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Going subnational: wage differentials across levels of government in Brazil, Mexico, and Uruguay

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Workers at subnational governments play a prominent role in the delivery of public services in most countries. Yet, information about their remuneration is scarce. Using data for Brazil, Mexico and Uruguay, we document that national government employees earn on average higher wages than observationally similar subnational employees; consequently, public-private sector wage gaps vary significantly by level of government. Then we use individual fixed-effects to estimate the wage premium to public sector employment (the wage gap net of selection effects) for Brazil and Mexico. We find that i) both national and subnational public employees receive a significant wage premium with respect to private sector employment; and ii) the difference between the national and subnational wage premiums is small in Brazil and null in Mexico.

KEYWORDS
public sector wage premium, subnational governments, Brazil, Mexico, Uruguay.

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H70, J31, J45, M50.

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Diferencias salariales entre niveles de gobierno en Brasil, México y Uruguay

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Los trabajadores de los gobiernos subnacionales desempeñan un papel destacado en la prestación de servicios públicos en la mayoría de los países. Sin embargo, la información sobre su remuneración es escasa. Utilizando datos de Brasil, México y Uruguay, este trabajo documenta que los empleados de gobiernos nacionales ganan, en promedio, salarios más altos que empleados subnacionales con similares características observadas. En consecuencia, las brechas salariales entre el sector público y el privado varían significativamente según el nivel de gobierno. Luego se utilizan efectos fijos de individuos para estimar la prima salarial del empleo en el sector público (la brecha salarial neta de efectos de selección) para Brasil y México. Encontramos que i) tanto los empleados públicos nacionales como subnacionales reciben una prima salarial significativa con respecto al empleo en el sector privado; y ii) la diferencia entre las primas salariales nacionales y subnacionales es pequeña en Brasil y nula en México.

KEYWORDS
Sector público, gobiernos subnacinoales, premio salarial, Brasil, México, Uruguay.

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1 | INTRODUCTION

There is broad consensus that bureaucratic effectiveness is central to economic development, and that one of the building blocks of an effective bureaucracy is having personnel with the right skills and motivations (Besley et al., 2021). A key policy tool to achieve this objective is financial incentives (Dal Bo et al., 2013; Deserranno, 2019). Pay and conditions in the public sector should be designed to attract and retain qualified workers, without raising the public wage bill excessively.

The relevance of the public sector wage structure as a determinant of sate capacity highlights the importance of studying the relative pay between public and private sector employment. However, while there exists an extensive literature on public-private wage differentials for multiple countries and time periods, most of the studies focus on the national government or do not distinguish among levels of government. The fact that subnational governments account for most of the public employment and are responsible for the provision of core public services makes it of great importance to carry the study of public wage gaps to the subnational levels of government.

To fill this research gap, we analyze public sector wage differentials across levels of government in Brazil, Mexico, and Uruguay, based on data from national household surveys. These three countries are the only ones in Latin America in which institutional surveys allow to know the level of government (national or subnational) to which public sector employees belong. These surveys are the Pesquisa Nacional por Amostra de Domicilios Continua (PNAD-C) for Brazil, the Encuesta Nacional de Ocupación y Empleo (ENOE) for Mexico, and the Encuesta de Hogares Continua (ECH) for Uruguay.

The public sector is a major employer in most economies and the three countries studied here are no exception. Public employment accounts for about 22% of total paid (salaried) employment in Uruguay, 18% in Brazil, and 12% in Mexico.[1] But most of these public sector employees work for a subnational government, especially in highly decentralized countries such as Brazil and Mexico—8 out of 10 public sector employees work in a subnational government in these two countries. Subnational governments usually share responsibilities with the national government in the provision of basic public services such as health care and education, and are the main responsible for the provision of other public services (such as urban planning, public transport, water and sanitation, and other public utilities, among others).

We first focus on the average public sector wage gap (i.e, the difference in the remuneration of public and private sector employees with similar observable characteristics), which we estimate by means of a mincerian equation with a binary indicator for being a public sector employee and conditioning on individual and job characteristics. The public sector wage gap is about 16% in Brazil, 30% in Mexico, and 15% in Uruguay. When we distinguish by level of government, which can only be done consistently in the three countries for the subset of public employees who work in the public administration, we find that subnational public sector employees earn higher wages than comparable private sector employees, but lower wages than employees from the national government. The national-subnational differential is particularly large in Brazil (78 percentage points).

The reported wage gaps could reflect both a wage premium of working in the public sector—i.e. a differential pay with respect to potential earnings in the private sector—and a selection term. The selection term emerges from the fact that workers are not randomly assigned across sectors. If workers' unobserved characteristics were correlated with both sector of employment and wages, the selection term would be non-zero. To estimate the

[1] Public sector employment represents about 30% of total paid employment worldwide and close to 18% in Latin America and the Caribbean, according to a new global dataset (Gindling et al., 2020).

wage premium to public sector employment, we take advantage of the longitudinal dimension of the Brazilian and Mexican surveys—in which sampled individuals are followed for five consecutive quarters—and expand the mincerian equation by including individual fixed effects. This strategy results in an unbiased estimate of the wage premium of working in the public sector for individuals who switch employment between sectors under the assumption that workers' unobserved heterogeneity in potential earnings does not vary over time.

Comparing wage gaps and wage premiums is informative about the underlying selection process between sectors. A larger (smaller) public sector wage gap than the corresponding wage premium implies that public sector employees are positively (negatively) selected into that sector in terms of potential earnings, a usual marker of quality. This could arise both from supply factors—e.g. amenities of public employment—or from demand factors—e.g. a high quality recruitment process in the public sector.

We find that public sector wage premiums continue to be positive, but of a smaller magnitude than wage gaps, which means that part of the wage differential paid by the public sector is explained by the hiring of individuals with higher earnings potential—beyond what can be predicted from observable characteristics such as education and labor market experience.

We take advantage of the more detailed nature of Brazilian data to study wage differentials at the national, state, and municipal level of government for all public sector employees. We find a large wage gap for national employees (84%), a positive but much smaller wage gap for state employees (38%), and a negative wage gap for municipal employees (-4%). Interestingly, introducing individual fixed effects reduces wage differentials in the case of national and state employees, while it has the opposite effect in the case of municipal employees—that is, the wage premium is larger than the wage gap for municipal workers. This means that while national and state public employees are positively selected in terms of earnings potential, this sorting becomes negative for municipal employees.

This paper adds to a large literature studying public sector pay differentials in developed and developing countries (See for instance Gindling et al. (2020); Giordano et al. (2014); Lausev (2014) for recent reviews).[2] Given that subnational governments employ a large share of public workers and are responsible for the provision of public goods and services, it is important to assess the remuneration of employees at this level of government. The main contribution of the paper is to provide the first evidence on public sector wage premiums at subnational levels of government in developing countries.[3]

This paper also relates to a recent empirical literature on the personnel economics of the state. Using Brazil as a case study, some scholars have shown that one of the obstacles to building an effective bureaucracy is patronage (Colonnelli et al., 2020), and that a disrupted bureaucracy is detrimental to service delivery (Akhtari et al., 2020; Toral, 2021). Our result of a negative selection into municipal employment in Brazil is consistent with the suboptimal bureaucratic quality depicted by those studies and even suggests that there may be deficiencies in personnel recruitment processes that go beyond the incidence of patronage.

