WPS5858

Policy Research Working Paper 5858

Higher Wages, Lower Pay

Public vs. Private Sector Compensation in Peru

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The World Bank
Latin America and the Caribbean Region
Economic Policy Unit
October 2011

Abstract

Do public sector employees earn less than their counterparts in the private sector? This paper addresses this question in the case of Peru, a country where civil service reform is being debated yet the only available empirical studies on wage differentials date back to the late 1980s. Using data from the 2009 national household survey, the authors perform a multiple step analysis. First, they estimate a single equation with a public sector dummy, which is found to be statistically significant and *positive* when only monetary wages are taken into account. However, when in-kind payments and bonuses are included to measure compensation, the analysis finds a private sector premium. Second, they estimate for public and formal private employees two distinct wage functions, including the inverse Mills ratio. This takes into account the selection bias resulting from workers self-selecting into the public or private sector. Third, these results are used to decompose wage differentials using the standard Oaxaca-Blinder approach. The results show that the compensation differentials are not significant except for the sub-sample of employees that achieved a postgraduate degree.

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Higher Wages, Lower Pay: Public vs. Private Sector Compensation in Peru

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JEL Classification: J31, J38

Keywords: public-private sector pay, Peru

[1] Corresponding author: acoppola@worldbank.org. We would like to thank, without implicating, Barbara Cunha, Julián Messina, Elizaveta Perova, and Jamele Rigolini for guidance on the methodology used in this paper, as well as comments from Jonas Frank and Mariano Lafuente and seminar participants, including Jorge Arrunátegui, Eduardo Beteta, Flor Blanco, Franklin Huaita, Miguel Jaramillo, and José Valdivia. The findings, interpretations, and conclusions expressed in this paper are those of the authors and do not necessarily reflect the views of the World Bank and its affiliated organizations, or those of the Executive Directors of The World Bank or the governments they represent.

1. Introduction

Public sector wages are often under the political spotlight. When governments face budgetary pressures public sector wages are one of the areas where governments can make meaningful adjustments, as the wage bill typically forms a significant portion of public expenditures. But public sector pay can also come under the spotlight in good times. For example, politicians in office may want to signal their austerity by pointing to public sector wage freezes. At the same time, public sector compensation needs to be high enough to attract skilled workers to perform the duties of the public administration.[2] At times, the political will to show fiscal restraint and the practical need to keep the public administration running leads to creative solutions by which public salaries may be frozen but supplementary payments or benefits are raised so as to increase compensation. All of this makes it more difficult to know the true compensation of public sector employees and how their compensation compares with that of workers in the private sector. Yet, answers to those questions are indeed informative for any evidence-based policy discussion on public sector pay.

Whether public sector wages are higher or lower than in the formal private sector is a particularly relevant piece of information for countries that are considering civil service reform options. One such country is Peru, where since 2008 a new Civil Service Public Authority (*Autoridad Nacional del Servicio Civil – SERVIR*) has been tasked with the goal of modernizing the public administration through the implementation of a civil service reform. In fact, the 2011 budget law calls on the Ministry of Economy and Finance to put forward by June 30, 2011 a draft law to reform public sector pay.[3] It is in this context that the paper aims to contribute to the policy discussion by providing an empirical analysis of public-private sector wage differentials in Peru.

The contribution of this paper is threefold. First, we show that any analysis of public-private sector pay differentials ought to take into account not only wages but also in-kind payments and bonuses that employees may receive. This is an issue that is seldom raised in the existing literature, which typically focuses only on monetary wages.

Second, the analysis of pay differentials in Peru is timely since the existing evidence on public-private sector wage differentials in Peru dates back to the late 1980s (Van der Gaag, Stelcner

[2] As many authors have noted, the secure nature of a public sector job may imply that compensation in the public sector may not need to be as high as in the private sector while still attract qualified workers. Still, whether the compensation level needed to attract skilled staff is equal to or lower to the compensation observed in the private sector, it is reasonable to think that there is a certain level of pay below which the public administration would find it difficult to attract and retain qualified staff.

[3] In addition, SERVIR has been mandated by Law 29615 of November 18, 2010 to propose a set of five basic laws covering civil service reform, one of which refers to public sector pay.

and Vijverberg, 1989). After more than 20 years from the contribution of Van der Gaag, Stelcner and Vijverberg, econometric analysis can take advantage of the large amount of household data currently available for Peru. We compare public sector and formal private sector wages by using 2009 data from the Encuesta Nacional de Hogares (ENAHO). The ENAHO is a rich source of information. Using ENAHO data, the analysis of public-private sector wage differentials can be based on more than 16,000 observations. The large amount of information available allowed controlling for variables which might affect the wage levels, such as the level of education, the working experience, the gender, the marital status and the location (urban/rural) of the employees included in the sample.

Finally, this paper investigates how much of the difference between public and formal private sector wages is actually driven by the specific characteristics of the individuals employed in each sector. The evaluation of the remaining part, i.e. the "unexplained difference" of the wage differential will provide valuable information to determine whether public sector employees in Peru earn a wage premium which is independent from their specific characteristics and skills. To breakdown the wage differentials into an explained and an unexplained part, the Oaxaca-Blinder approach is used.

The topic of wage differential in Peru has been already considered in the past. In the late 1980s, Van der Gaag, Stelcner and Vijverberg (1989) used a switching regression model to show that public sector wages offered in Peru are well below those in the private sector. The rationale behind public sector penalties might be that lower wages in the public sector compensate a less competitive working environment and a level of job security which is obviously higher in the public sector. More recently, empirical contributions which based their estimations on 1990s household survey data (Panizza and Quiang, 1999; Panizza, 2001) found evidence of a public sector premium in Latin America, particularly for female workers. Empirical evidence of a public sector premium has been found also outside Latin America. Heitmueller (2006) found evidence of a public sector premium for women in Scotland by using a switching regression model. Gibson (2009) found a public sector premium in Australia, Canada, Great Britain and United States by using propensity score matching. According to the theoretical literature, public sector premia might be the result of different factors, including: (i) a higher level of unionization in the public sector (Holmlund, 1993); (ii) softer budget constraint faced by the public sector (Gregory and Borland, 1999); (iii) tighter no-shirking constraint in the public sector, given the higher firing costs (Panizza, 2001).

The structure of the note is the following: after this introduction, section 2 describes the data and the variables used; section 3 explains the methodology adopted; section 4 shows the results of the estimations; finally section 5 concludes.

2. Data

The data used in this study are drawn from the national household survey (the *Encuesta Nacional de Hogares*, ENAHO) carried out by the Peruvian *Instituto Nacional de Estadística e Informática* (INEI). The ENAHO is an invaluable source of information which in 2009 covered more than 20,000 households. The survey collects extensive data on socioeconomic information as well as labor force activities, including whether the members of the households work in the public or the private sector, both formal and informal.[4] Based on 2009 survey, 15,613 employees provided information on their salary and the sector where they work (public or private). In particular, wage data are available for 3,670 public sector workers and 11,943 private sector workers (see Table 1).[5] Only one-third of these private sector workers have a formal contract (4032 private sector employees have a formal contract).

In order to analyze the differential between public sector and private sector pay, compensation has been computed by aggregating wages, in-kind payments, and bonuses. In addition, we focus on hourly compensation rather than annual earnings. As discussed by Blinder (1976) and Blomquist (1978), the estimation of an earning function based on annual earnings may confound pay differences and issues related to the amount of labor supplied. Based on descriptive statistics in Table 1, public sector pays higher wages than the private sector (8.81 vs 4.34 Nuevos soles per hour). Also total hourly compensation is higher in the public sector (9.38 vs 5.29 Nuevos soles).[6] However, caution is needed to interpret these results because of the different characteristics among workers in the two sectors and the fact that the private sector includes both formal and informal workers.

