2	-20.7	21.1	-3.6	35.2
2014	-4.7	-4.0	12.5	-15.4	6.5	-7.5	49.3	-3.1	-2.7	-17.8	-0.6	-14.9	26.6	-4.0	30.3
2015	-4.6	-0.7	13.4	-14.0	6.9	0.9	59.6	-2.9	-3.1	-15.4	-4.8	-13.5	24.0	-3.6	32.6
2016	-4.5	-3.0	11.4	-13.2	7.8	2.0	58.1	-2.6	-2.6	-16.1	-3.6	-16.0	25.0	-2.9	31.3
2017	-4.1	-8.2	11.4	-9.8	9.1	3.2	54.2	-3.2	-2.5	-13.1	-3.7	-16.3	21.5	-3.0	36.8

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B3. Composition and Wage structure effects by covariates at quantile 10 (%).

	Composition effect							Wage structure effect							
Year	Man	White	Age	Regional	Schooling	Educ levels	Tenure	Man	White	Age	Regional	Schooling	Educ levels	Tenure	Constant
2006	0.8	0.7	8.8	-32.7	-14.8	2.4	39.9	0.0	-1.9	43.5	3.6	14.4	-17.0	1.8	-17.8
2007	1.6	-9.5	7.9	-33.0	-11.5	-2.2	34.4	-0.4	2.2	57.2	6.3	-2.8	-19.0	2.4	-9.7
2008	0.8	10.9	3.1	-28.6	-11.3	1.2	44.1	0.0	-7.1	43.2	12.8	-9.3	-1.4	8.4	17.8
2009	1.9	18.6	14.4	-23.2	-7.7	7.2	27.0	-0.3	-2.1	30.5	4.6	18.5	6.4	-0.4	-37.1
2010	2.1	18.5	7.1	-18.6	-9.5	7.4	36.9	-0.4	-1.9	28.5	1.6	21.9	2.5	1.6	-41.7
2011	2.0	-3.9	14.0	-5.6	-8.3	0.3	65.8	-0.7	0.6	51.5	-0.6	-6.3	5.7	3.1	-31.5
2012	1.8	22.9	9.4	-12.7	0.5	3.9	48.9	-0.4	-1.8	28.7	0.9	19.5	4.0	1.7	-42.9
2013	1.1	19.6	10.4	-14.0	3.4	1.2	50.1	-0.3	-1.6	32.3	0.7	16.2	4.1	1.5	-43.3
2014	1.0	19.1	9.9	-13.6	7.6	0.2	48.5	-0.2	-1.4	25.9	0.8	20.4	5.4	1.1	-44.8
2015	1.3	24.4	8.9	-9.3	7.0	4.6	44.6	-0.3	-1.9	23.2	1.0	22.8	4.8	1.1	-45.0
2016	0.9	24.4	9.3	-8.0	8.1	5.0	44.3	-0.2	-2.0	26.5	1.4	18.7	5.1	1.3	-44.9
2017	0.6	21.5	10.5	-7.4	10.7	4.5	44.8	-0.2	-1.5	27.0	0.9	21.6	2.6	1.2	-45.1

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B4. Composition and Wage structure effects by covariates at quantile 90 (%).