The rest of the paper is organized as follows. We describe the data in Section 2 and provide the relevant institutional context of public employment in Brazil in Section 3. In Section 4 we present our empirical strategy to estimate wage differentials between public and private employment, while in Section 5 we report and discuss the main results. Finally, in Section 6 we conclude.

[2] This topic has received renewed attention in recent years as many countries have followed wage cut policies to consolidate public finances in the wake of the Great Recession (Bargain et al., 2018; Depalo et al., 2015).

[3] Previous studies of public wage differentials in local governments focused in developed countries (Lewis et al., 2018; Borjas, 2002; Mueller, 2000; Smith, 1977).

2 | DATA

2.1 | National household surveys

We use microdata from national household surveys from three Latin American countries: Brazil, Mexico, and Uruguay. These are the only permanent household surveys in the region that allow us to identify the level of government (national or subnational) to which public sector workers are attached.[4]

These surveys are conducted by the national statistical office of each country to investigate several characteristics of the population on a regular basis, including demographics and labor market outcomes, and are representative of their national population. For Brazil, we use the Pesquisa Nacional por Amostra de Domicilios Contínua (PNAD-C), which is administered quarterly on a sample of about 211,000 households. In Mexico, data come from the Encuesta Nacional de Ocupación y Empleo (ENOE), which interviews about 120,000 households per quarter. Both PNAD-C and ENOE have a rotating panel design in which sampled households are followed over five consecutive quarters. For Uruguay, we use the Encuesta de Hogares Continua (ECH), a survey that is administered on an annual sample of about 54,000 households. Data are collected on a continuous basis, and sampled households are interviewed only once.

2.2 | Identification and characterization of subnational public sector workers

In the three countries under analysis, we first identify if individuals work in the public/private sector using direct questions about the sector of employment included in the surveys' questionnaires. We consider as public sector workers all individuals employed in the executive, legislative or judicial branch of government, the armed forces, public enterprises, and autonomous organizations.

We also produce comparable definitions of the sub-sector within the public sector for all public employees, the type of occupation they have, and the type of organization in which they work. To identify the sub-sector, we rely on specific surveys' questions that collect information about the sector of economic activity of the company, business or institution in which a person works. We define the following five sub-sectors: public administration, defense and security, education, health, and others. To classify workers by type of occupation, given that countries use different systems of occupation codes, we first convert the national codes to the International Standard Classification of Occupations 2008 (ISCO-08) using official crosswalks. Then, we classify public sector workers into five occupational groups using the occupational categories of the Worldwide Bureaucracy Indicators (WWBI): managers, professionals, technicians, clerical, elementary. Finally, we classify the type of organization in which the individual works as autonomous or non-autonomous, following specific questions of each survey questionnaire that collect that information. Autonomous organizations of the public sector can be broadly defined as those with formal authority for decision-making on specific subjects.

Finally, the identification of the level of government (national/subnational) of public sector employees is also straightforward in Brazil and Uruguay, as in both cases there are survey questions that directly collect such information. In the case of Uruguay, however,

[4]The Encuesta Continua de Hogares of Nicaragua also allows the identification of subnational public sector employees. However, its public use database is only available for the first quarter of 2012, and hence we did not include it in the analysis. In other 14 Latin American and the Caribbean countries analysed—Argentina, Bolivia, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Panamá, Paraguay, Peru, and Venezuela—household surveys do not collect information on the level of government to which public sector workers are attached.

the question about the level of government in which the individual is employed is only asked to workers from non-autonomous organizations, which represent about 55% of all public sector employees in that country. Hence, it is not possible to know the level of government of public workers in autonomous organizations. In the case of Mexico, the identification of individuals working at subnational levels of government requires more steps and some assumptions. The level of government can be directly derived from a survey question only for public administration employees, which represent about 38% of public sector employment in that country. For public workers in the education sector, we take advantage of the fact that the operation of basic education in Mexico is responsibility of the state governments, with the exception of Mexico City, and classify as subnational employees all public sector workers employed in a basic education institution, and not residing in Mexico City.[5] This criterion allows us to assign a level of government to an additional 29% of public sector workers. Finally, we use a survey question about the provider of social security benefits, and classify as subnational employees all workers covered by ISSTE estatal, an organization in charge of providing benefits only to state level public employees.[6] This criterion allows us to assign the level of government to an additional 2% of public workers. Overall, we are able to classify the level of government for almost 70% of public sector workers in Mexico.[7]

2.3 | Working sample

We restrict the analysis to individuals in paid employment aged 18 to 65 at the time of the survey. For some exercises, we use only data on public sector workers or on those working in the public administration subsector. To gain statistical power and be able to characterize subnational public employees with more precision, we use pooled data from the first quarter of 2017 to the fourth quarter of 2019. For the analysis of wage differentials by sector of employment, we further restrict the sample to individuals working between 30 and 60 hours per week. Additionally, we discard the lowest and the highest 3 percent of the hourly wage distribution to guarantee that the results are not heavily influenced by outlying values of the outcome variable.

Table 1 shows descriptive statistics for our working sample. For each country, the first column refers to all wage earners in the economy, the second column restricts the sample to public sector workers, and the third column further restricts the sample to those individuals working in public administration. In all the three countries, public sector employees tend to be older, are more likely to be female, are more educated, have higher salary, and work fewer hours per week than the typical salaried employee in the economy. As expected, public administration workers more closely resemble the typical public sector employee than the average wage earner in the economy.

3 | INSTITUTIONAL CONTEXT

The countries in our sample are either upper-middle income (Brazil and Mexico) or high income (Uruguay) economies according to the World Bank country classification. The three countries are organized under a presidential representative democracy with three levels of

[5] We assume that individuals work in the same state where they live.

[6] ISSTE covers almost all national government employees (with exceptions like the military), while ISSTE estatal refers to coverage provided by ISSTE to workers from state governments. ISSTE and ISSTE estatal are coded as separate categories in the ENOE survey.

[7] Table A.1 in the Appendix shows the number of public sector employees by level of government.