Table 1 also displays data on education attainment, age, marital status and whether workers live in an urban or rural location. Data shows that public sector employees achieved, on average, higher levels of education. The average age in the public sector is 41 years. Workers are younger in the private sector (32 years). The percentage of married employees and female employees is higher in the public sector.[7]

[4] In 2010, ENAHO won the first prize of the World Bank Award to the Innovation in Statistics.

[5] Public and private sector workers are defined based on their responses to the ENAHO (question #510). Different classifications have been used to test for the robustness of the compensation differential analysis (i.e., including/excluding soldiers, public company employees, special service firms (SERVICE) employees). Results are qualitatively the same.

[6] It is important to note that private sector employees work longer hours. Because of this, take-home pay might be higher for private sector employees even if hourly compensation is lower.

[7] Two tables summarizing descriptive statistics for the female (Table A.1 – Panel A) and male population (Table A.1 – Panel B) are provided in Annex 1.

Table 1. Descriptive Statistics

Population Characteristics	All	Public Sector	Private Sector	Formal Private Sector
Number of observations	15613	3670	11943	4032
Average # of hours worked per week	43.6	40.6	44.5	49.6
Average hourly wage	5.39	8.81	4.34	7.01
Employees receiving in kind compensation	43.1%	24.7%	48.7%	50.7%
Average in kind compensation per hour	0.33	0.09	0.41	0.46
Employees receiving bonus over the last year	35.1%	64.0%	26.3%	61.9%
Average hourly value of bonus	0.53	0.48	0.54	1.58
Total Hourly Compensation (including in-kind compensation and bonuses)	6.25	9.38	5.29	9.05
Completed & Non-Completed Primary	17.7%	5.6%	21.4%	7.5%
Completed & Non-Completed Secondary	41.8%	22.2%	47.9%	38.7%
Non-Completed Post-Secondary	12.1%	10.8%	12.5%	16.3%
Completed Post-Secondary (Non-University)	13.9%	24.6%	10.6%	19.3%
Completed Post-Secondary (University)	11.9%	29.0%	6.6%	15.4%
Completed Post-Secondary (Postgraduate)	2.6%	7.8%	1.0%	2.8%
Average Age	34.2	40.6	32.3	35.2
Females	32.8%	42.5%	29.8%	30.1%
Married	27.1%	44.8%	21.7%	32.3%
Urban (>400 households)	75.0%	81.2%	73.1%	90.0%

Note: The average of in-kind compensation and bonus is computed at the sector level

A preliminary analysis of the statistical distribution of public and private sector wages seems to suggest the existence of a public sector premium in Peru. The comparison of the distributions of public sector and private sector wages (see Graph 1) suggests three main differences: (a) the mean for public sector wages is higher than in the private sector; (b) the skewness of the public sector wage distribution is negative whereas the skewness of the private sector wage distribution is positive; (c) the standard deviation of the private sector distribution is larger. Two preliminary hypotheses stem from these findings: (i) the higher variation in private sector wages could be the consequence of the higher degree of informality in the private sector (many employees without a contract which earn much lower wages); (ii) the differential between means in the two sectors (and the negative skewness of the public sector distribution) might be the consequence of a public sector that hires, on average, people with a higher level of education. Descriptive statistics in Table 1 support these hypotheses.

The higher degree of informality in the private sector could play an important role in explaining wage differentials. A comparison between public sector and private sector needs to take into account the issue of the higher degree of informality that exists in the private sector. The analysis of ENAHO data shows that: (i) a large number of individuals working in the private sector do not have a formal contract; (ii) individuals without a formal contract earn much lower salaries. As a consequence, it is important to control for the "informality issue" in order to perform a consistent comparison between public and private sector wages. To address this issue, all the private sector employees without a formal contract have been excluded from the analysis. [8] Therefore, the focus of the analysis will be on the comparison between public sector and formal private sector workers (columns 2 and 4 of Table 1, respectively).[9]

Higher levels of education might explain the higher average level of compensation in the public sector. On average, the public sector hires more educated people than the private sector. Based on the sample of ENAHO, more than 60% of public sector workers completed some kind of post-secondary education and only 5.6% of employees did not start a secondary education course. In contrast, the percentage of private sector workers with a post-secondary degree (18.2%) is lower than the share of public sector workers that completed just primary education (21.4%). Interestingly, the average education level of private sector workers improves significantly when we exclude from the sample those workers without a formal contract. A significant part of formal private sector workers (37.5%) achieved a post-secondary education level whereas only 7.5% did not start a secondary education course (see Table 1). People with higher education tend to earn higher wages; average salaries in the public sector may be higher as a result of the differential of the education in the labor forces. To take this issue into account, we distinguished between people with higher or lower education while comparing public and privates sector wages. If higher education is one of the drivers of higher wages in the public sector, wage differentials should shrink once we control for the level of instruction. Results in Figure 2 corroborate this hypothesis.

The analysis of the statistical distributions of compensation for each education levels provides additional information (see Figure 3).[10] The public sector distribution for the three highest

[8] The issue of formality has been considered under the legalistic definition based on the right to a retirement pension linked to employment. Even if data on the right to a retirement pension are not directly available, the existence of a formal contract between employer and employee is considered to be a reasonable signal of formality.

[9] The analysis of the distribution of public sector and formal private sector compensation allows to compute and compare wage compression ratios in Peru. The compression ratio, computed as the ratio between the 90th percentile and the 10th percentile of the population, is much higher in the formal private sector (9.4) than in the public sector (3.1).

[10] Female and male pay distributions for each education level are presented in Annex 1 (Table A1.2 – Panel A and Panel B).

education levels is significantly leptokurtic whereas private sector distributions are much flatter. Moreover, the right tail of the private sector pay distribution is heavier than the right tail of public sector pay distributions for each level of education and, in particular, for post-secondary education levels. The shape of the distributions suggests the signaling power of a post-secondary degree in the public sector. Once a particular post-secondary degree is achieved, compensation hovers around a certain level without major variations. On the contrary, private sector wages differ significantly within the same level of education. This higher degree of variation is probably the consequence of a closer link between performance and compensation in the private sector.

3. Methodology

To analyze the differential between public sector and private sector compensation in Peru we followed three different estimation approaches. The first approach consisted in estimating a Mincerian regression with a dummy variable to reflect whether an employee is working in the public sector or not, as in Rees and Shah (1995):

$$\ln(W_i) = X'\beta + \gamma D_i^{Pub} + \varepsilon_i \qquad \text{(Eq. 1)}$$

where $\ln(W_i)$ represents the log of the hourly compensation of the i-th worker; X is a matrix of explanatory variables (education[11], experience, gender, marital status, and urban/rural location); D_i^{Pub} is a dummy which is equal to 1 when the i-th worker is employed in the public sector; and ε is the error term. In this setup, we will pay particular attention to the coefficient γ. A positive and statistically significant coefficient for γ would indicate the presence of a public sector premium.

