ECONOMIC ANNALS, Volume LVII, No. 192 / January – March 2012
UDC: 3.33 ISSN: 0013-3264

DOI:10.2298/EKA1292007L

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PUBLIC SECTOR PAY GAP IN SERBIA DURING LARGE-SCALE PRIVATISATION, BY EDUCATIONAL QUALIFICATION

ABSTRACT: *The paper explores the effect of large-scale privatisation of public sector activities on public-private sector pay differential, for groups of workers according to educational qualification on average and across the pay distribution in Serbia, from 2004 until 2008. The paper finds that both unskilled and skilled men and women in the public sector saw significant improvements in their financial position relative to their private sector counterparts with the progress of the economic transition. The results showed that the size of the public sector pay premium declines both with higher educational level and higher percentile of earnings distribution. This indicates, between and within groups, the inequality-reducing feature of the public sector pay determination.*

KEY WORDS: *Earnings, Transition, Quantile regression, Serbia*

JEL CLASSIFICATION: J31, P31

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1. INTRODUCTION

In Serbia between 2004 and 2008, the period analysed in this paper, the public sector was largely privatised. The transformation of ownership has a potential effect not only on employment composition but also on relative wages, and hence on the distribution of wages in the two sectors of employment.

The purpose of this paper is to analyse the evolution of earnings in the private and public sectors during the major period of economic transition in Serbia. This will be done by examining public-private wage differentials, on average and across the percentiles of the wage distribution, for male and female employees by their educational qualification, and controlling for other characteristics.

Previous studies of the public-private sector pay gap mainly considered the period before the launch of the large-scale privatisation programmes. These studies provide evidence of a public sector pay penalty relative to the private sector at the early stages of economic transition.

In particular, Jovičić, Nojković and Paranos (2000) caried out an early study that estimated public/private pay differentials in the Federal Republic of Yugoslavia. The OLS method was used to estimate the sectoral gap in 1998 from the Labour Force Survey (LFS). It was found that mostly men between 35 and 49 years of age (and in proportion to their education), who worked long hours and preferably ran their own businesses, collected the largest relative private sector mark-up.

Jovanović and Lokshin (2003) employed the same data source for both male and female employees from 15 to 64 years, but only examined the year 2000. This study attempted to correct for sector selection by using marital status and number of job holders in a household to obtain selectivity-corrected hourly earnings estimates. The average private sector premium was found to be 9.4% for males and 4% for females.

Reilly (2003) provides evidence of a rather erratic private sector premium in Serbia from 1995 to 2000 for male employees aged between 18 and 64, by using LFS data. The quantile regression results from this study suggest that the hourly wage premium for a private sector job at the 50th percentile of the conditional wage distribution was just over 20% in 1995, insignificantly different from zero in 1996, 1997, and 1999, and nearly 24% in 1998. In the last year observed, the median point estimate was found to be comparable in magnitude to the 1995 estimate. Finally, Krstić, Litchfield and Reilly (2007) estimated the average

private sector effect on monthly pay, conditioned on human capital and other individual characteristics, by using the same data sample as in Reilly (2003) but extending the research period until 2003. This study suggests substantial average premia to private sector workers during the early period of the so-called 'sluggish' transition, which declined sharply from 2000 onwards (i.e., from 28.5% in 1996 to 8% in 2003).

This paper aims to complement the previous research by estimating the evolution of the public sector pay gap during the major period of economic transition, from 2004 until 2008. Large-scale privatisation and systematic structural reforms in Serbia were initiated after 2000, and the private sector overtook the public sector share in employment in 2003. During the first years of the 2000s the government wage policy aimed to adjust the disparities across wages in activities that employ a large portion of highly educated workers that had lagged behind the Republic's average growth for years, such as public education, public health, and public services (Ognjenović, 2003). Hence, it seems highly likely that the outcome of empirical analysis for the more recent period would differ considerably from previous studies which reported public sector pay penalties for workers with similar characteristics. In order to analyse the effects of recent wage reforms, the public sector pay gap in this paper will be estimated for groups of workers by educational level.