TABLE 1 Characteristics of workers by sector of employment

	Brazil			Mexico			Uruguay		
	Wage earners	Public sector	Public Administration	Wage earners	Public sector	Public Administration	Wage earners	Public sector	Public Administration
Demographics									
Age	37.7	42.9	43.4	36.3	41.2	41.5	39.6	43.5	45.9
Female (%)	45.5	59.5	49.5	36.7	48.4	44.4	43.1	51.8	49.5
Education level									
Incomplete secondary or less (%)	33.0	12.5	15.5	54.1	18.8	25.4	52.1	31.5	31.7
Complete secondary (%)	37.7	27.7	27.8	25.0	22.0	23.2	24.4	26.0	25.1
Some tertiary (%)	7.0	7.3	8.2	4.4	5.7	6.0	8.2	10.7	12.7
Complete tertiary (%)	22.3	52.5	48.5	16.5	53.6	45.4	15.2	31.9	30.5
Labor market outcomes									
Monthly Wage (ppp dollars)	943.6	1533.4	1816.7	655.1	982.8	913.2	1397.9	1672.3	1704.7
Weekly hours	42.1	38.9	38.7	46.0	40.5	41.2	42.1	39.0	37.5
Hourly wage	5.7	9.9	11.8	3.7	6.2	5.6	8.4	10.9	11.6
Observations	1,442,728	279,368	95,084	777,105	116,855	46,267	81,850	18,675	3,721

Notes: The table presents mean of characteristics of wage earners individuals. For each country, the first column refers to private and public sector wage earners, the second column refers to public sector wage earners and the third column refers to public administration wage earners. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C, ENOE and ECH from 1Q2017 to 4Q2019.

government: national, state or department, and municipal.[8] The number of subnational governments is 5,597 in Brazil (26 States, a Federal District, and 5,570 Municipalities), 2,489 in Mexico (32 States, a Federal District, and 2,457 Municipalities), and 131 in Uruguay (19 Departments and 112 Municipalities).

3.1 | Size and composition of public sector employment

In all three economies, the public sector is a major employer. Public sector employees account for about 22% of total paid employment in Uruguay, 18% in Brazil, and 12% in Mexico. These figures become 27%, 22%, and 18%, respectively, if public sector employment is computed as a share of formal paid employment in the economy.[9] A similar conclusion can be reached if we gauge the importance of public employment in the economy in terms of the wage bill (Table 2, Panel A).

In all countries, the largest sub-sector in terms of employment is public administration, which accounts for about 35% of total employees in Brazil, 38% in Mexico, and 25% in Uruguay. The second largest sector is education, and the third one is health. These two sectors together account for almost half of public employees in Mexico and Brazil, and for about one third in Uruguay (Table 2, Panel B).

The occupation composition of the public workforce is relatively similar in the three countries. One of the largest occupation categories is professionals, which accounts for about 31% of public employees in Brazil and Mexico, and close to 24% of public employees in Uruguay. A related category is technicians, which explains 20% of public employment in Brazil, and about 14% in Mexico and Uruguay. As expected, the category of managers, which typically includes directors and senior officials, accounts for a small fraction of public employment in all three countries. These three groups of occupations comprise the most highly skilled positions and explain together about half of total public employment in these countries. The rest of positions in the public sector correspond to less qualified occupations such as clerical and elementary jobs (Table 2, Panel C).

[8] Unless otherwise clarified, in the characterization below we distinguish between two main levels of government: national and subnational, with the latter including both state and municipal governments

[9] To obtain these figures we assume that all public employment is formal, and define formal employment in the private sector as that in firms with at least 5 paid employees.

TABLE 2 Size and composition of public sector employment

	Brazil	Mexico	Uruguay
Panel A: Size of public employment			
Public employees over total paid employment (%)	18.5	12.3	22.5
Public employees over formal paid employment (%)	21.6	17.7	26.2
Public wage bill over total paid employment wage bill (%)	30.2	18.5	26.7
Public wage bill over formal paid employment wage bill (%)	33.1	23.7	29.2
Panel B: Distribution by sector of activity (%)			
Public Administration	34.8	37.7	24.9
Defense and security	11.8	5.5	20.1
Education	30.0	29.1	19.0
Health	14.7	17.7	12.8
Others	8.6	10.0	23.1
Total	100.0	100.0	100.0
Panel C: Distribution by type of occupation (%)			
Managers	5.0	7.6	3.3
Professionals	31.7	31.0	23.9
Technicians	20.3	14.2	13.9
Clerical	28.8	31.2	41.3
Elementary	14.1	16.1	17.6
Total	100.0	100.0	100.0
Panel D: Distribution by level of government (%)			
National government	16.0	11.2	38.1
Subnational governments	84.0	59.3	16.6
Unclassified	0.0	29.5	45.3
Total	100.0	100.0	100.0

Notes: This table presents results of size and composition of public sector employees by country. Panel A shows the share of public sector over total and formal employment and the share of public sector wage bill over total and formal employment. Panel B presents distribution of public sector employees by sector of activity, Panel C presents distribution by type of occupation and Panel D presents distribution by level of government. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C, ENOE and ECH from 1Q2017 to 4Q2019.

3.2 | Public sector employment in subnational governments

Our main interest lies in analyzing the characteristics of public sector employees at subnational levels of government. Subnational governments are significant economic and social actors in these three countries, especially in the cases of Brazil and Mexico, two of the most decentralized countries in Latin America. Subnational governments account for 84% of all public employment in Brazil and for a similar figure in Mexico if we consider only public employees for whom it is possible to know the level of government to which they belong. In Uruguay, on the other hand, only 30% of public employees (among those who can be classified by level of government) belong to a subnational entity.[10]

As already pointed out, we can only compare national to subnational public sector employees in a consistent fashion across the three countries if we restrict the analysis to those bureaucrats working in the public administration sub-sector. Table 3 shows such

[10]With the information available, we are not able to identify the level of government for 30% of public employees in Mexico and for 45% of public employees in Uruguay. For more details about the data and workers classification by level of government see section 2.

comparison.[11] An important dimension in which subnational bureaucrats seem to differ systematically from national ones is education. In all three countries, employees at the national public administration are more educated than those working at subnational levels of government. As an example, the fraction of bureaucrats in the national government with complete tertiary education reaches 77% in Brazil, 58% in Mexico, and 45% in Uruguay, while the corresponding fractions in subnational governments are, respectively, 44%, 41%, and 17%.[12] These differences in education are reflected in the type of occupation held by national and subnational workers. In all three countries, the share of professionals and technicians is much higher at the national level of government than at subnational levels, while the opposite is true with the share of elementary workers. As far as demographic characteristics are concerned, there is no clear pattern of differences between national and subnational workers in the three countries. Workers in subnational public administration are more likely to be female than their national counterpart in Brazil, but less likely to be female in Mexico and Uruguay. In terms of age, subnational bureaucrats are slightly younger in Brazil, slightly older in Mexico, and of similar age in Uruguay, with respect to national ones.