As a second approach, we distinguished two different Mincerian equations for the public and the formal private sector. In contrast to Equation (1), by estimating two separate equations we allow the coefficients on the explanatory variables (the vector β) to differ according to the sector considered. As underlined by Panizza, this allows us to capture different returns to education, experience and other individual-specific characteristics across sectors. This implies the estimation of the following two equations:

[11] The education dummy variables measure the level of education achieved by each individual, including: non-completed and completed primary education; non-completed and completed secondary education; non-completed post-secondary education; completed post-secondary education (non-university); completed post-secondary education (university); completed post-secondary education (postgraduate). Each single dummy variable takes value 1 if an individual achieved a level of education equal or higher than the level measured by the dummy variable. For instance, if an individual has completed secondary education, dummy variables for primary and secondary education will take value 1; dummy variables for non-completed and completed post-secondary education will take value 0.

$$\ln\left(W_i^{Pub}\right) = X\beta^{Pub} + \varepsilon_i^{Pub} \qquad \text{(Eq. 2)}$$

$$\ln\left(W_i^{Pri}\right) = X\beta^{Pri} + \varepsilon_i^{Pri} \qquad \text{(Eq. 3)}$$

Crucially, the results from estimating these regressions can be used to decompose the raw differences in average earnings between the public and the private sector into: (i) difference explained by worker characteristics (endowments) and (ii) unexplained difference, that is thought to be related to different returns to worker characteristics across sectors (Blinder, 1973; Oaxaca, 1973). For example, the extent to which education affect wages might be different in the public and private sector. Formally, this is shown in Equation (4) below:

$$\overline{W^{Pri}} - \overline{W^{Pub}} = \left[\left(\overline{X^{Pri}} - \overline{X^{Pub}}\right)\beta^*\right] + \left[\overline{X^{Pri}}\left(\beta^{Pri} - \beta^*\right) + \overline{X^{Pub}}(\beta^* - \beta^{Pub})\right] \qquad \text{(Eq. 4)}$$

where $\overline{W^{Pub}}$ and $\overline{W^{Pri}}$ are the mean log hourly wages of workers in public and formal private sector, respectively; $\overline{X^{Pri}}$ and $\overline{X^{Pub}}$ are the mean characteristics of workers in the two sectors; β^{Pub} and $\beta^{Pri}$are the vectors of returns to worker characteristics estimated from (2) and (3); and β^* is a "non-discriminatory" vector of coefficients which measures the return to worker characteristics that would exist if returns would not differ across sectors. Therefore, we have a "two-fold" decomposition where the first component – $\left(\overline{X^{Pri}} - \overline{X^{Pub}}\right)\beta^*$ – is the part of the pay differential that is "explained" by group differences in the predictors (the "quantity effect") whereas the second component – $\overline{X^{Pri}}\left(\beta^{Pri} - \beta^*\right) + \overline{X^{Pub}}(\beta^* - \beta^{Pub})$ – is the "unexplained part" which can be attributed to discrimination and also captures all potential effects of differences in unobserved variables. Following Reimers (1983), we used the average coefficients over both groups as an estimate for the "non-discriminatory" parameter vector β^*.

The third approach takes a step further by dealing with potential selection bias. If workers are not randomly distributed across sectors (which is plausible, especially if there is a wage differential between sectors), there might be a selection bias problem. OLS estimations for equations (2) and (3) would be biased if some unobserved characteristics which affect wage levels are correlated with characteristics which influence the probability of working in one sector or the other. It is therefore important to model the selection process and underline the consequences of non-random sorting between the public sector and the formal private sector. Van der Gaag, Stelcner and Vijverberg (1989) modeled the selection process as follows:

$$I_i^* = Z_i\gamma + \mathrm{u_i} \qquad \text{(Eq. 5)}$$

where I^* is a partially observed index that describes the selection process. We observe the outcome (public or formal private sector job) depending on whether I^* is positive or negative. We set I = 1 (the worker belongs to the public sector) if $I^* \geq 0$ and I = 0 (the worker belongs to

the formal private sector) if $I^* < 0$. Taking both the wage functions and the selection process into account, the model described by equations (2), (3) and (5) can be summarized as follows (Heckman, 1979):

$$E[W^{Pub}|I^* \geq 0] = X\beta^{Pub} + \frac{\sigma_{Pub,u}}{\sigma_{Pub,Pub}}\lambda_{Pub} \quad \text{(Eq. 6)}$$

$$E\left[W^{Pri}|I^* < 0\right] = X\beta^{Pri} + \frac{\sigma_{Pri,u}}{\sigma_{Pri,Pri}}\lambda_{Pri} \quad \text{(Eq. 7)}$$

where $\sigma_{Pub,Pub}$ and $\sigma_{Pri,Pri}$ are the standard deviations of ε_i^{Pub} and ε_i^{Pri}, respectively; $\sigma_{Pub,u}$ is the covariance between ε_i^{Pub} and u_i; $\sigma_{Pri,u}$ is the covariance between ε_i^{Pri} and u_i; and λ_{Pub} and λ_{Pri} represent the inverse Mills ratio, i.e. the ratio of the normal density function over the cumulative distribution function. If $\sigma_{Pub,u} = \sigma_{Pri,u} = 0$, OLS will yield unbiased estimates of the wage equations (2) and (3). Otherwise, a correction for the selection bias is needed.

Following the same approach of Anós Casero and Seshan (2006), we tackled this issue by adopting a two-stage estimation method. In the first stage, we estimated probit equations to determine which variables affect the probability of working in the public sector and in the private sector. Based on these estimates, a selection term λ (the inverse Mills ratio) was built and added to each wage equation:

$$\ln\left(W_i^{Pub}\right) = X\beta^{Pub} + \theta^{Pub}\lambda^{Pub} + \varepsilon_i^{Pub} \quad \text{(Eq. 8)}$$

$$\ln\left(W_i^{Pri}\right) = X\beta^{Pri} + \theta^{Pri}\lambda^{Pri} + \varepsilon_i^{Pri} \quad \text{(Eq. 9)}$$

This approach allowed estimating the wage regressions consistently by using OLS. Finally, estimates of the selectivity-corrected equations were used to obtain the Oaxaca-Blinder decomposition of wage differentials into an explained part (driven by differences in average worker characteristics) and an unexplained portion (driven by differences in the returns to worker characteristics between the public sector and the formal private sector).

4. Results

The analysis of wage differentials in Peru was performed following the approach outlined in the previous section. The first estimation approach consists in estimating a log-wage equation which includes a dummy variable to control for public sector employment (Rees and Shah, 1995). Estimation results suggest the presence of a public sector premium in Peru when considering only monetary wages. According to the estimations of Equation 1, public sector hourly wages are 1.07 Nuevos soles, or 12 percent higher than in the formal private sector,

ceteris paribus (see Table 2 – Wages Only column).[12] When considering also the impact of in-kind compensation and bonuses, the sign of the public sector dummy changes to negative (see Table 2 – Total Compensation column). Total compensation in the formal private sector is higher (1.06 Nuevos soles per hour, or 11 percent). This underscores the importance of considering non-monetary compensation when comparing salaries in the public and private sector.[13]

Table 2. OLS Estimation Results

Variables	Wages Only	Total Compensation
Public Sector Dummy	**0.070*** **	**-0.059** **
Secondary Education	0.258***	0.286***
Non Completed Post-Secondary	0.198***	0.190**
Completed Post-Sec (non University)	0.169***	0.174***
Completed Post-Sec (University)	0.474***	0.466***
Postgraduate	0.357***	0.364***
Age	0.035***	0.038***
Age Squared (/100)	-0.027***	-0.029***
Female	-0.149***	-0.180***
Married	0.095***	0.116***
Urban	0.096***	0.119***
Observations	7702	7702
R-squared	0.320	0.292

*** p<0.01, ** p<0.05, * p<0.1

The coefficients estimated for the rest of explanatory variables show the expected sign and significance. Education has the expected positive sign on compensation. For example, a worker with secondary education is estimated to have a total compensation 1.33 Nuevos soles higher than a worker who achieved just primary education.[14] Given our modeling strategy, the impact of higher levels of education can be computed using the cumulative impact of all education levels achieved. This is because a worker that has completed post-secondary education would also have completed all lower levels of education.

In keeping with the literature, experience is included in the regression both in levels and squared to account for non-linearities. As expected, experience has a positive non-linear impact

[12] The value of 1.07 Nuevos soles is obtained by taking the exponential of the coefficient γ estimated for Equation 1.

[13] The robustness of results is tested by re-estimating the log-wage equation after dividing employees into three categories: professionals, technical experts and auxiliaries. The results of this robustness test are presented in Annex 2.

[14] The marginal impact is computed by taking the exponential of the coefficient estimated for secondary education (0.286). See footnote 6 for details on the structure of education dummies.

on compensation, which increases until an individual is 65 years old and then starts decreasing. Finally, an additional set of dummy variables was included in Equation 1 to take into account most relevant individual-specific characteristics: gender, marital status and urban/rural location. When focusing on gender, results show that women earn a lower salary than men (1.20 Nuevos soles per hour, or 13 percent of the average compensation). Results also show that hourly wages are higher for married employees (1.12 Nuevos soles per hour) and people living in an urban location (1.13 Nuevos soles per hour). The explanatory power of the model is in line with that of other standard Mincerian regressions.