| | Composition effect | | | | | | | Wage structure effect | | | | | | | |
Year	Man	White	Age	Regional	Schooling	Educ levels	Tenure	Man	White	Age	Regional	Schooling	Educ levels	Tenure	Constant
2006	−5.4	8.0	5.2	−32.1	−14.0	3.2	32.2	−4.1	−11.8	10.3	−2.8	24.0	−32.9	−2.1	−11.9
2007	−5.7	7.8	6.9	−29.6	−13.9	−2.7	33.4	−8.1	−16.8	−32.0	29.3	5.2	−0.8	−4.7	−3.1
2008	−5.6	9.7	10.3	−23.2	−12.3	−3.4	35.5	−9.6	−18.3	2.2	35.0	5.3	−21.0	−6.2	−2.3
2009	−4.4	11.6	17.2	−16.9	−12.3	−5.9	31.8	−5.4	−6.8	3.8	−4.5	3.5	−35.8	−5.2	35.0
2010	−4.5	2.4	13.1	−21.7	−15.4	−4.2	38.8	−3.9	−4.0	−6.3	−7.8	2.6	−28.6	−2.7	44.1
2011	−5.1	3.8	14.9	−14.0	−4.1	−12.8	45.3	−5.5	−6.3	−23.5	−17.6	2.1	−2.4	−1.9	40.8
2012	−4.8	11.1	12.4	−13.4	0.3	−10.7	47.2	−3.2	−6.7	−27.6	−15.3	−2.4	3.9	−0.6	40.3
2013	−5.2	−0.6	13.0	−13.2	1.9	−15.6	50.5	−3.2	−3.6	−26.0	−12.5	−6.8	−0.5	−0.3	47.1
2014	−5.5	3.3	10.2	−10.2	3.8	−14.0	53.0	−2.8	−4.5	−31.7	−15.2	0.5	9.0	0.4	35.9
2015	−6.2	2.8	9.2	−12.5	4.1	−4.9	60.3	−2.3	−4.0	−26.3	−22.3	0.0	7.5	0.3	37.3
2016	−5.9	3.8	7.3	−13.4	4.5	−2.4	62.8	−2.9	−4.1	−24.6	−22.9	−1.7	13.6	2.3	27.9
2017	−7.5	−1.5	15.0	−4.6	6.8	−1.9	62.8	−5.7	−5.9	3.8	−33.6	−5.0	−9.7	1.2	35.2

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B5. Composition and Wage structure effects by covariates at mean in early childhood education (%).

Year	Composition effect						Wage structure effect						
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	0.0	−14.6	14.4	10.2	1.2	59.6	−0.2	−2.6	−27.4	8.3	−10.9	−4.7	46.0
2007	0.1	−10.0	12.5	−0.4	11.5	65.5	−0.5	−5.8	−30.5	10.3	35.9	−6.3	10.6
2008	0.4	15.1	10.7	18.8	19.3	35.7	−0.2	−7.0	−13.3	22.5	30.0	−2.8	−24.2
2009	0.7	−0.1	15.6	16.2	25.7	41.7	−0.3	−4.5	−23.8	9.9	−10.0	−5.5	45.9
2010	0.1	−10.4	5.5	−7.7	1.6	74.7	−0.7	−0.7	−29.7	3.2	7.5	−1.4	56.9
2011	0.7	14.9	7.0	7.6	30.1	39.7	0.1	−9.2	−23.1	25.5	−11.2	−1.2	29.7
2012	0.7	3.2	7.7	13.8	31.6	42.9	−0.1	−3.1	−28.3	6.5	−6.7	−3.9	51.4
2013	0.3	−1.7	9.3	10.4	28.4	49.9	−0.4	−1.9	−26.2	9.3	−8.7	−2.9	50.5
2014	0.6	3.0	10.0	10.5	33.9	41.9	−0.1	−1.9	−26.3	5.5	−10.9	−2.8	52.5
2015	0.7	−0.2	13.4	12.3	30.6	42.9	−0.1	−1.8	−24.7	4.3	−11.0	−3.2	54.9
2016	0.6	3.1	13.1	13.0	27.1	43.1	−0.1	−1.2	−24.3	1.5	−11.7	−2.6	58.7
2017	0.8	−1.9	12.7	8.6	28.3	47.8	−0.1	−0.1	−24.0	−0.4	−13.8	−2.3	59.3

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B6. Composition and Wage structure effects by covariates at quantile 50 in early childhood education (%).