This paper also contributes to empirical literature on the public sector pay gap in transition economies in general. A common finding from other countries is that economic transition first negatively affects the public sector pay gap (i.e., an average public sector pay gap estimate is around -20%) but this penalty declines towards zero or transfers into a premium by the end of economic transition (Flanagan (1995) for Czech Republic, Newell and Socha (1998), Newell (2001), Adamchik, Hyclak and King (2003) and Newell and Socha (2007) for Poland, Lehmann and Wadsworth (2000) and Brainerd (2002) for Russia, Hámori (2007) and Laušev (2010) for Hungary). In addition, quantile regression studies suggest that the public sector pay effect differs across the pay distribution. In particular, it is found to be more negative at the beginning of economic transition and less positive at the end of economic transition among high earners than among low earners. This suggests that public sector pay is more compressed than private sector pay (Brainerd (2002) for Russia, Leping (2006) for Estonia, Newell and Socha (2007) for Poland, Hámori (2007) and Laušev (2010) for Hungary). For this reason, for each gender, the public sector pay gap across the earnings distribution will be estimated for each group of workers according to their educational qualification by using the quantile regression approach.

The empirical analysis in this paper will be accomplished by using Labour Force Survey (LFS) data from 2004 to 2008. The analysis of distributional aspects of wages in Serbia will provide answers to four research questions. Firstly, the paper will show how the public sector workers at the selected percentiles of the earnings distribution fare in terms of earnings relative to their private sector counterparts during the major period of economic reform. Secondly, the paper will present various measures of pay variability or dispersion (the standard deviation of the log of hourly earnings, the decile ratios, and the Gini coefficients) to check if there is a difference between public and private sectors in terms of the magnitude of pay inequality. Thirdly, the empirical evidence will indicate if there is a pay differential between the public and private sectors for groups of workers with different educational attainments and, if so, how this pay differential has changed during the period of large-scale privatisation. Finally, analyses of separate quantile regression estimates by gender and skill level will disclose if there are differences in the shape of the conditional wage distribution between the public and private sectors.

The paper is organised as follows. The first part explains the data. The following part presents the empirical results. The final part concludes the paper with some policy implications.

2. DATA

This paper employs microdata from the Labour Force Survey (LFS) conducted in October over the period 2004 to 2008. The LFS data sets are based on a nationally representative random sample and use a two-staged stratified sampling method. The total number of households in each survey is 6,500 (7,000 in 2008) and the number of individuals that were interviewed in each survey is around 20,000. Each of the annual data sets represents a cross-sectional view of the labour market.

The working samples are restricted to full-time male and female employees between 15 and 64 years who reported non-zero monthly wages and non-zero hours of work for their main job only. We make a distinction between two main sectors: public and private. The public sector is set to include only state and social ownership types, excluding other properties (cooperative, mixed, and unknown). Table 1 provides information on the timing of the surveys and working sample sizes by gender and ownership type.

Table 1: Timing of surveys and number of observations used in analysis

Reference Year and Month	Number of Males		Number of Females		Total
	Public	Private	Public	Private	
Oct-04	1,472	935	1,091	721	4,219
Oct-05	1,314	1,123	1,002	729	4,168
Oct-06	1,186	1,186	966	797	4,135
Oct-07	1,059	1,261	881	894	4,095
Oct-08	959	1,423	832	958	4,172

Data Source: LFS successive years from 2004 to 2008

The earnings definition relates to pay received for the reference month, and any arrears owed to the worker may be reflected in the monthly pay measure. It is also important to point out that the difference between earnings and regular wage became insignificant after the fiscal reform in June 2001, when all additional earnings payments, such as hot meal allowances and holiday cash grants, which were non-taxable before and thus comprised an important part of income in the public sector, were included in the regular wage. Furthermore, the earnings definition excludes taxes, pensions, and any welfare payments. In the years before 2008 there is no information as to whether the employee has paid insurance for pension and health or not. In the LFS 2008 sample about 6.5% of individuals are not entitled to pension or health insurance (6.3% in the private sector and 0.2% in the public sector).