The second estimation approach consists in estimating the Mincerian regressions separately for the public and the formal private sector (Equations 2 and 3). To do so, we followed a two-step approach to correct for potential selection bias. In the first step, probit equations are estimated to understand which variables affect the probability of working in the public sector or in the formal private sector. The first probit equation estimates the probability of working in the public sector. Therefore, its dependent variable takes value 1 if the i-th worker is employed in the public sector and value 0 if she is a formal or informal private sector employee (results are shown in the first column of Table 3). The second probit equation follows the same approach. Its dependent variable takes value 1 if the i-th worker is a formal private sector employee and value 0 if she is a public sector employee or an informal private sector employee (results are shown in the second column of Table 3).

Table 3. Probit Estimation Results

Variables	Public Sector	Formal Private Sector
Secondary Education	0.762***	0.393***
Non Completed Post-Secondary	0.458***	0.249***
Completed Post-Sec (non University)	0.347***	0.252***
Completed Post-Sec (University)	0.674***	0.261***
Postgraduate	0.283***	-0.073
Age	0.105***	0.092***
Age Squared (/100)	-0.091***	-0.120***
Female	0.211***	-0.517***
Married	0.147***	0.049**
Urban	-0.250***	0.461***
Large cities dummy	-0.653***	0.416***
Observations	3670	4032
Pseudo R-squared	0.261	0.185

McFadden's Pseudo R2 evaluates the goodness-of-fit of the models.
*** p<0.01, ** p<0.05, * p<0.1

All variables included in Equation 1 affect significantly wage levels. Therefore, they are all potentially relevant to affect the selection of the public/private sector and need to be included in the probit equations (Van der Gaag, Stelcner and Vijverberg, 1987). In addition, we included

a large city (more than 100,000 households) dummy in the probit equations. The aim of including the large city dummy is to exploit the information content stemming from the fact that living in a large city might affect the percentage of opportunities of working in the public or private sector. Because of scale effects, the proportion of public sector employees in a large city is expected to be lower. In fact, in our data set the share of people employed in the public sector is smaller in large cities: public sector workers account for 15 percent of workers in our sub-sample of large cities while they account for 25 percent of workers in all other urban areas. At the same time, the large city dummy has a relatively muted impact on wage levels with respect to the urban/rural dummy. Pay differentials between urban and non-urban employees are considerable (7.1 versus 3.6 Nuevos soles per hour) while the differential between large city workers and the rest of urban workers is smaller (8.0 versus 6.8 Nuevos soles per hour). In addition, the correlation between compensation and the large city dummy (0.08) is smaller than the correlation between compensation and the urban/rural dummy (0.18). This is important for our estimation strategy since a variable that affects the sector of employment but does not directly affect wages is needed for the two-step approach followed.

Results in Table 3 show that education affects in a positive way the participation into the public and formal private sectors. However, a comparison between the two columns of Table 3 highlights how education has a stronger impact on the probability of working in the public sector. The relationship between age and labor force participation is non-linear. In the public sector, the probability of participation increases until workers reach the age of 58 years. In the formal private sector, the turning point is much lower. The probability of participation increases until workers reach the age of 38 years and then starts decreasing. This is consistent with the well-known pattern by which participation in self-employment rises with age (World Bank, 2007). Given that self-employment is largely informal in Peru, this would explain why participation in the formal private sector declines from a relatively young age.

Individual-specific characteristics are also very important to determine where to work. Interestingly, results underline that the probability of working in the public sector increases for women. Consistent results are found when focusing on the formal private sector since the probability of working in the private sector is lower for women.

Other individual-specific characteristics are relevant, too. Being married affects positively the participation in both the public and the formal private sectors but the probability of working in the public sector is higher. Finally, both urban dummies show a significant coefficient. Living in an urban location increases the probability of working in the formal private sector and

decreases the chance of working in the public sector. [15] Living in a large city (such as Lima or Arequipa) increases further the chance to work in the formal private sector.

Based on the results of these estimations, the inverse Mills ratios were constructed and added as an additional explanatory variable (the "selection term" λ) to the wage equations (2) and (3). This approach (Heckman, 1979) allows us to estimate the wage equations consistently using OLS (see Section 3 – Equations 8 and 9).

Estimations of wage equations (8) and (9) show that returns to education are significant, both in the public and the formal private sector (see Table 4). The comparison of estimation results shows that returns to education are generally higher in the public sector. However, returns to postgraduate education are significantly higher in the formal private sector. In addition, note how returns to non-university (technical) post-secondary education are not significant in the formal private sector. This contrasts with the positive impact that completed non-university post-secondary education has on wages within the public sector, as shown in the fourth graph of Figure 3. As discussed above, this may be related to the importance of formal qualifications to determine compensation within the public sector.

Table 4. Selectivity Corrected Compensation Equations Estimation Results

Variables	Public Sector	Formal Private Sector
Secondary Education	0.508***	0.105**
Non Completed Post-Secondary	0.210***	0.161***
Completed Post-Sec (non University)	0.282***	0.064
Completed Post-Sec (University)	0.567***	0.411***
Postgraduate	0.295***	0.617***
Age	0.063***	0.007
Age Squared (/100)	-0.055***	0.011
Female	-0.075***	-0.159***
Married	0.083***	0.161***
Urban	0.041	0.030
Selection Term	0.197***	-0.279***
Observations	3670	4032
Chi-squared	541.0	853.5

*** p<0.01, ** p<0.05, * p<0.1

Compensation is also significantly affected by experience, gender and family status. However, experience (proxied by age) influences compensation only in the public sector. The impact is positive until workers reach 57 years of age, then its sign switches.

[15] In a large city, the percentage of opportunities in the public sector is likely to be smaller.

On the gender differentiation issue, results confirm the findings of the first set of estimations (Table 2). On average, female workers earn lower salaries. Moreover, the gender penalty appears to be stronger in the private sector.

Finally, being married has a positive effect on compensation in both the public and the formal private sector. Coefficients estimated to control for urban/rural location are not significant.

The third and last estimation approach focuses on what drives pay differentials between the public and the formal private sector. Pay differentials are the result of different human capital endowments and other unobservable factors. The well-known Oaxaca-Blinder decomposition described above (Equation 4) can be used to break down the difference between public and formal private sector compensation into an "explained difference", which is the result of differences in the observable characteristics affecting compensation (education, experience, gender, marital status, and location), and an "unexplained difference" which summarizes the difference in returns to the aforementioned observable characteristics and also captures all potential effects of differences in unobserved variables. Results of this decomposition are shown in Table 5.

The first column of the table focuses on the whole sample. The overall difference is not statistically significant (-0.022). However, it is important to note that this result stems from two factors at play that off-set each other. On one hand, the endowment coefficient is negative and statistically significant (-0.231), meaning that the observed compensation in the public sector is lower than expected given the employees' endowments, such as higher education and greater experience. On the other hand, the coefficient on returns is positive and statistically significant (0.209), meaning that returns to education and the remaining workers' characteristics are higher in the formal private sector.

Table 5. Decomposition of Mean Log Compensation Differentials

Oaxaca Decomposition	Whole Sample	Ed. Lvl. 1	Ed. Lvl. 2	Ed. Lvl. 3	Ed. Lvl. 4	Ed. Lvl. 5	Ed. Lvl. 6
Log Wage Difference	-0.022	1.292*	0.182	0.187	0.002	0.002	0.577***
Explained Difference (Endowments)	-0.231***	0.037	-0.040**	-0.084***	-0.082***	-0.115***	-0.090**
Unexplained Difference (Returns)	0.209***	1.255*	0.222	0.271*	0.084	0.117*	0.668***
Observations	7702	509	2374	1055	1679	1685	400

Note: Mean log wage differentials are computed by subtracting public sector wages from formal private sector wages.