TABLE 3 Characteristics of public administration employees by level of government

	Brazil		Mexico		Uruguay	
	Subnational	National	Subnational	National	Subnational	National
Female	50.3	44.2	43.5	47.3	43.1	56.1
Age group						
34 or less	25.1	19.3	29.9	32.5	18.1	21.2
35-50	42.2	39.4	42.6	42.7	41.0	35.8
51 or more	32.7	41.3	27.5	24.7	40.9	43.0
Education level						
Incomplete secondary or less	17.4	2.6	30.1	9.9	45.3	18.4
Complete secondary	29.9	13.7	22.8	24.6	27.7	22.4
Some tertiary	8.5	6.6	5.6	7.4	9.9	14.6
Complete tertiary	44.1	77.1	41.5	58.1	17.2	44.7
Type of occupation						
Managers	6.3	4.4	10.4	11.7	4.0	3.5
Professionals	15.9	33.8	12.7	20.6	9.6	30.4
Technicians	26.8	33.9	13.6	16.5	15.4	15.7
Clerical	27.4	25.3	39.7	42.3	44.6	43.3
Elementary	23.6	2.7	23.6	9.0	26.5	6.7
Observations	83,224	11,881	35,707	10,294	1,946	1,635

Notes: The table presents mean of characteristics of public sector employees grouped by level of government. For each country, the first column refers to subnational employees (state and municipal) and the second column refers to national employees. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C, ENOE, ECH from 1Q2017 to 4Q2019.

[11] Table A.2 compares national to subnational workers across the whole public sector in Brazil, the only country in which the data allow to know the level of government for all public employees.

[12] Notice that the typical bureaucrat from a subnational government is still more educated than the average wage earner in the economy, as it can be deduced by comparing these results to those from Table 1.

3.3 | Wages in national and subnational governments

We now compare public sector wages by level of government, restricting the analysis to public administration employees for the reasons outlined above. Figure 1 shows histograms of log hourly pay by level of government in each country in our sample. Brazil stands out for the fact that public sector wages are much higher at the national level than at subnational levels. The wage distribution for individuals working in national public administration stands clearly to the right of the one for those working for subnational governments. The same pattern is observed in the cases of Uruguay and Mexico, although differences in wages that national and subnational governments pay are notably lower.

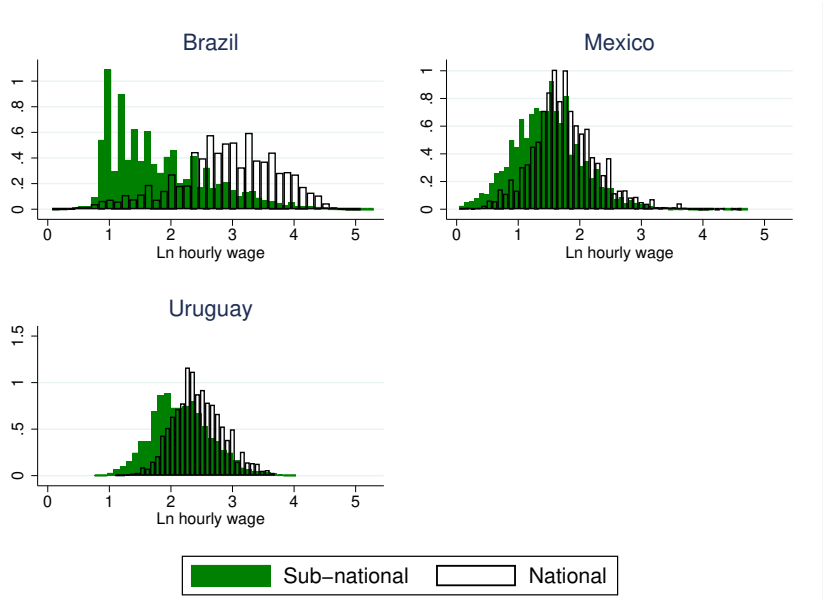

FIGURE 1 Public Administration wage distribution by level of government.

Notes: This figure presents the distribution of public sector employees hourly wages in logarithm by level of government for each country. All sample are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C, ENOE and ECH from 1Q2017 to 4Q2019.

To illustrate better the magnitude of the (raw) wage differential between national and subnational governments in each country, Figure 2 plots this difference by decile of the wage distribution. For each country, each point on the curve shows the average difference between national and subnational wages for workers who are in a certain decile in the wage distribution of the sector in which they work (e.g. a difference of 0.5 log points for decile 1 means that individuals in the first decile of the distribution of national government wages earn 50% more than individuals in the first decile of the subnational government wage distribution). Thus, in the case of Brazil, the difference between national and subnational hourly wages increases from about 50% at the bottom decile of the wage distribution up to about 140% at the 5th decile, and then declines to about 60% for workers in the top decile. In the cases of Mexico and Uruguay, these differences are more stable throughout the wage distribution and of lower magnitude (in the 20% to 30% range).[13]

[13] Table A.3 in the Appendix shows the quartiles of the wage distribution for private wage earners, formal wage earners, national and subnational public administration and the rest of the public sector for each country.

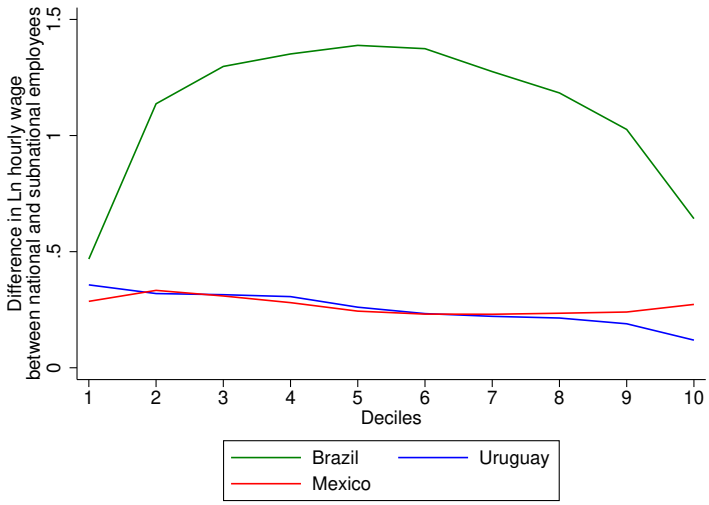

FIGURE 2 National-Subnational wage differential by decile of the wage distribution.

Notes: this figure shows the difference between national and subnational hourly wages in logarithm by decile of the wage distribution. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C, ENOE and ECH from 1Q2017 to 4Q2019.

4 | EMPIRICAL STRATEGY

We start our analysis following the standard approach in the literature to estimate the public sector wage gap (i.e, the relative remuneration of public sector employees with respect to observationally similar private sector employees), which is based on a *mincerean* equation like the following one:

$$wage_{it} = \beta_0 + \beta_1 \text{public sector}_{it} + \Gamma X_{it} + \theta_t + \epsilon_{it} \quad (1)$$

In which $wage_{it}$ is the (natural logarithm of the) hourly wage earned by individual i at time t, $\text{public sector}_{it}$ is a dummy variable that indicates if the individual works at the public sector at time t, X_{it} is a vector of individual characteristics (age and age squared, a dummy for being female, a set of dummy variables for the highest level of schooling achieved, and a set of dummy variables for the type of occupation), θ_t is a vector of time (quarter-year) fixed effects, and ϵ_{it} is an error term. β_1 is the parameter of interest and is informative about the wage gap between public and private employees (conditional on the covariates included in X_{it}).