The greater share of workers in the private sector than in the public sector not entitled to pension or health insurance will tend to overestimate the public sector penalty and, conversely, underestimate the public sector premium. Although we acknowledge this problem there is no reasonable way to resolve it, due to data limitations. Another common problem for researchers using self-reported data is the possibility that individuals under-report their earnings. If this is more likely for private sector workers then this will affect the public sector pay gap in the opposite direction to the effect of social insurance entitlements.

Finally, the earnings definition used in our analysis is based on the hourly earnings on the main job. The hourly pay is calculated by dividing the last month's pay by monthly working hours, obtained by multiplying the reported usual numbers of hours worked per week by the average number of weeks in a month (i.e., 4.25). The hourly pay is deflated by using the consumer price index (CPI) that relates to

the month in which the various surveys were conducted. The CPI is recalculated using October 2005 as the base.

Inspection of sample proportions reveals that public and private sector workers differ in a number of characteristics. Public sector workers are on average older with more labour force experience than private sector workers. Moreover, public sector workers are better educated with roughly 5-9% more men and 9-14% more women with university degrees than private sector workers. Workers with only secondary school qualifications are more likely to work in the private than in the public sector. Private sector workers are more likely to work longer hours per month and be single. From 2004 in particular, public sector workers are more likely to live in the cities and private sector workers in the rural areas.

3. EMPIRICAL RESULTS

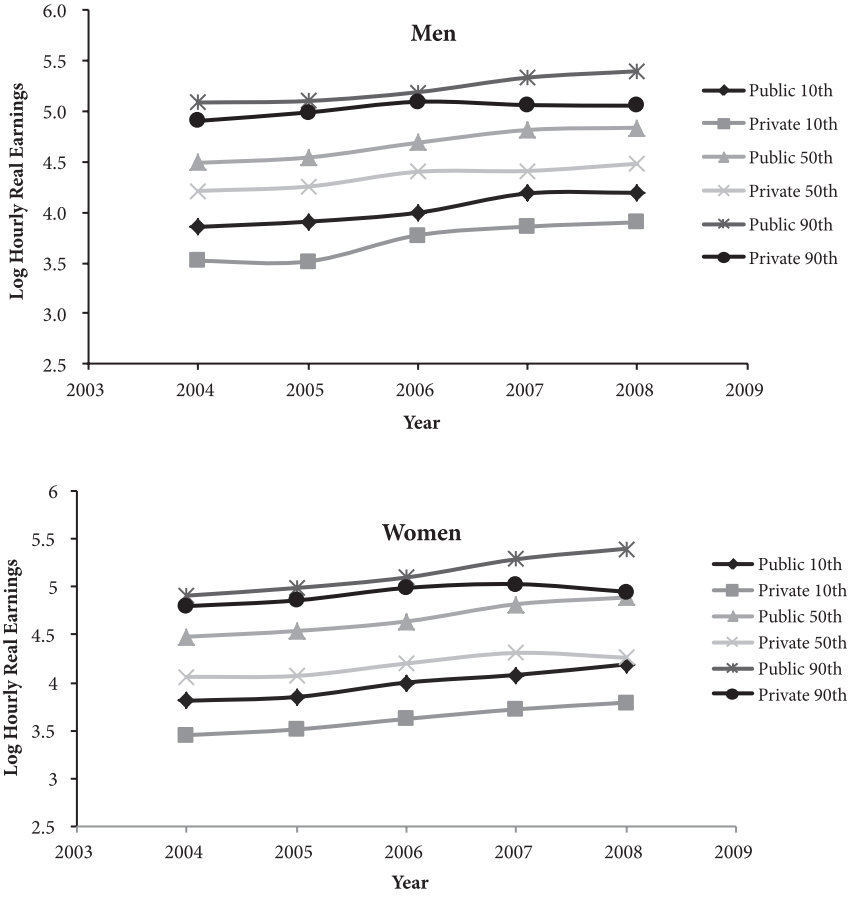
3.1 Earnings Inequality Measures

This section illustrates trends in unconditional real hourly earnings by gender and ownership type at different points of the pay distribution. In addition, the magnitude of pay inequality in each sector is summarised.