Year	Composition effect						Wage structure effect						
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	−0.1	−3.1	15.4	12.4	1.2	67.8	−0.1	−4.2	−29.0	10.7	−2.6	−2.8	50.5
2007	0.0	4.1	13.4	0.2	12.5	69.7	−0.3	−7.0	−27.2	9.0	44.1	−3.3	9.2
2008	0.3	16.0	11.0	17.1	17.9	37.6	0.0	−9.1	−19.3	27.2	34.9	−2.0	−7.6
2009	0.6	−5.5	15.5	12.4	22.8	43.3	−0.1	−2.0	−19.9	5.0	−12.7	−3.5	56.7
2010	0.1	−9.4	7.1	−7.4	1.9	74.1	−0.4	−0.9	−28.4	−1.3	−3.9	−2.6	62.5
2011	0.6	17.7	7.4	8.0	29.0	37.2	0.2	−7.9	−24.5	20.6	−8.8	−0.7	37.2
2012	0.5	−7.3	10.1	9.4	28.3	44.3	−0.1	−0.9	−25.5	2.5	−11.8	−2.9	56.3
2013	0.1	−0.5	9.7	9.3	28.8	51.6	−0.3	−1.6	−27.2	8.3	−8.4	−2.2	51.9
2014	0.4	0.6	11.2	8.5	33.4	45.9	−0.1	−1.2	−26.8	3.6	−10.8	−2.2	55.3
2015	0.5	−4.2	12.9	9.9	28.5	44.0	−0.1	−0.9	−25.4	1.3	−11.2	−2.4	58.6
2016	0.5	1.3	13.2	12.2	27.0	45.8	−0.1	−0.8	−25.5	0.6	−11.6	−2.0	59.3
2017	0.7	−2.6	12.0	7.9	27.5	49.2	−0.1	0.1	−24.5	−0.7	−13.3	−2.0	59.3

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B7. Composition and Wage structure effects by covariates at quantile 10 in early childhood education (%).

Year	Composition effect						Wage structure effect						
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	-0.1	11.1	18.6	12.0	-2.8	55.5	0.1	-1.5	29.0	-5.5	23.1	1.7	-39.0
2007	0.0	7.8	16.9	-1.3	9.1	64.9	0.2	-1.1	31.8	-3.1	19.4	2.1	-42.3
2008	-0.2	15.2	12.5	16.9	16.1	39.0	0.1	-2.2	33.9	1.8	14.7	2.1	-45.2
2009	-0.1	30.3	16.1	12.5	13.7	27.3	0.0	-2.6	26.0	0.1	24.8	1.2	-45.3
2010	-0.2	25.7	11.3	-8.1	0.3	54.4	0.1	-1.9	30.3	-4.7	21.0	1.9	-40.0
2011	0.2	16.0	7.7	-0.7	27.0	48.4	0.2	-2.5	48.2	-8.6	-14.4	3.9	-22.2
2012	0.1	19.6	3.7	8.9	24.5	43.3	0.1	-2.2	24.6	-6.5	25.6	2.3	-38.8
2013	-0.1	21.4	9.2	9.0	22.4	37.9	0.1	-1.9	28.6	-0.1	20.9	1.5	-46.9
2014	-0.2	19.1	10.7	8.7	27.5	33.8	0.0	-1.5	28.2	-1.6	21.7	1.0	-46.1
2015	0.0	20.7	10.3	10.8	21.4	36.8	0.0	-1.7	27.5	-3.0	22.3	1.0	-44.4
2016	-0.1	23.6	10.6	12.9	20.1	32.7	0.0	-2.0	27.9	0.0	21.8	1.0	-47.3
2017	0.1	18.1	13.2	9.7	21.7	37.4	0.0	-1.3	27.9	-0.1	22.5	0.9	-47.4

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B8. Composition and Wage structure effects by covariates at quantile 90 in early childhood education (%).

Year	Composition effect						Wage structure effect						
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	0.2	−6.2	11.1	7.8	0.3	74.3	−1.1	−6.5	−13.8	1.4	−13.2	−9.0	54.9
2007	0.4	−19.8	9.7	−0.2	5.0	64.9	−2.0	−5.9	−19.0	12.0	47.2	−12.1	1.8
2008	0.7	−19.3	8.0	8.1	8.8	55.1	−1.0	−1.4	−38.4	3.1	17.4	−3.1	35.7
2009	0.4	−21.0	7.9	8.6	8.6	53.6	−1.0	0.3	−41.2	2.1	−1.3	−1.4	52.8
2010	0.7	−22.3	7.6	−8.2	1.1	60.1	−1.9	−1.4	−22.7	12.4	−7.0	−7.0	47.4
2011	0.8	−11.6	6.7	4.6	14.7	61.6	−1.0	−1.6	−42.5	3.7	5.4	−0.9	44.9
2012	0.8	−16.8	4.1	6.7	12.1	59.5	−1.1	−1.0	−42.5	1.4	−1.7	−1.1	51.2
2013	0.9	−21.6	3.2	6.5	11.4	56.5	−1.4	0.1	−42.8	2.8	−0.4	−0.8	51.7
2014	1.0	−13.5	3.1	6.8	13.3	62.3	−1.2	−1.0	−43.7	1.2	2.0	−0.4	50.5
2015	1.1	−17.1	3.3	6.0	11.0	61.5	−1.4	−1.2	−41.5	3.4	2.9	−1.4	48.3
2016	1.1	−15.6	2.9	6.6	11.3	62.5	−1.7	−2.1	−39.6	3.0	4.2	−1.4	48.0
2017	1.4	−16.8	3.1	3.6	11.9	63.2	−1.6	−2.0	−36.0	8.6	−0.2	−3.3	48.2