Given our interest in the earnings of public sector employees by level of government, we disaggregate the dummy variable $\text{public sector}_{it}$ in three different categories in the following equation:

$$wage_{it} = \alpha_0 + \alpha_1 NPA_{it} + \alpha_2 SNPA_{it} + \alpha_3 \text{other public sector}_{it} + \Gamma X_{it} + \theta_t + u_{it} \quad (2)$$

In which NPA_{it} is a dummy variable that indicates if individual i works for the national public administration at time t, $SNPA_{it}$ indicates if individual i works for a subnational public administration at time t, and $\text{other public sector}_{it}$ indicates if individual i works for

any other public sector agency at time t. We are only able to separate by level of government for workers in the public administration sector because of the data limitations explained in Section 2.2. The comparison group is still formed by salaried workers in the private sector. α_1 and α_2 are informative about the conditional wage gap between national and subnational public administration employees, respectively, and private sector employees. We are interested in testing whether $\alpha_1 = \alpha_2$ to learn about potential wage differentials between national and subnational government employees.

The interpretation of β_1, α_1, α_2, and α_3 is of a descriptive nature, as these parameters capture both the wage premium of public sector employment and any omitted variable bias induced by the correlation between public sector employment and unobserved individual heterogeneity in earnings potential not controlled for in X_{it} (i.e., a selection term). To deal with this selection term, we take advantage of the rotating panel design of the Brazilian and Mexican surveys and include a set of individual fixed effects τ_i in equations 1 and 2. These individual fixed effects allow us to identify the wage premium of public sector employment net of (time-invariant) individual heterogeneity in potential earnings in the private sector. The identification of the parameters of interest is based on switchers, i.e., individuals transitioning between private and public sector employment (equation 1) and across the different categories of the public sector (equation 2). We cannot implement this strategy for Uruguay because there individuals are only interviewed once—as opposed to five times in the other two countries—and hence we do not include that country in the wage premium analysis.

We estimate equations 1 and 2 separately for each country in a sample of salaried workers (as detailed in Section 2.3) in a pooled cross-sections (without τ_i) and a panel (with τ_i) setting. Standard errors are clustered at the individual level.

5 | THE PUBLIC SECTOR WAGE GAP AND PREMIUM BY LEVEL OF GOVERNMENT

5.1 | The public sector wage gap

Table 4 reports results of estimating equation 1 in the pooled cross–section setting. As its is possible to see in columns (1), (3), and (5), public sector workers command significantly higher hourly wages than private sector ones, conditional on their age, gender, education, and type of occupation. The public sector wage gap is of around 16% in Brazil, 30% in Mexico, and 15% in Uruguay (all point estimates are statistical significant at the one-percent level).

Columns (2), (4), and (6) present results for the estimation of equation 2, which allows us to investigate the heterogeneity in the public sector wage gap by level of government (national/subnational) among public administration workers. In the three countries under analysis, both national and subnational government workers in the public administration sector earn significantly higher wages than private sector workers of similar characteristics. However, subnational employees earn lower wages than their national counterparts (SNPA − NPA). Interestingly, there are important differences between countries in the subnational–national public sector wage gap. In Brazil, the gap is of 78 percentage points, while in Mexico and Uruguay is of around 13 and 9 percentage points, respectively.[14]

[14] Note these percentage points must be interpreted with respect to the hourly wage of private sector workers.

TABLE 4 Public sector wage gap

	Log Hourly wage					
	Brazil		Mexico		Uruguay	
	(1)	(2)	(3)	(4)	(5)	(6)
Public Sector	0.162***		0.297***		0.155***	
	(0.002)		(0.002)		(0.004)	
Public sector by type						
National Public Administration (NPA)		0.960***		0.366***		0.221***
		(0.009)		(0.006)		(0.009)
Subnational Public Administration (SNPA)		0.180***		0.236***		0.129***
		(0.003)		(0.004)		(0.009)
Rest of public sector		0.097***		0.320***		0.133***
		(0.003)		(0.003)		(0.004)
SNPA - NPA		-0.780***		-0.130***		-0.092***
		(0.010)		(0.006)		(0.013)
Observations	1,441,784	1,441,784	751,136	750,746	81,734	80,354

Notes: this table shows the wage gap for public sector employees. For each country, the first column shows the gap between working in the public and the private sector. The second column presents the gaps of different public sector areas and the private sector. The difference between subnational and national coefficients is calculated after the estimation. Robust standard error in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C, ENOE and ECH from 1Q2017 to 4Q2019.

In summary, subnational government workers in the public administration sector earn higher wages than private sector workers, but lower wages than their national government counterparts—with a particularly large gap in Brazil—even after controlling for characteristics like gender, age, schooling, and position in the occupation.

5.2 | The public sector wage premium

We turn now to investigate if the documented wage gaps are in effect the result of a wage premium (i.e., differential pay with respect to potential earnings in the private sector) or are explained by a selection effect. Table 5 presents the results of adding individual fixed effects to equations 1 and 2. As it is possible to observe in columns (1) and (3), the public sector wage premium is positive and significant in both Brazil and Mexico—as said before, we cannot implement this exercise for Uruguay. In the case of Brazil, workers who enter(exit) the public sector earn wages around 7% higher(lower) than in the private sector, while in Mexico that premium amounts to around 22%. In both countries, the public sector wage premium is lower than the wage gap by around 9 percentage points (16% vs. 7% in Brazil, and 30% vs. 22% in Mexico). In other words, taking into account unobserved heterogeneity across individuals leads to a reduction of the observed wage gap across sectors. This implies that there is a positive selection into the public sector of individuals with high earnings potential.

Columns (2) and (4) present results for the public sector wage premium by level of government. In all cases, being a public sector worker entails a significant wage premium

TABLE 5 Public sector wage premium

	Log Hourly wage			
	Brazil		Mexico	
	(1)	(2)	(3)	(4)
Public Sector	0.074***		0.223***	
	(0.004)		(0.010)	
Public sector by type				
National Public Administration (NPA)		0.118***		0.225***
		(0.012)		(0.015)
Subnational Public Administration (SNPA)		0.080***		0.213***
		(0.004)		(0.011)
Rest of public sector		0.070***		0.228***
		(0.004)		(0.011)
SNPA - NPA		-0.038***		-0.012
		(0.011)		(0.012)
Observations	1,441,784	1,441,784	751,136	750,746
Individuals	579,516	579,516	376,832	376,703
Switchers	82,869	82,869	30,180	30,180

Notes: this table shows the wage premium for public sector employees. For each country, the first column shows the premium of working in the public over the private sector. The second column presents the premium of different public sector areas over the private sector. The difference between subnational and national coefficients is calculated after the estimation. Robust standard error in parenthesis clustered at individual levels. *** p<0.01, ** p<0.05, * p<0.1. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C and ENOE from 1Q2017 to 4Q2019. Individuals is the total of individuals in the sample, switchers is the total of switches individuals made between sectors.

with respect to being employed in the private sector. In line with the previous results, wage premiums are lower than the corresponding wage gaps reported in Table 4. The contrast between the wage premium and the wage gap between national government and private sector employees in Brazil (12% vs. 96%) stands out. This difference indicates that most of the large wage gap of national government workers in Brazil is explained by the positive selection of individuals with high-earning potential to this level of government. Turning into differences within the public administration sector, we observe a significant but small wage premium to be employed in the national vs the subnational level of government in Brazil—of around 3.8 percentage points—while in Mexico we do not find a significant difference in the premium of both levels of government. In other words, the results indicate that once individual-specific heterogeneity is taken into account, the average difference in earnings between national and subnational employees in the public administration sector varies from small in Brazil to null in Mexico.