Trends in the real hourly earnings by ownership type at different points of the log pay distribution are presented for male and female workers in Figures 1 and 2. The Figures disclose an upward trend during 2004-2008 in both public and private sectors at all percentiles. Yet public sector male and female workers at all the percentiles of unconditional hourly earnings distribution fared better than those in the private sector.

The advantage of holding a public sector job was the greatest for workers at and below the median.

Figures 1 and 2: Real hourly earnings percentiles for male and female employees in public and private sectors in Serbia, 2004-2008



Notes to Figures 1 and 2: Hourly earnings percentiles are given in natural logarithm values. Earnings relate to total main job pay compensation net of taxes, pensions, and welfare benefits and expressed in October 2005 prices. *Data Source*: Labour Force Survey of the Republic of Serbia (LFS), 2004-2008

Table 2 summarises three different measures of pay variability or dispersion: the standard deviation of the log of hourly earnings, the decile ratios, and the Gini coefficients by gender and ownership type. The standard deviation or square root of variance is the average difference of the scores from the mean of the log pay distribution. The 90/10th ratio presents the difference between estimated log pay on the 90th and on the 10th percentile of the pay distribution. Unlike the

decile ratios that relate the pay at the different percentiles of the distribution, the Gini coefficient is a measure of inequality across the whole distribution, as it is influenced by the shape of the distribution at all percentiles.[1]

Table 2: Earnings inequality by gender and ownership type in Serbia, 2004-2008

Year	90/10th Decile Ratio				Standard Deviation				Gini Coefficient			
	Men		Women		Men		Women		Men		Women	
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
2004	1.23	1.39	1.10	1.35	0.55	0.59	0.48	0.59	0.26	0.31	0.24	0.32
2005	1.20	1.48	1.14	1.35	0.50	0.60	0.49	0.56	0.26	0.31	0.25	0.32
2006	1.19	1.32	1.10	1.37	0.48	0.53	0.45	0.55	0.26	0.29	0.23	0.32
2007	1.15	1.20	1.20	1.31	0.49	0.56	0.48	0.52	0.25	0.30	0.25	0.30
2008	1.20	1.16	1.20	1.16	0.47	0.49	0.48	0.50	0.26	0.28	0.25	0.28

Notes to Table 2: Decile ratio 90/10th is calculated as the difference between the log earnings at the 90th percentile and at the 10th percentile. The Gini coefficient estimates use earnings in the unlogged form.

Data Source: Labour Force Survey of the Republic of Serbia (LFS) from 2004 until 2008

According to all measures of pay inequality presented in Table 2 the private sector earnings distribution is wider than the public sector earnings distribution for both men and women over most of the years observed. The public sector pay inequality declines until 2006 and increases in the last two years. On the other hand, there was a private sector pay compression in the last two years. This period coincides with tax reform that allowed tax exemption for the first 5,000 Serbian dinars of every wage from January 1, 2007[2], which is likely to have affected more private than public sector earnings given that minimum wage recipients or those receiving only slightly higher earnings are more concentrated in the private sector.

3.2 Annual Mean Estimates of Public Sector Pay Gap by Educational Qualification

Public-private sector earnings differentials may be largely determined by the different nature of jobs and skills in the two sectors. In order to obtain conditional average public-private sector pay differentials for each year for men and women,

1 If one randomly draws two people from the population then the expected wage difference between those two people as a proportion of the average wage is twice the Gini coefficient, so that Gini of 0.238 says that the expected wage gap between two men chosen at random is 47.6% of the average pay (Puhani, 1997).

2 As well as reductions in the personal income tax burden from 14% to 12% of the gross wage, Quarterly Monitor of Economic Trends and Policies in Serbia (2007) No. 8.

separately, we pool both sectors' data together in an ordinary least squares (OLS) earnings regression with a dummy variable P_i taking the value one if i th employee works in the public sector and zero otherwise. This model is given by:

$$\ln w_i = \alpha + \beta' x_i + \gamma P_i + \varepsilon_i \qquad \text{for } i = 1, \ldots, n \tag{1}$$

where $\ln w_i$ is the log of real hourly earnings for the i th individual which is explained by x_i set of observed worker and job characteristics with the parameter vector β and ε s are error terms constructed to be uncorrelated with x. Hence, in this model $\hat{\gamma}$ is the 'average' estimate of the public sector pay gap equivalent to an intercept shift.