We repeated the Oaxaca-Blinder decomposition for each sub-sample of workers with a specific education level. This approach allows controlling for the specific features of a public sector which hire, on average, employees with a higher level of education. As shown in Table 5, results change across the different levels of education. Significantly, when focusing on the sub-sample of employees that achieved a postgraduate degree (see Table 5 - Education Level 6), the hourly compensation offered by the formal private sector is higher (0.577). Differences are less significant for lower levels of education. Higher compensation for formal private sector employees with a postgraduate degree is the consequence of the higher returns provided by the formal private sector (0.668). Note that even within levels of education, there are differences in endowments between public and formal private sector employees. The negative signs in the second row of Table 5 indicate that, given the endowments of public sector workers, one would have expected higher wages. These coefficients are driven by the fact that excluding education characteristics, public sector employees still have more experience and a greater proportion of public sector workers are married (see Table 1). The focus on individual levels of education highlights that the potential lack of competitiveness by the public sector in attracting qualified workers appears to be concentrated at the highest levels of education, particularly at the postgraduate level. This would suggest that public sector pay reforms under consideration may involve increases to compensation for the most educated employees.

5. Conclusions

Our analysis suggests a number of main conclusions on the structure of public sector pay, the differences in pay between the public and private sector, and the factors behind such differences.

In the public sector the distribution of the hourly compensation has a particularly acute peak (leptokurtic distribution) for the highest levels of education. Once a worker achieves a post-secondary degree, compensation hovers around a certain level without major variations. This suggests that the public sector is using a post-secondary degree as a driver of compensation. In contrast, formal private sector wages differ significantly within the same level of education. This higher degree of variation is probably the consequence of a closer link between performance and compensation in the formal private sector.

If we consider only wages, there is a public sector premium in Peru when controlling for education, experience, gender, marital status and urban/rural location of the employees. However, the results change when we include in-kind payment and bonuses and undertake the Mincerian regression analysis on the basis of total hourly compensation. Indeed, when using total compensation estimation results show that formal private sector compensation in Peru is higher than in the public sector. This underscores the importance of including non-monetary

compensation when calculating public-private sector pay differentials, an issue to which the literature pays insufficient attention.

When self-selection is taken into account, pay differentials lose significance when we focus on the whole sample. However, private sector premium is still present for workers with the highest level of education. Results from the Oaxaca – Blinder decomposition show that this differential is driven by the higher returns offered by the formal privates sector to those workers that achieved a higher level of education.

Finally, the analysis allows investigating the issue of wage differentials from the gender perspective. Results show that female workers earn a lower salary in Peru and that the gender penalty is more significant in the formal private sector than in the public sector.

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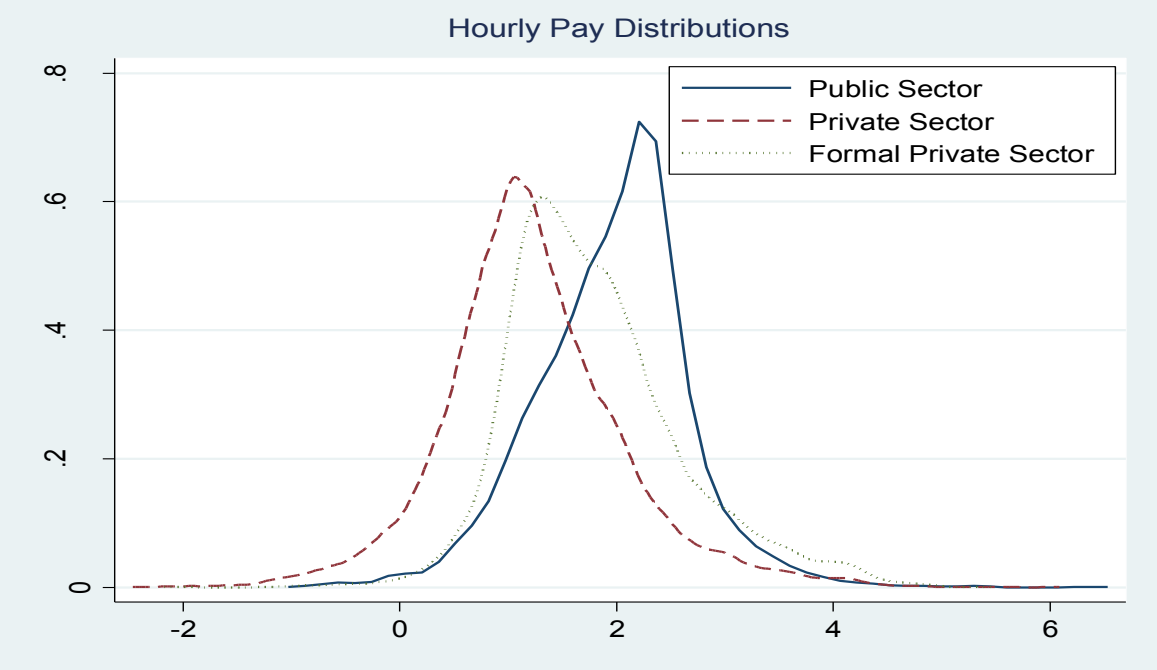
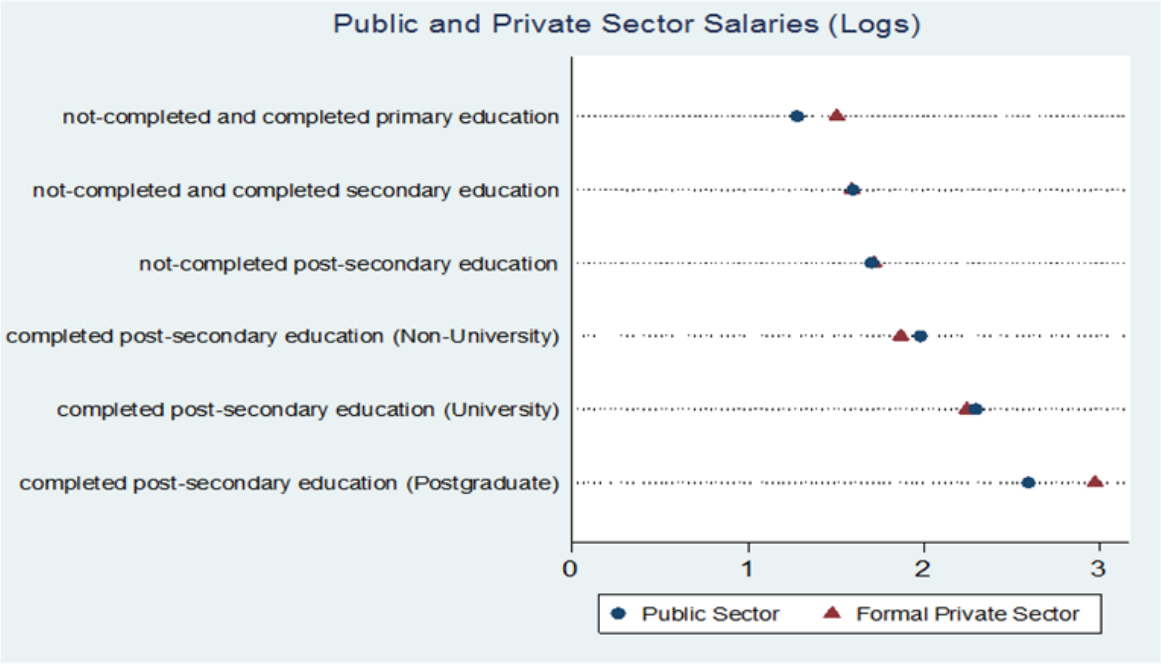
Figures

Figure 1. Pay distributions by sector (Logs)