As detailed in Section 2.2, the Brazilian survey allows us to identify the level of government to which all public sector employees are attached, including the precise level of subnational government in which they work: state or municipal. We use this more comprehensive information to study whether there are wage differentials between these two levels of subnational government in the Brazilian context, with the additional advantage of not

having to restrict the analysis to the public administration sector. As a first approximation, Figure 3 shows the distribution of wages by the three levels of government. Interestingly, there seems to be a hierarchy among wage distributions that mimics the hierarchy among levels of government.

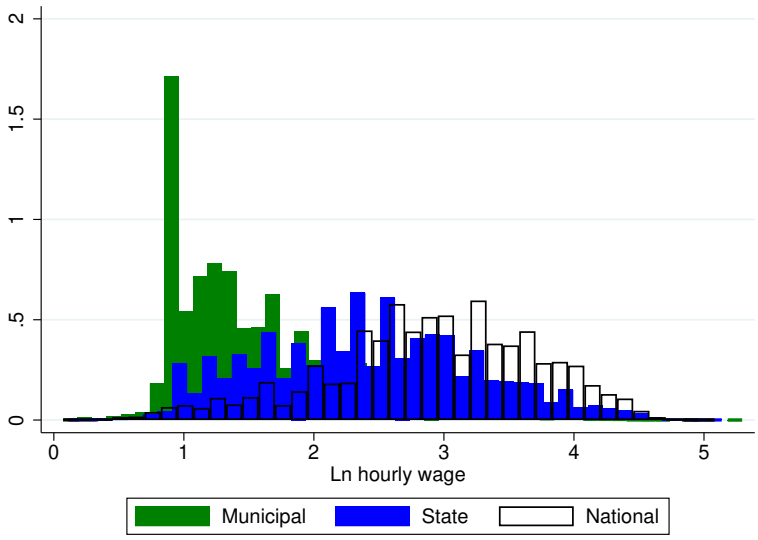

FIGURE 3 Brazil: Wage distribution of public administration employees by level of government.

Notes: This figure presents the distribution of public sector employees hourly wages in logarithm by level of government. Subnational level is desegregated in state and municipal. All sample are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C from 1Q2017 to 4Q2019.

Table 6 reports results for the wage gap—column (1)—and premium—column (2)—with respect to the private sector across levels of government. The regression estimates confirm the wage hierarchy observed in Figure 3. National government employees earn on average around 84% more than their private sector counterparts, state government employees around 38% more, and municipal employees around 4% less—again, conditional on age, gender, schooling, and position in the occupation. These wage gaps are significantly different from each other from both the economic and statistical point of view (rows 4–6). The negative wage gap of municipal employment stands out, in contrast to the large positive gaps of national and state government employment. We observe the same wage hierarchy among levels of government when looking at the wage premium, but—as expected—taking into account individual heterogeneity reduces the estimated point estimates for national and state government employment. The national government wage premium is approximately 14%, while the state and municipal government premia are around 11% and 6%, in all cases with respect to the private sector. Again, these premia are significantly different from each other. The change in the sign of the estimated wage premium vs wage gap of municipal employment is noteworthy and suggests that there is selection into this level of government of individuals with low earnings potential, as opposed to what happens in national and state government employment.

TABLE 6 Brazil: Public service wage gap and premium by level of government

	Log Hourly wage	
	Gap	Premium
	(1)	(2)
National	0.839***	0.139***
	(0.006)	(0.010)
State	0.377***	0.107***
	(0.004)	(0.006)
Municipal	-0.040***	0.063***
	(0.002)	(0.005)
State - National	-0.462***	-0.032***
	(0.007)	(0.010)
Municipal - National	-0.879***	-0.076***
	(0.006)	(0.010)
Municipal - State	-0.417***	-0.044***
	(0.004)	(0.006)
Individual FE	NO	YES
Observations	1,406,355	1,406,355
Individuals		573,884
Switchers		76,881

Notes: this table shows the wage gap and premium for public sector employees for Brazil, desegregating subnational into state and municipal. The first column shows the gap of working in some level of the public over the private sector. The second column presents the premium results. The difference between subnational and national coefficients is calculated after the estimation. Robust standard error in parenthesis clustered at individual levels in the second column. *** p<0.01, ** p<0.05, * p<0.1. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C from 1Q2017 to 4Q2019. Individuals is the total of individuals in the sample, switchers is the total of switches individuals made between sectors.

5.3 | Robustness checks

The use of the panel structure of the Brazilian and Mexican surveys allows us to estimate the wage premium to public sector employment net of selection effects, but it comes at a cost. Note that the inclusion of individual fixed effects means that the estimation of wage premia comes from individuals who switch between employment status; but since the dummies capturing employment status are susceptible to measurement error, some switches in the data are likely to be false. This can bias the coefficients of the wage premium towards zero—a fact well known from the literature on union wage effects (Freeman, 1984). This is more concerning in the specifications disaggregate public sector employment (by level of government), as a more precise definition of the type of employment held requires more precision on the recording of this variable during the survey interview Hence, we now investigate the robustness of the results to measurement error in the public sector employment variables.

We drop from the sample individuals with unlikely transitions between categories of employment, whom we call *odd switchers*. We define as unlikely transitions those in which an individual goes from a given employment category to another category and then returns

to the initial one during the time in which she is observed in the data (up to five quarters in both surveys). For example, if we observe that an individual goes from the national government to the subnational government and back, we assume this is more likely a sign of measurement error in the employer information in a particular wave than a real transition. Columns (1) and (3) in Table 7 presents the results from this exercise for the aggregated public sector wage premium. In both cases, the magnitude of the point estimate is larger than the one estimated in the previous table (0.085 versus 0.074 in Brazil and 0.237 versus 0.223 in Mexico), which indicates the presence of some bias due to measurement error in the main estimation, although small. Columns (2) and (4) presents results for the dissagregated wage premium. Again, the magnitude of the estimated coefficients are larger than those presented in Table 7, but the difference is small. A similar finding emerges from performing the same exercise on the results presented in Table 6 (see Table A.4)