Acknowledging that the public sector effect may vary with a worker's skill level we apply the model in (1) on groups of workers according to their educational qualification and gender. The unskilled group includes workers with primary educational qualification or less. The skilled group includes workers with high school qualifications and college degrees. The high-skilled group includes workers with a university degree and above.

The $\hat{\gamma}$ from an hourly earnings equation is estimated for each skill level and gender by using the following x_i set of 'control' variables: labour force experience, marital status, nationality, settlement type, region, industry branch, and occupational affiliation. The fit of the hourly earnings equations augmented by 'control' variables, using the R-squared, is reasonably good and improves over the years. The Breusch-Pagan test for heteroskedasticity is performed by regressing the residuals from an OLS regression on the same set of covariates and showed heteroskedastic errors in most cases. A common way of estimating variance of coefficients in the presence of heteroskedasticity is to use robust or White (1980) standard errors to calculate 95% confidence intervals.

Figure 3: Public sector pay relative to private sector pay: conditional differences in hourly pay by gender and skill with 95% confidence interval, 2004-2008

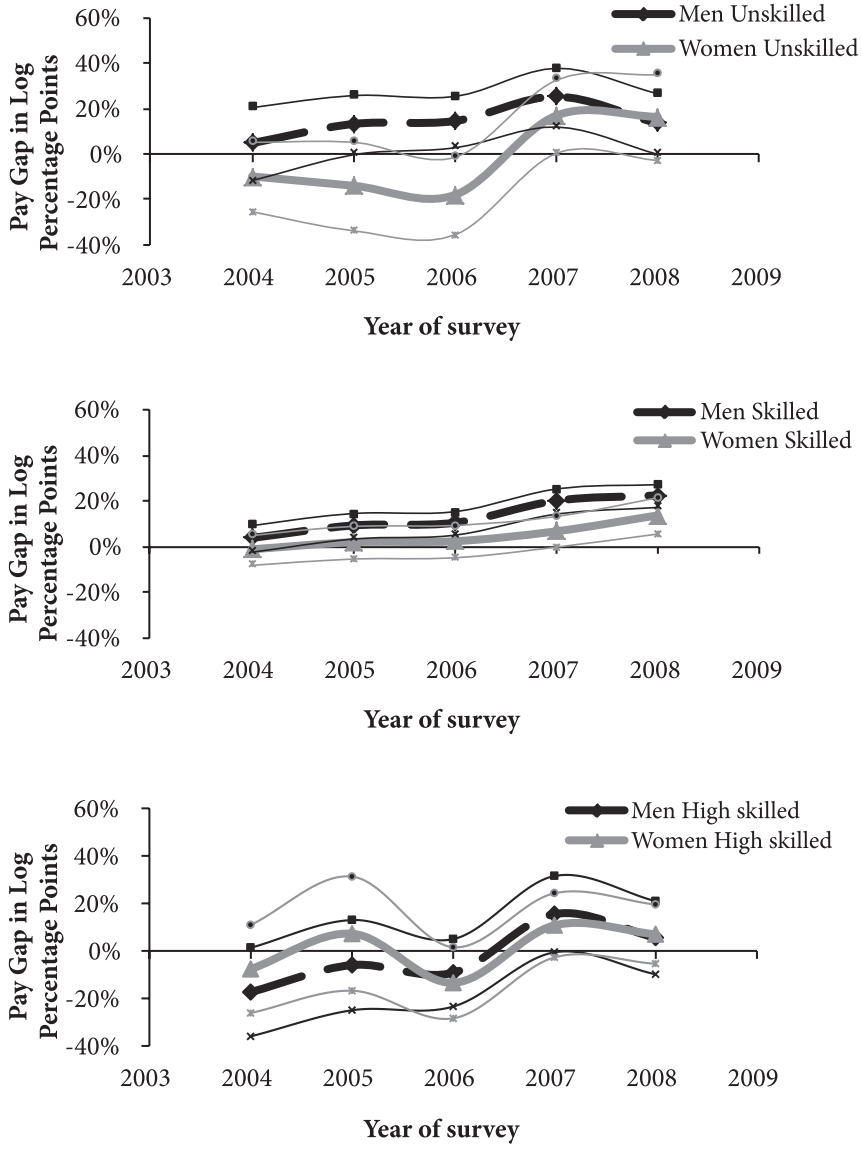


Figure 3 plots the conditional average public sector pay gap[3] across groups differentiated by qualifications attained with a 95% confidence interval for men and women, respectively. Figure 3 shows that public sector unskilled men have experienced the greatest improvement in their financial position when compared to their private sector counterparts. In particular, the public sector pay gap for unskilled men became statistically significantly different from zero from 2005. On average this group of workers collected around 14% mark-up over the period covered by the analysis. Unskilled women in the public sector experienced more cyclicality in pay relative to their private sector counterparts, but became statistically significantly better-off from 2007.

On the other hand, both public sector skilled men and women saw an increasing trend in average pay mark-up relative to their private sector counterparts i.e., about 13% for men and 5% for women on average during the period covered by the analysis. Finally, the public sector pay gap for male and female workers with university degrees and above was not statistically significantly different from zero in most of the years covered by the analysis.