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B9. Composition and Wage structure effects by covariates at mean in primary education (%).

Year	Composition effect						Wage structure effect						
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	−1.8	−5.8	6.2	−33.6	−23.1	29.6	−2.8	−5.1	−23.0	21.7	−9.9	−6.3	31.1
2007	−2.3	2.0	9.2	−39.9	−12.8	33.7	−2.9	−5.1	−19.3	14.8	38.2	−5.4	−14.3
2008	−2.0	−2.8	8.8	−39.6	−12.1	34.6	−3.2	−4.0	−14.6	14.6	40.2	−5.6	−17.8
2009	−2.3	−3.7	10.5	−34.9	−15.5	33.2	−3.8	−2.9	−22.7	20.5	−6.7	−7.1	36.4
2010	−2.1	−8.2	6.4	−32.1	−12.6	38.6	−3.3	−0.9	−24.6	12.8	−7.3	−5.4	45.7
2011	−2.1	−8.6	7.8	−21.2	−14.4	45.8	−4.7	−2.1	−28.8	11.2	10.0	−5.6	37.6
2012	−2.2	−11.3	7.1	−22.2	−9.3	47.9	−3.3	−0.5	−20.9	5.4	−13.9	−4.1	51.9
2013	−2.7	−10.4	9.6	−22.0	−6.3	48.9	−4.0	−1.6	−15.8	1.6	−17.2	−5.0	54.8
2014	−2.8	−15.0	8.6	−19.8	−3.5	50.4	−4.6	−2.5	−22.0	1.0	−7.5	−5.5	56.8
2015	−2.8	−14.6	9.5	−16.3	−3.3	53.5	−5.6	−1.8	−13.5	−6.8	−5.0	−6.4	61.0
2016	−3.1	−10.2	9.8	−14.8	−1.5	60.6	−4.5	−2.7	−12.8	−0.1	−17.7	−4.2	58.0
2017	−3.4	−18.2	10.4	−10.5	0.0	57.6	−4.9	−1.6	−16.4	−3.2	−13.2	−3.3	57.4

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B10. Composition and Wage structure effects by covariates at quantile 50 in primary education (%).

| | Composition effect | | | | | | Wage structure effect | | | | | | |
Year	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	-1.8	-8.3	6.1	-32.5	-22.8	28.6	-2.8	-4.5	-23.4	19.4	-11.0	-6.6	32.3
2007	-2.3	1.9	9.3	-40.0	-12.9	33.6	-2.9	-5.1	-18.6	14.4	38.0	-5.5	-15.6
2008	-2.1	-3.0	8.8	-39.5	-12.2	34.4	-3.2	-4.0	-14.2	14.5	39.8	-5.6	-18.7
2009	-2.1	-3.5	10.6	-34.6	-16.0	33.1	-4.0	-3.0	-21.9	22.1	-6.2	-7.6	35.2
2010	-2.0	-8.5	6.5	-32.2	-12.7	38.1	-3.4	-0.9	-24.6	13.4	-7.2	-5.7	44.8
2011	-2.1	-8.4	7.9	-21.2	-14.6	45.9	-4.7	-2.1	-28.1	10.7	10.1	-5.6	38.8
2012	-2.1	-11.3	7.1	-22.2	-9.4	47.9	-3.3	-0.4	-20.3	5.4	-14.0	-4.2	52.4
2013	-2.6	-8.9	9.6	-22.6	-6.5	49.8	-4.0	-1.6	-14.1	2.8	-17.5	-4.9	55.0
2014	-2.7	-13.4	8.6	-20.3	-3.6	51.5	-4.8	-2.7	-20.5	3.5	-6.5	-5.6	56.3
2015	-2.7	-14.5	9.4	-16.4	-3.3	53.8	-5.8	-1.7	-12.2	-5.7	-5.8	-6.6	62.2
2016	-3.0	-9.4	9.9	-15.1	-1.5	61.0	-4.4	-2.6	-11.6	0.1	-18.9	-4.2	58.2
2017	-3.3	-17.7	10.4	-10.6	0.0	58.0	-5.0	-1.6	-15.0	-2.9	-14.0	-3.4	58.0

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B11. Composition and Wage structure effects by covariates at quantile 10 in primary education (%).