TABLE 7 Public sector wage premium - Robustness checks

	Log Hourly wage			
	Brazil		Mexico	
	No odd switchers		No odd switchers	
	(1)	(2)	(3)	(4)
Public Sector	0.085***		0.237***	
	(0.005)		(0.012)	
Public sector by type				
National Public Administration (NPA)		0.132***		0.240***
		(0.016)		(0.018)
Subnational Public Administration (SNPA)		0.091***		0.227***
		(0.006)		(0.014)
Rest of public sector		0.080***		0.243***
		(0.005)		(0.013)
SNPA - NPA		-0.041***		-0.013
		(0.016)		(0.016)
Observations	1,359,720	1,359,720	728,517	728,132
Individuals	551,977	551,977	368,231	368,102
Switchers	40,542	40,542	21,149	21,149

Notes: this table presents the wage premium for public sector employees robustness check. For each country, the first column shows the premium of working in the public over the private sector. The second column presents the premium of different public sector areas over the private sector. Odd switchers were left out the sample. An individual is considered an odd switcher if, between quarters, after she changed to an other sector of employment, she comes back to a sector she was employed before. The difference between subnational and national coefficients is calculated after the estimation. Robust standard error in parenthesis clustered at individual levels. *** p<0.01, ** p<0.05, * p<0.1. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C and ENOE from 1Q2017 to 4Q2019. Individuals is the total of individuals in the sample, switchers is the total of switches individuals made between sectors.

5.4 | Wage differentials across governments of the same level

The results presented in the previous sections show how the public sector wage gap and premium vary by level of government. We turn now to study geographic variation in the

wage gap and premium within a given level of government. We keep our focus in Brazil given that the survey from this country offers more detailed information about the level of government to which public sector employees are attached.

Figure 4 plots public sector wage gaps and premiums by level of government and state. Two patterns stand out. First, the wage gap of national government employees varies more across states than the wage gap of state government employees, which in turn shows more dispersion than the wage gap of municipal government employees. This is consistent with a model in which public sector wages adapt less to local labor market conditions than private sector wages because a more rigid wage-setting process and differences in market structure (e.g., one national government vs. a myriad of firms). There is no unique pay scale for the public sector in Brazil and hence it seems sensible that subnational governments be able to set wages closer to those in the private local labor market.

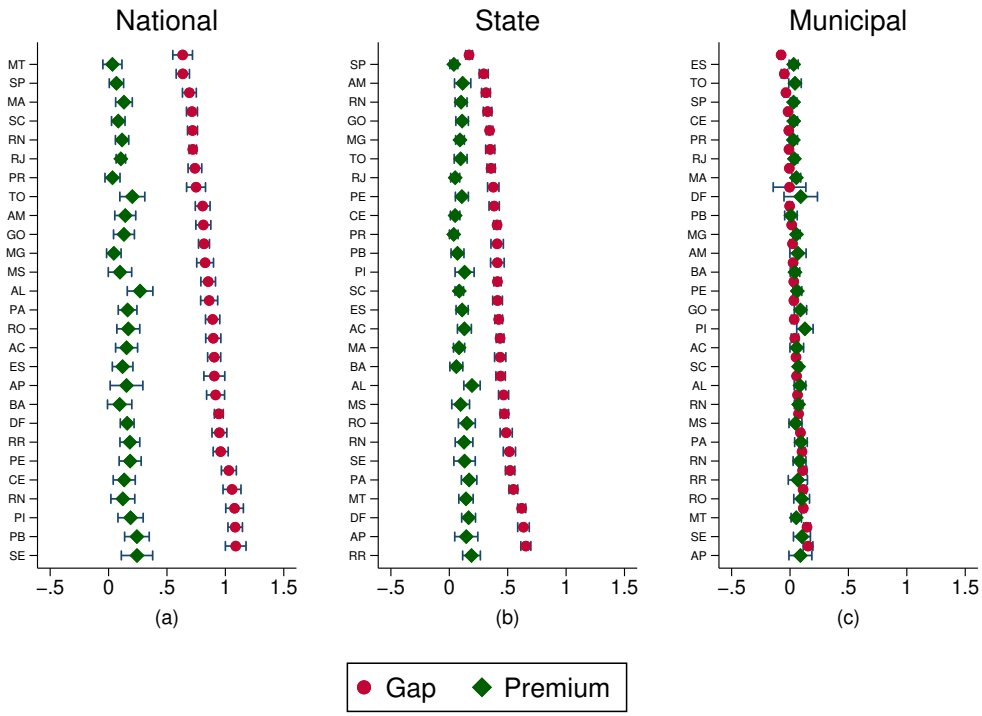

FIGURE 4 Public sector wage gap and premium by state and level of government - Brazil.

Notes: this figure shows the coefficients and its confidence intervals of the hourly wage gap and premium of working in the public sector by level of government for Brazil by state. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C from 1Q2017 to 4Q2019.

Second, the cross-state variation in the public sector wage premium is modest (in contrast to that of the wage gap). It is noteworthy that national and state government employees who reside in states with relatively large public sector wage gaps do not receive large premiums, which suggests that these governments are using the larger relative wages to attract individuals with higher earnings potential in the private sector.

Figure 5 presents the correlation between the estimated public sector wage gap (Panel A) and premium (Panel B) and the private sector hourly wage by level of of government and state. As expected, there is a negative association between the public sector wage gap and average private sector wages, which is stronger for higher levels of government. In contrast,

the association between wage premiums to national and state government employment and private sector wages is much weaker.

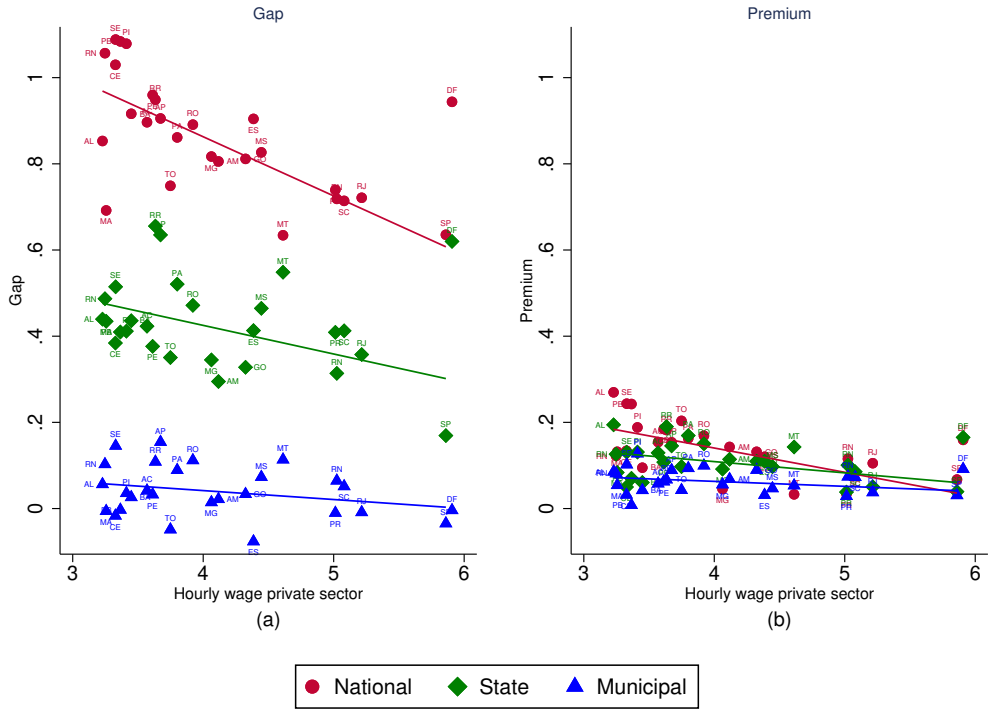

FIGURE 5 Correlation between public sector wage gap and premium and the private sector hourly wage by state and level of government - Brazil.