Furthermore, it is important to point out that the highest increase in the public sector pay premium occured in 2007 for most of the public sector workers. This growth continued in 2008 only for skilled employees.

Summarising the results for male workers during the 2004-2008 period the public sector pay gap declined with higher educational qualifications. Among female workers those with high school qualifications and college degrees gained the most from having a public sector status. When compared to their private sector counterparts the public sector unskilled and skilled male workers appeared to gain more than female workers, while this is not the case for high skilled employees. However, the 95% confidence intervals of conditional estimates within each skill group intersect, suggesting that male and female estimates cannot be separated for every year.

3.3 Pooled Quantile Regressions Estimates by Educational Qualification

The previous analysis suggested a declining public sector pay premium with skill level. This indicates a compressed structure in the public sector earnings distribution relative to the private sector pay dispersion. Furthermore, public sector pay compression may differ within each skill group. In order to test both

3 Expressed in log percentage points throughout the paper

between and within group public-private sector pay differentials during the major period of economic transition the sector pay gap in this section is estimated across the pay distribution for each skill level and gender by pooling 2004-2008 data.

For this purpose, the quantile regression method is used to estimate the public/private sector earnings differentials at different points in the earnings distribution. While the conditional mean in the previous section is estimated by ordinary least squares (OLS) regression which predicts the average (mean) earnings by minimising the sum of squared errors, the quantile regressions predict the quantiles of the earnings distribution by minimising the absolute sums of the errors (i.e., the estimator is known as Least Absolute Deviations (LAD)).

Formally, this means that OLS (i.e., the conditional mean $E(\ln w_i \mid x_i)$) solves:

$$\min \sum_{i=1}^{n} (\ln w_i - \beta' x_i - \gamma P_i)^2 \tag{2}$$

and LAD (i.e., the conditional median $Med(\ln w_i \mid x_i)$) solves:

$$\min \sum_{i=1}^{n} \left| \ln w_i - \beta' x_i - \gamma P_i \right| \tag{3}$$

where $\sum_{i=1}^{n} \left| \ln w_i - \beta' x_i - \gamma P_i \right| = \sum_{i=1}^{n} (\ln w_i - \beta' x_i - \gamma P_i) \operatorname{sgn}(\ln w_i - \beta' x_i - \gamma P_i)$ and sgn(*a*) is the sign of *a* : 1 if *a* is positive and -1 if *a* is negative or zero.