	Composition effect						Wage structure effect						
Year	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	0.6	−12.8	6.4	−27.9	−22.8	29.5	0.5	0.8	35.6	6.2	20.7	−0.6	−35.6
2007	1.3	1.1	11.6	−37.0	−16.3	32.7	0.2	−0.6	49.6	3.0	8.9	−0.1	−37.6
2008	1.6	8.7	8.6	−35.7	−14.6	30.8	0.0	−1.7	46.2	8.5	8.1	0.2	−35.2
2009	1.5	17.5	9.9	−25.6	−15.9	29.7	0.0	−2.0	32.4	5.1	18.7	0.8	−40.9
2010	1.4	11.9	7.6	−26.0	−14.7	38.4	0.0	−1.2	32.7	6.2	17.9	1.5	−40.5
2011	1.0	3.0	11.8	−18.4	−17.7	48.1	−0.2	−0.7	50.1	8.6	−4.1	2.2	−34.2
2012	1.1	7.7	8.5	−20.5	−13.7	48.6	−0.2	−0.5	30.9	5.4	19.6	2.1	−41.3
2013	0.6	6.7	10.8	−21.3	−9.1	51.6	−0.3	−1.0	44.5	5.1	8.3	2.4	−38.5
2014	0.7	8.4	10.3	−22.0	−4.8	53.7	−0.2	−0.9	27.9	3.8	23.7	1.5	−41.9
2015	1.0	9.6	10.7	−18.1	−5.0	55.6	−0.3	−0.7	25.6	3.9	25.3	1.4	−42.8
2016	1.1	4.6	11.9	−16.9	−2.6	62.9	−0.4	−0.3	33.1	7.0	18.7	1.9	−38.7
2017	0.3	6.0	12.7	−15.3	0.0	65.8	−0.2	−0.5	30.4	4.9	21.0	1.8	−41.2

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B12. Composition and Wage structure effects by covariates at quantile 90 in primary education (%).

Year	Composition effect						Wage structure effect						
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	−3.7	22.0	3.2	−26.3	−13.9	30.9	−2.3	−12.3	−43.5	25.2	1.7	−1.3	13.7
2007	−4.1	22.1	4.4	−30.4	−6.3	32.7	−1.6	−7.8	−34.2	16.1	28.6	−1.1	−10.5
2008	−3.8	20.2	4.6	−32.3	−5.4	33.7	−2.1	−8.5	−23.6	17.3	28.2	−1.3	−19.0
2009	−4.1	21.7	6.4	−29.4	−7.6	30.9	−2.6	−10.9	−30.3	19.1	−8.9	−3.8	24.4
2010	−4.2	14.6	4.0	−30.4	−6.9	39.7	−2.6	−8.7	−35.9	17.9	−6.0	−1.4	27.5
2011	−4.3	7.1	5.1	−20.1	−11.9	51.5	−4.2	−7.2	−39.4	10.8	3.6	−2.9	31.9
2012	−3.6	12.3	4.1	−24.8	−5.8	49.3	−4.2	−9.6	−34.3	3.9	−6.0	−1.8	40.2
2013	−3.7	3.8	5.3	−29.2	−3.7	54.3	−3.8	−5.9	−30.1	4.5	−11.4	−1.4	42.8
2014	−3.8	9.4	3.9	−26.2	−2.1	54.6	−4.2	−7.9	−41.2	6.2	0.1	−0.6	39.8
2015	−4.6	0.2	4.5	−24.0	−2.1	64.6	−4.6	−6.6	−40.0	−0.1	−1.2	−1.4	46.0
2016	−4.1	7.0	5.0	−20.9	−0.9	62.1	−5.4	−8.7	−27.4	6.8	−14.5	0.9	36.3
2017	−5.0	−9.4	7.3	−13.5	0.0	64.9	−8.0	−6.5	−19.3	−13.7	−12.4	2.1	38.0