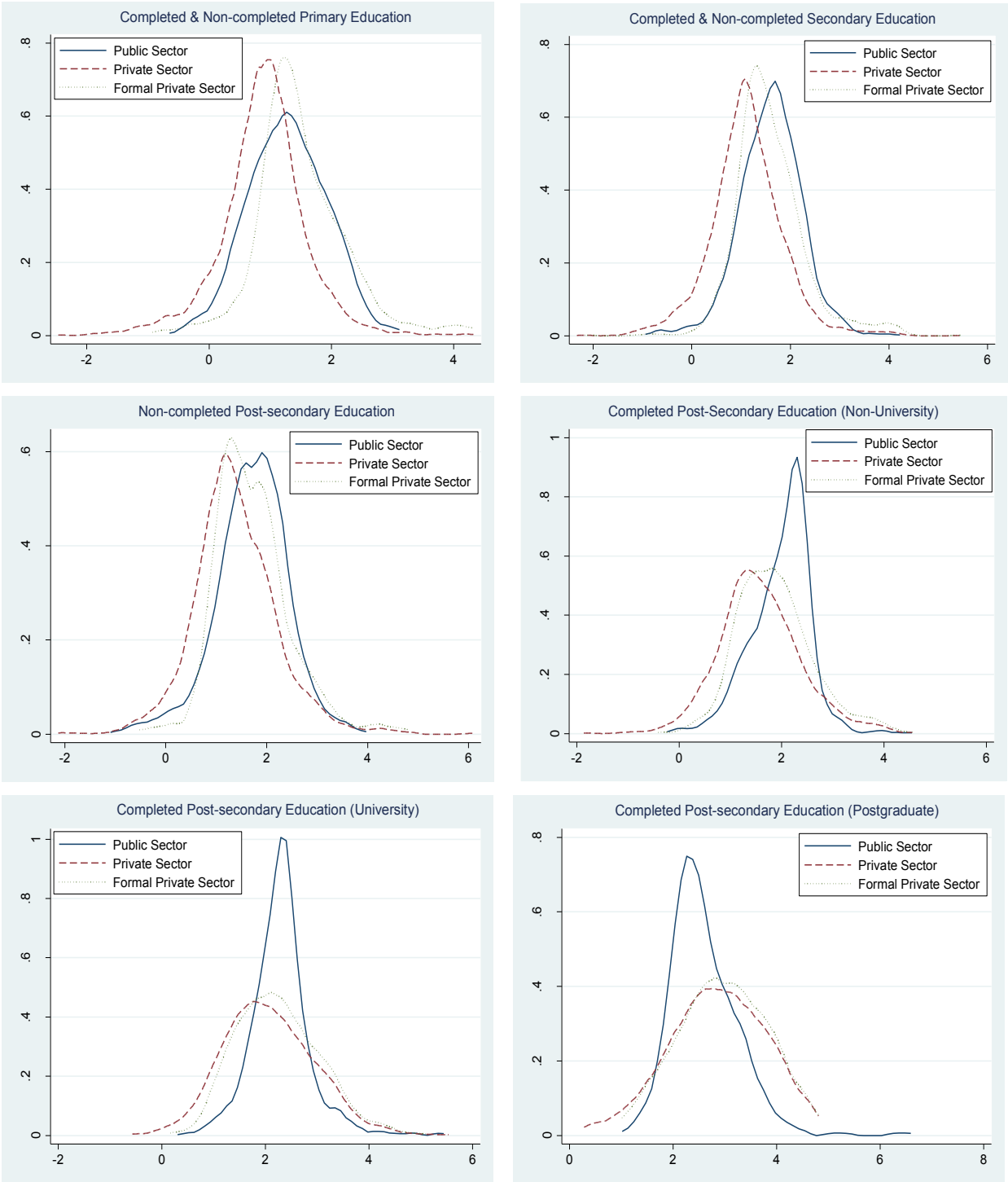
Source: Authors' calculations based on ENAHO.

Figure 2. Mean public and formal private sector pays at different education levels



Source: Authors' calculations based on ENAHO.

Figure 3. Hourly Pay Distributions by Education Level



Source: Authors' calculations based on ENAHO.

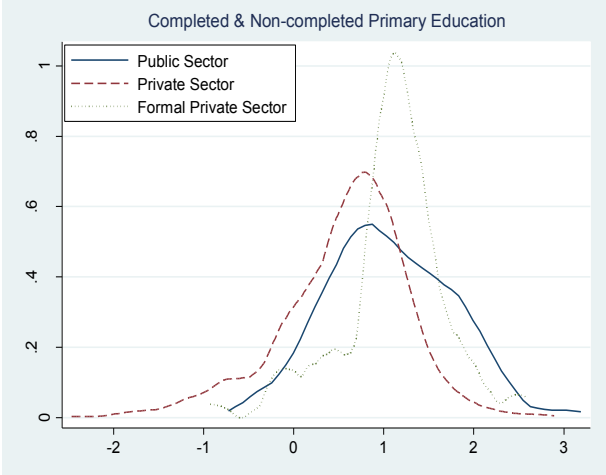
Annex 1 – Public vs. Private Sector Compensation, Breakdown by Gender

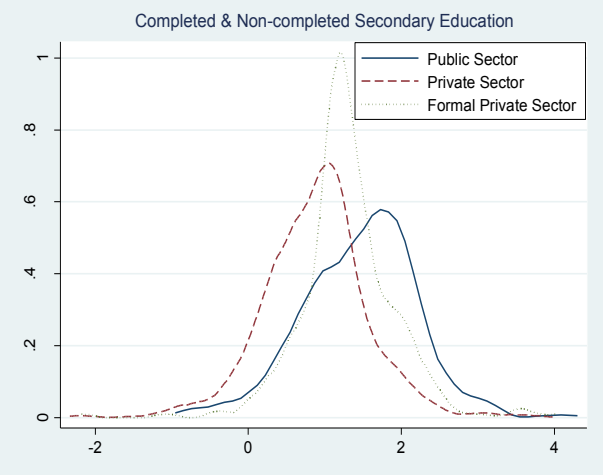
Table A1.1 – Descriptive Statistics, Breakdown by Gender

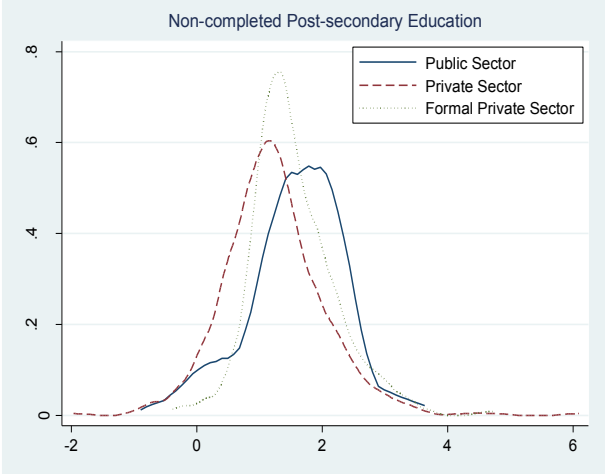
Panel A. Male Population	All	Public Sector	Private Sector	Formal Private Sector
# of Observations	10499	2111	8388	2820
Average Hourly Wage (Nuevos soles)	5.46	9.04	4.56	7.36
Standard Deviation (Log of Wage)	0.88	0.68	0.84	0.74
Skewness (Log of Wage)	0.06	0.30	0.15	0.70
Non-Completed Primary (%)	9.2%	2.8%	10.8%	3.4%
Completed Primary (%)	9.6%	4.1%	10.9%	5.0%
Non-Completed Secondary (%)	17.2%	5.6%	20.1%	10.8%
Completed Secondary (%)	29.6%	22.2%	31.5%	33.1%
Non-Completed Post-Secondary (%)	11.6%	11.4%	11.6%	15.6%
Completed Post-Secondary (%)	22.8%	53.9%	15.0%	32.1%
Average Age	34.4	41.5	32.6	36.3
Married (%)	28.3%	49.1%	23.1%	36.6%
Urban (%, >400 households)	72.6%	78.9%	71.0%	88.8%
Large Cities (%, >100,000 households)	21.6%	14.0%	23.5%	35.1%