Since the linear quantile regression model can also be estimated on quantiles other than median, the general model can be formulated as in Koenker and Basset (1978):

$$\ln w_i = \beta'_{\vartheta} x_i + \gamma_{\vartheta} P_i + \varepsilon_{i\vartheta} \qquad \text{for } i = 1, \ldots, n \tag{4}$$

with $Quant_{\vartheta}(\ln w_i \mid x_i, P_i) = \beta'_{\vartheta} x_i + \gamma_{\vartheta} P_i$ and $Quant_{\vartheta}(\varepsilon_{i\vartheta} \mid x_i, P_i) = 0$ where ϑ^{th} is the regression quantile, $0 < \vartheta < 1$, computed by:

$$\min_{\beta \in R^k} \left\{ \sum_{i:\ln w_i \geq \beta'_{\vartheta} x_i + \gamma_{\vartheta} P_i} \vartheta \left| \ln w_i - \beta'_{\vartheta} x_i - \gamma_{\vartheta} P_i \right| + \sum_{i:\ln w_i < \beta'_{\vartheta} x_i + \gamma_{\vartheta} P_i} (1-\vartheta) \left| \ln w_i - \beta'_{\vartheta} x_i - \gamma_{\vartheta} P_i \right| \right\} \tag{5}$$

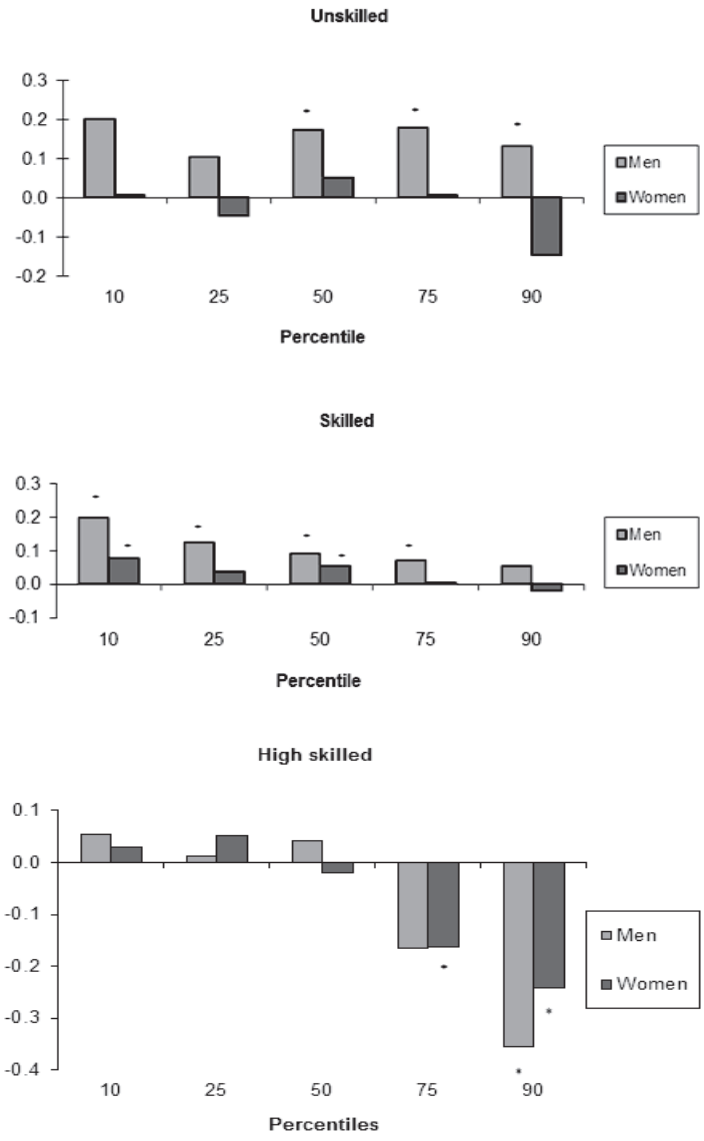
If $\hat{\gamma}_{\vartheta}$ is positive, then public sector workers at ϑ^{th} conditional quantile of $\ln w_i$ earn a premium. If $\hat{\gamma}_{\vartheta}$ is negative, then public sector workers at ϑ^{th} conditional quantile of $\ln w_i$ earn a penalty.

Therefore, estimating (4) the public sector pay effect can be traced over the entire conditional distribution of ln w by increasing ϑ continuously from 0 to 1. In this context, the quantile regression estimates provide a richer insight into the public sector pay effects than the OLS estimates.