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B13. Composition and Wage structure effects by covariates at mean in high school education (%).

| Year | Composition effect | | | | | | Wage structure effect | | | | | | |
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	−5.5	−40.1	4.3	2.3	3.3	44.5	−3.6	2.6	−21.0	−18.4	−9.5	−0.6	44.3
2007	−9.2	−17.3	6.7	3.6	−5.2	58.1	−4.4	−1.6	−25.5	−21.8	30.6	1.1	15.0
2008	−7.6	13.4	10.9	12.0	7.8	48.3	−5.7	−4.8	−24.4	−17.1	21.9	−2.2	24.0
2009	−1.8	65.3	12.9	3.9	7.8	8.3	−4.3	−9.9	−9.1	−22.1	−9.0	−3.4	42.2
2010	−4.5	44.3	19.0	−7.1	0.6	24.6	−4.6	−3.6	−14.7	−21.4	−7.9	−2.2	45.7
2011	−2.4	13.3	4.5	23.8	−37.0	19.0	−4.6	−4.5	−23.2	−15.6	−5.8	−0.4	46.0
2012	−3.0	26.5	23.9	16.6	9.3	20.8	−6.3	−4.3	−6.4	−19.1	−13.5	−3.6	46.8
2013	−4.8	23.5	8.6	23.4	3.9	35.9	−3.7	−2.6	−9.7	−20.6	−16.4	−0.3	46.7
2014	−8.3	1.1	6.9	28.0	2.4	53.3	−2.4	−0.3	−16.7	−16.9	−15.1	0.3	48.2
2015	−9.2	16.6	7.1	13.5	1.9	51.8	−2.4	−1.6	−16.4	−13.1	−19.0	0.2	47.4
2016	−8.0	6.7	7.0	−5.9	3.9	68.4	−3.1	−0.3	−19.1	−13.7	−17.9	1.6	44.4
2017	−11.0	19.3	8.3	7.8	6.6	47.0	−2.5	−2.6	−12.3	−15.9	−20.2	0.5	45.9

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B14. Composition and Wage structure effects by covariates at quantile 50 in high school education (%).

Year	Composition effect						Wage structure effect						
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	−5.5	−34.9	4.5	4.2	3.5	47.4	−4.2	2.8	−22.5	−21.8	−8.2	−0.3	40.1
2007	−9.4	−14.9	7.0	4.7	−6.0	58.0	−4.7	−1.8	−27.1	−22.2	33.0	1.2	10.0
2008	−6.7	17.8	9.8	11.6	8.2	45.9	−7.0	−6.2	−23.1	−21.6	30.3	−2.3	9.6
2009	−1.4	66.4	12.9	4.5	7.1	7.7	−4.8	−11.0	−9.0	−24.7	−6.9	−3.6	40.0
2010	−4.7	42.0	12.8	−5.6	13.3	21.7	−4.2	−4.9	−18.9	−22.3	−6.1	−1.5	42.1
2011	−2.4	13.6	4.6	23.5	−37.2	18.7	−4.7	−4.8	−21.2	−17.6	−6.9	−0.5	44.3
2012	−2.7	27.7	23.5	16.6	8.9	20.5	−6.9	−5.3	−2.5	−20.9	−15.7	−4.0	44.7
2013	−4.8	24.4	8.9	21.7	3.9	36.4	−3.9	−3.1	−10.4	−21.3	−16.1	−0.1	45.0
2014	−6.5	1.9	6.2	26.3	2.3	56.8	−2.7	−0.5	−16.0	−18.8	−15.5	1.3	45.1
2015	−8.0	20.1	7.2	7.5	1.8	55.4	−2.8	−2.5	−16.3	−15.4	−18.0	1.0	43.9
2016	−7.5	7.8	7.8	−11.7	3.5	61.6	−3.4	−0.7	−20.9	−12.5	−18.4	1.3	42.8
2017	−10.5	20.9	8.3	−6.7	6.0	47.7	−3.3	−3.3	−13.3	−14.1	−22.9	0.7	42.4