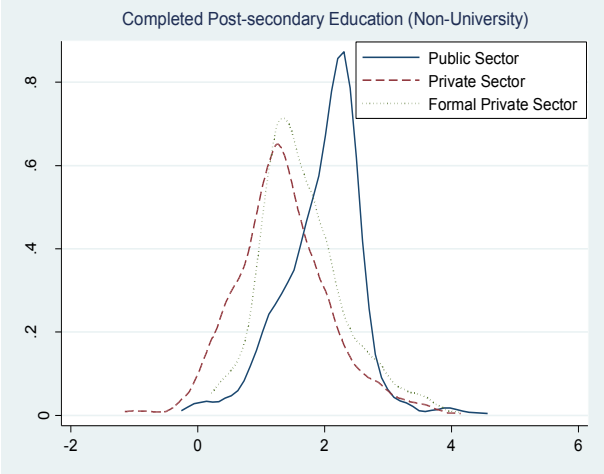
Panel B. Female Population	All	Public Sector	Private Sector	Formal Private Sector
# of Observations	5114	1559	3555	1212
Average Hourly Wage (Nuevos soles)	5.20	7.70	3.75	6.19
Standard Deviation (Log of Wage)	0.98	0.71	0.91	0.73
Skewness (Log of Wage)	-0.13	-0.39	0.10	0.48
Non-Completed Primary (%)	9.6%	2.2%	12.8%	2.5%
Completed Primary (%)	5.9%	1.6%	7.8%	3.0%
Non-Completed Secondary (%)	9.8%	3.1%	12.7%	4.2%
Completed Secondary (%)	21.8%	11.6%	26.2%	22.3%
Non-Completed Post-Secondary (%)	13.3%	10.1%	14.7%	17.9%
Completed Post-Secondary (%)	39.7%	71.5%	25.7%	50.2%
Average Age	33.9	39.3	31.5	32.5
Married (%)	24.7%	39.0%	18.5%	22.4%
Urban (%, >400 households)	79.9%	84.3%	78.0%	92.7%
Large Cities (%, >100,000 households)	25.4%	15.1%	29.9%	43.6%

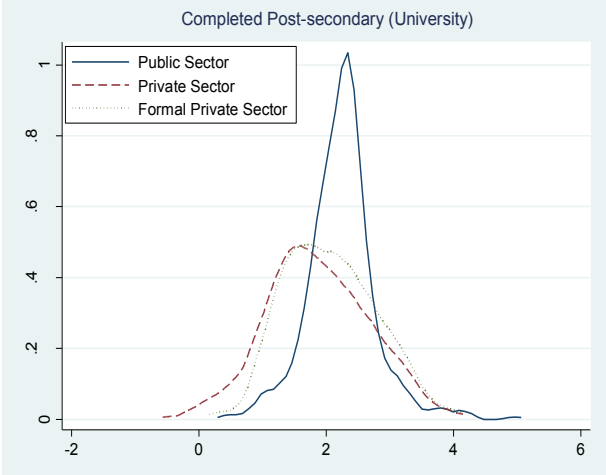
Table A1.2 – Panel A: Hourly Pay Distributions by Education Level (Female Population)











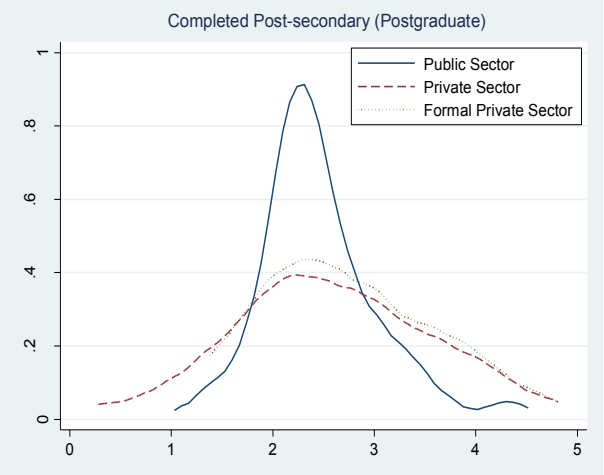
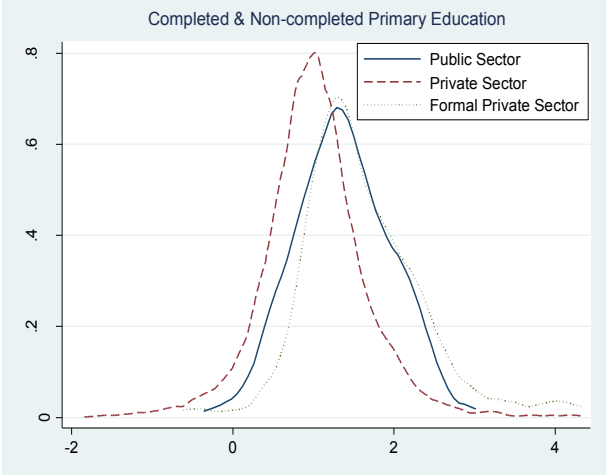
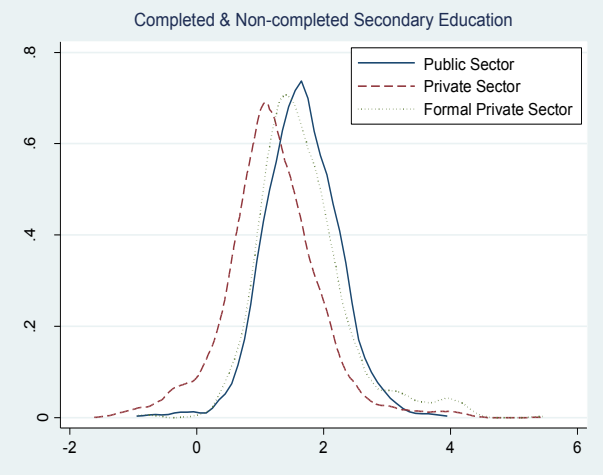
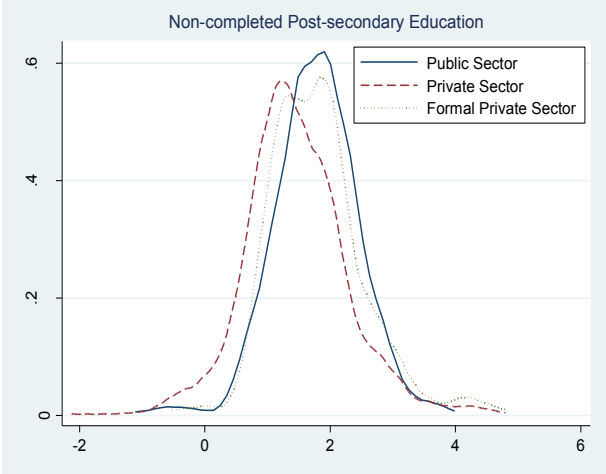
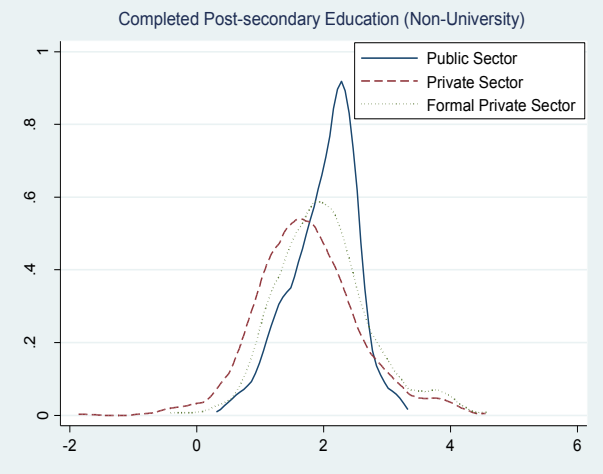