Notes: this figure shows the correlation of hourly wage gap and premium of working in the public sector by level of government for Brazil by state and the private sector hourly wage. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C from 1Q2017 to 4Q2019.

6 | CONCLUSIONS

Despite the existence of a large literature on the returns to public sector employment, the question of how this returns vary by level of government has received little attention. This omission contrasts with the increasing relevance of subnational governments in the delivery of public services across the developing world—a result of the decentralisation reforms held in the 1990s. Motivated by this research gap, we analysed national household surveys from 14 Latin American countries and identified three instances (Brazil, Mexico, and Uruguay) that allow us to identify the level of government (national or subnational) to which public sector employees are attached.

Our first set of results show that national and subnational government employees from the public administration sector—the most important numerically within the public sector—command significantly higher wages than observationally similar private sector employees in the three countries analyzed. Importantly, national government employees earn significantly higher wages than subnational government employees (again, controlling for observable characteristics). In Brazil and Mexico, we estimate wage premia to public sector employment (as the panel structure of the surveys from those countries allows us to identify the public sector wage premium net of individual heterogeneity). We find that both national and subnational public administration workers receive on average a significant earnings premium. Interestingly, the difference between the national government and subnational government premia is small in Brazil and null in Mexico. We go further and analyze separately national, state, and municipal employees in Brazil—where the data makes it possible. We find wage gaps and premia that mimic the hierarchy of the levels of government (e.g, higher for state than for municipal government employees).

Together, our results indicate that the large wage gap between public and private sector employees observed in the three countries is explained by both the hiring of individuals with higher-than-average productivity (as proxied by higher earnings in the private sector) and a wage premium. However, the analysis on Brazil reveals that not all levels of government offer average wages above private sector standards, as we observe for municipal governments in that country. There, the combination of relatively lower average public sector wages and a positive wage premium indicates that municipal government employees are negatively selected in terms of earning potential, which is consistent with the growing evidence on the practice of patronage in public employment in that level of government in Brazil (Akhtari et al., 2020; Colonnelli et al., 2020; Brassiolo et al., 2021; Toral, 2021).

This paper documents significant variation across (and within) levels of governments in how public sector employees are payed—and in the selection patterns behind the returns to public sector employment—in three Latin American countries. Results call for further research to better understand the profile and selection pattern of subnational government workers, who are increasingly important for the delivery of public services, but still much less studied than their national counterparts.

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A | APPENDIX: TABLES AND FIGURES

TABLE A.1 Public sector employees by level of government

	Brazil	Mexico	Uruguay
National	46,496	13,410	7,122
Subnational	256,953	69,422	3,334
Unclassified	0.0	34,023	9,017
Total	303,449	116,855	19,473

Notes: This table presents results of frequencies of level of government of public sector employees by country. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C, ENOE and ECH from 1Q2017 to 4Q2019.

TABLE A.2 Characteristics of public sector employees by level of government

	Brazil	
	Sub-national	National
Female	59.5	34.4
Age group		
34 or less	24.4	33.3
35-50	46.4	38.2
51 or more	29.3	28.5
Education level		
Incomplete secondary or less	12.7	4.5
Complete secondary	29.7	23.3
Some tertiary	7.6	7.6
Complete tertiary	49.9	64.5
Type of occupation		
Managers	4.0	4.6
Professionals	30.2	28.2
Technicians	18.5	17.4
Clerical	26.5	21.5
Elementary	14.2	2.5
Sector of activity		
Public Administration	36.1	30.7
Defense and security	11.1	25.7
Education	34.0	19.2
Health	15.3	7.3
Others	3.6	17.1
Observations	228,984	39,004

Notes: This table presents characteristics of public sector employees by level of government for Brazil. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C from 1Q2017 to 4Q2019.

TABLE A.3 Wage distribution moments - PPP dollars

	P(25)	P(50)	P(75)	P(90)	Mean
Brasil					
Private wage earners	430	594	849	1,375	851
Formal wage earners	458	637	1,062	1,934	1,025
National Public Adminstration	1,719	3,167	5,266	8,335	3,933
Sub-national Public Adminstration	500	825	1,667	3,126	1,438
Rest of Public Sector	552	1,042	1,719	2,972	1,473
Mexico					
Private wage earners	410	533	721	1,001	641
Formal wage earners	454	594	820	1,201	733
National Public Adminstration	691	931	1,304	1,908	1,138
Sub-national Public Adminstration	494	708	954	1,431	846
Rest of Public Sector	649	858	1,184	1,717	1,020
Uruguay					
Private wage earners	796	1,073	1,525	2,222	1,322
Formal wage earners	894	1,227	1,719	2,488	1,481
National Public Adminstration	1,275	1,616	2,242	2,951	1,861
Sub-national Public Adminstration	959	1,281	1,726	2,377	1,473
Rest of Public Sector	1,074	1,403	1,900	2,596	1,609

*Notes:*This table presents moments of the wage distribution for private wage earners, formal wage earners, national and subnational public administration and the rest of the public sector for each country. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C, ENOE and ECH from 1Q2017 to 4Q2019.

TABLE A.4 Brazil: Public service wage premium - Robustness checks

	Log Hourly wage
National	0.152***
	(0.013)
State	0.119***
	(0.008)
Municipal	0.073***
	(0.007)
State - National	-0.033***
	(0.012)
Municipal - National	-0.078***
	(0.013)
Municipal - State	-0.045***
	(0.007)
Individual FE	YES
Observations	1,330,457
Individuals	546,487
Switchers	37,912

Notes: This table presents results of robustness check for Brazil wage premium by level of government estimation. Odd switchers were left out the sample. An individual is considered an odd switcher if, between quarters, after she changed to an other sector of employment, she comes back to a sector she was employed before. The difference between levels of government is calculated after the estimation. Robust standard error in parenthesis clustered at individual levels. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. All samples are restricted to individual between 18 and 65 years old who declare positive wages. Data comes from national household surveys: PNAD-C from 1Q2017 to 4Q2019. Individuals is the total of individuals in the sample, switchers is the total of switches individuals made between sectors.