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B15. Composition and Wage structure effects by covariates at quantile 10 in high school education (%).

| Year | Composition effect | | | | | | Wage structure effect | | | | | | |
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	−0.2	45.0	6.5	7.9	1.9	38.4	−1.6	−9.4	26.5	−12.6	20.4	1.8	−27.7
2007	−2.4	40.7	7.0	−9.3	10.9	29.7	−1.1	−9.7	20.7	−7.5	35.4	−0.5	−25.0
2008	−0.1	55.2	1.7	4.3	18.5	20.2	−1.9	−15.5	−16.2	−14.0	−2.3	−0.9	49.1
2009	−4.0	−1.6	22.1	16.8	−7.7	47.7	−2.7	−0.7	−3.0	0.7	−30.5	−3.1	59.4
2010	−3.0	45.2	6.0	−5.1	−4.8	36.0	−1.9	−5.3	−13.0	−3.4	−12.9	−2.4	61.0
2011	−0.6	−17.0	4.8	28.6	−26.7	22.3	−3.9	9.3	20.4	−25.4	−6.9	4.4	29.8
2012	−0.8	33.3	15.2	11.4	7.8	31.5	−2.5	−4.5	53.5	−9.3	−27.5	−0.3	2.5
2013	−6.8	2.2	9.7	10.8	7.0	63.5	−1.7	0.4	−1.7	−3.0	−34.8	−1.9	56.5
2014	−4.7	−33.3	6.8	1.0	4.1	50.2	−1.4	2.0	−1.2	−2.0	−34.5	−1.7	57.2
2015	−4.7	21.6	9.5	−8.0	4.3	51.9	−1.4	−0.5	−16.3	2.7	−20.4	−2.6	56.2
2016	−3.0	17.4	13.7	−16.1	6.3	43.5	−0.8	0.3	−13.8	−0.8	−26.8	−2.0	55.4
2017	−3.1	47.6	7.3	−9.6	5.8	26.5	−1.4	−3.7	−7.6	−4.0	−25.1	−2.7	55.5

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.

Table B16. Composition and Wage structure effects by covariates at quantile 90 in high school education (%).

Year	Composition effect						Wage structure effect						
	Man	White	Age	Regional	Schooling	Tenure	Man	White	Age	Regional	Schooling	Tenure	Constant
2006	−6.5	−32.9	1.3	−2.0	−30.2	27.1	−3.5	6.4	7.6	−51.4	25.1	0.2	−5.8
2007	−10.9	−12.0	8.6	−18.6	−23.1	26.9	−10.4	3.2	−15.4	−35.6	26.6	0.0	−8.7
2008	−14.5	12.2	16.8	−0.1	−16.5	40.0	−26.0	−2.8	−25.8	−24.5	7.5	−4.2	−9.2
2009	−3.3	31.1	19.0	20.8	−15.8	−10.0	−4.4	−5.7	18.6	−45.5	10.3	−6.1	9.4
2010	−6.5	8.0	23.9	23.9	−32.9	−4.8	−4.4	−2.3	17.2	−48.6	7.4	−5.4	14.9
2011	−2.8	11.6	10.8	26.8	−44.7	−3.2	−3.2	−4.2	11.7	−35.8	−9.9	−3.9	31.3
2012	−7.5	−1.8	29.1	51.1	6.1	−4.5	−3.8	−2.4	4.8	−44.7	−2.4	−4.5	37.3
2013	−7.5	−12.8	21.7	52.6	2.2	3.2	−3.5	0.0	−7.3	−37.6	−5.4	−2.3	44.0
2014	−6.6	−21.8	11.1	48.9	0.8	10.9	−2.7	0.6	−11.0	−37.3	−3.1	−0.6	44.6
2015	−14.0	7.2	16.1	36.1	1.1	25.5	−1.9	−1.0	2.0	−50.6	−2.4	−1.1	41.0
2016	−10.3	−14.2	7.4	25.0	1.5	41.6	−0.8	1.1	2.4	−55.1	0.6	2.1	37.8
2017	−14.7	27.2	17.2	4.9	3.0	33.0	−3.0	−4.0	23.3	−37.9	−14.6	−0.3	17.0

Note: All values are percentages and represent the contribution positive/negative in composition effect or wage structure effect.