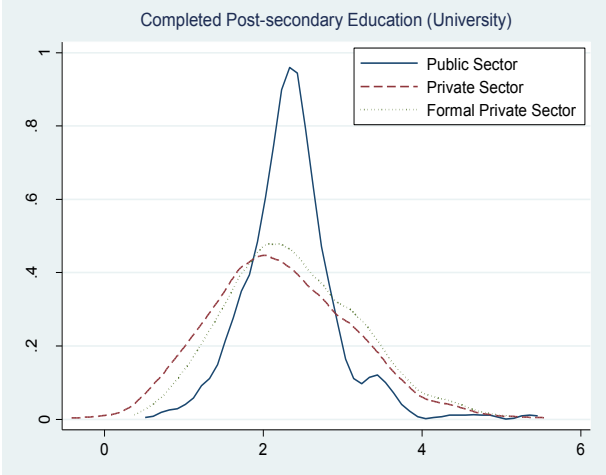
Table A1.2 – Panel B: Hourly Pay Distributions by Education Level (Male Population)

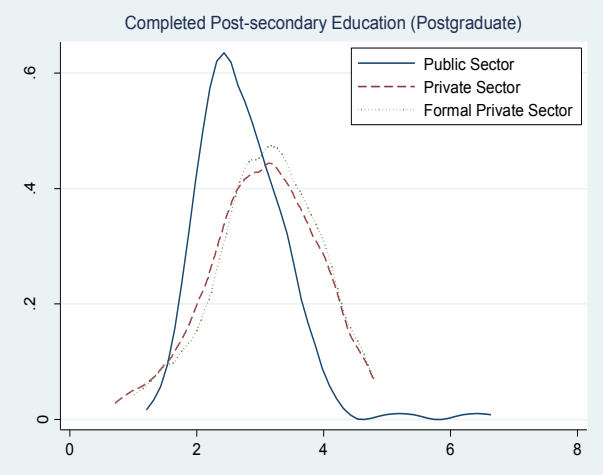












Annex 2. Public vs. Private Sector Compensation across working categories

An alternative approach to investigate the existence of compensation differentials between the public and the formal private sector is to use ENAHO data to distinguish employees based on their responsibilities and the service provided and verify the existence of compensation differential within each group. In particular, compensation differentials in Peru can be analyzed after dividing employees into the following categories: professionals, technical experts and so-called "auxiliaries" (i.e., support staff or 'auxiliaries') (SERVIR, 2010).

In order to test the robustness of the results obtained by this study, we used the same approach followed by SERVIR (2010) to disaggregate the data sample and estimated the log-wage equation (Rees and Shah, 1995) for each occupational group. Table A2.1 shows some descriptive statistics useful to contextualize the analysis. The majority of respondents belong to the Technical experts' category. As for professionals, the large part of respondents is employed in the public sector (with a proportion close to 4:1) whereas the majority of technical experts and auxiliaries work in the formal private sector. Average values for total compensation are consistent with our expectations. When we focus on total compensation, we notice that compensation is significantly for professionals and, generally, for those one working in the formal private sector.

Table A2.1. Descriptive statistics

Population Characteristics	**Professionals**	**Technical Experts**	**Support staff (*auxiliares*)**
Number of observations	1633	2178	1892
Number of observations (sub-sample: public sector)	1282	783	505
Number of observations (sub-sample: private sector)	351	1395	1387
Total Hourly Compensation (including in-kind compensation and bonuses)	12.96	9.74	7.24
Total Hourly Compensation (sub-sample: public sector)	12.47	9.37	5.45
Total Hourly Compensation (sub-sample: private sector)	14.77	9.95	7.90

Regression analysis provides a further insight. Total compensation is significantly higher in the formal private sector for technical experts and support staff (*auxiliares*). The empirical evidence is less clear for professionals. The sign of the public sector dummy suggests a lower compensation for public sector professionals but the difference is not statistically significant. This result is rather surprising since we expected a more pronounced private sector premium for professionals. The coefficients estimated for the rest of the explanatory variables are consistent with our expectations. Education matters, especially

for professionals and technical experts. Female employees earn a lower compensation, especially in the auxiliaries' category. Both the marital status and the location dummy have a positive impact on total compensation. Finally, experience positively affects compensation but its impact is more evident for technical experts and auxiliaries.

Table A2.2. Estimation results

Variables	Professionals	Technical Experts	Auxiliaries
Public Sector Dummy	**-0.032**	**-0.119*** **	**-0.150*** **
Secondary Education	0.782***	0.254**	0.223***
Non Completed Post-Secondary	0.068	0.252***	0.141***
Completed Post-Sec (non University)	0.344***	0.035	0.067
Completed Post-Sec (University)	0.427***	0.328***	0.041
Postgraduate	0.294***	0.452***	"o"
Age	0.018	0.031***	0.027***
Age Squared (/100)	-0.011	-0.017	-0.016*
Female	-0.194***	-0.151***	-0.396***
Married	0.069**	0.114***	0.149***
Urban	0.038***	0.155***	0.139***
Observations	1633	2178	1892
R-squared	0.185	0.237	0.187

*** p<0.01, ** p<0.05, * p<0.1, "o" when omitted for collinearity

The absence of a significant private sector premium for the professionals' category is surprising and deserves further attention. We looked at the different professions included in the sample of professionals and realized that results could be biased by the composition of the sample. We found that a large share of employees belonging to the group of professionals is constituted by teachers (66.4 percent). Teachers work mainly in the public sector and earn significantly less than the other professionals in the sample. In addition, compensation is particularly low for teachers working in the private sector. They earn 53 percent less than other professionals working in the public sector and 57 percent less than other private sector professionals (see the last two columns of Table A2.3). Therefore, it is difficult to compare them with other professionals, at least when focusing on compensation.

The lower compensation of teachers is probably biasing the estimation of the log-wage equation. To verify this, we re-estimated the model after excluding teachers from the group of professionals. Results of the analysis confirm our suspects. Coefficients estimated differ according to the sample considered. This highlights the heterogeneity of a sample which put together teachers with the rest of professionals. In particular, the private sector premium grows significantly after excluding teachers from the sample up to the point of being higher than private sector premia estimated for the technical experts and auxiliaries' categories. Implications of these results are twofold: compensations for teachers in the

public sector are already high and do not need further adjustments; compensations in the private sector are significantly higher for professionals, especially when we exclude teachers from the sample.

Table A2.3. Descriptive statistics

Population Characteristics	Professionals	Teachers	Professionals (excluding teachers)
Number of observations	1633	1084	549
Number of observations (sub-sample: public sector)	1282	937	345
Number of observations (sub-sample: private sector)	351	147	204
Total Hourly Compensation (including in-kind compensation and bonuses)	12.96	10.21	18.38
Total Hourly Compensation (sub-sample: public sector)	12.47	10.5	17.82
Total Hourly Compensation (sub-sample: private sector)	14.77	8.41	19.35

Table A2.4. Estimation results

Variables	Professionals	Teachers	Professionals (excluding teachers)
Public Sector Dummy	**-0.032**	**0.294*** **	**-0.186*** **
Secondary Education	0.782***	0.733**	"o"
Non Completed Post-Secondary	0.068	0.079	0.645*
Completed Post-Sec (non University)	0.344***	0.300***	0.639
Completed Post-Sec (University)	0.427***	0.314***	0.411
Postgraduate	0.294***	0.089*	0.288***
Age	0.018	0.02	0.017
Age Squared (/100)	-0.011	-0.015	-0.005
Female	-0.194***	-0.122***	-0.175***
Married	0.069**	0.040	0.118*
Urban	0.038***	0.068*	0.471**
Observations	1633	1084	549
R-squared	0.185	0.211	0.157

*** p<0.01, ** p<0.05, * p<0.1, "o" when omitted for collinearity