The public sector pay differentials during the 2004-2008 period are estimated for six groups of workers according to educational qualification and gender, controlling for the same set of explanatory variables as in the previous section and for the time effect. Standard errors are obtained by the bootstrapping procedure (Hahn, 1995) with 1000 replications in all cases. The results are plotted in Figure 4.

As pointed out by Disney and Gosling (2003), estimating quantiles of the distribution of pay is more informative especially when the return to or the distribution of unobserved determinants of pay differs across given sets of characteristics at various points of the pay distribution. Particularly, if public sector workers with university degrees are more equal in terms of ability and intrinsic incentives than their private sector counterparts, or the private sector is more likely to pay a premium for these unobserved characteristics, then we would expect to find the difference between the estimated effects of the public sector at, for example, the 50^{th} and 90^{th} percentiles. This is exactly what is obtained for high-skilled and skilled workers in Figure 4.

Figure 4: Public sector hourly pay premium/penalty by highest educational qualification across the pay distribution by gender in Serbia during 2004-2008



Notes to Figure 4: * denotes that estimates are significantly different from zero at the 0.05 significance level based on estimated standard errors obtained by the bootstrapping procedure with 1000 replications in all cases. *Data Source*: Pooled LFS 2004-2008

In particular, Figure 4 shows that working in the public sector reduces pay inequality among university, college, and high school graduates, relative to their private sector counterparts. University graduates below and at the median of the pay distribution fare similarly across sectors, but those at the 75th and 90th percentile obtain penalties by not working in the private sector. A similar pattern is repeated for skilled workers who gain a significant public sector premium, but this premium dissipates as one moves up the pay distribution. Yet this pattern is not repeated for male unskilled workers who collect a statistically significant public sector pay premium at and above the median. This premium is similar in size to the pay gap estimated for male skilled workers at the bottom of the earnings distribution. This finding suggests that male unskilled workers at the upper end and both male and female skilled workers at the lower end of the earnings distribution collect the largest mark-up to public sector status.

4. CONCLUSION

In Serbia systematic economic reforms and large-scale privatisation programmes were launched during the last decade. This paper has examined the public/private sector earning differentials over the major period of economic transition by using Labour Force Survey microdata from 2004 until 2008. The sample has been divided into groups by highest educational qualification and gender.

The paper found that the average conditional public sector pay gap grew from zero to premium for unskilled and skilled workers and fluctuated around zero for high skilled workers. Moreover, the results suggested a declining public sector pay premium with skill level. This indicated greater pay compression in the public than in the private sector. Additionally, results from quantile regressions showed that both unskilled men at the upper part of the earnings distribution and skilled men and women at the lower part of the earnings distribution collected the largest mark-up to earnings relative to their private sector counterparts. University graduates at and below the median fared the same across sectors, while those above the median obtained penalties by having a public sector status. Therefore the paper revealed, both between and within groups, an inequality-reducing effect resulting from public sector pay determination.

Interpreting the results through a competitive world framework, it is likely that workers of different quality would be employed in the two sectors. Employers in the private sector would tend to hire the better quality employees at the highest

educational levels. The public sector would tend to attract better quality men and women with lower and middle educational qualifications.

Finally, if non-wage attributes such as insurance in the form of greater job security, flexible working hours, and social insurance were added to the current earnings of employees, the public sector pay premium for workers with lower and middle educational qualifications would be even higher. Moreover, holding a job in the public sector would likely become attractive for some workers with the highest educational levels.

Therefore, the results presented in this paper raise a concern for policy makers regarding overpaid public sector workers relative to their private sector counterparts. In this context, the effect of the recently implemented measures of a general pay freeze within the public sector initiated by the Serbian government in 2009 and 2010 will require future research. Another striking feature of the data may be related to the public sector pay flexibility. In particular, the results indicated that public sector workers with university and college degrees and high school qualifications have greater equality in terms of pay compared to their private sector counterparts. The inequality-reducing feature of public sector pay determination implies more compressed pay distribution in the public than in the private sector. This suggests that public sector workers are either more similar in terms of ability and intrinsic incentives than their private sector counterparts, or that the private sector is more likely to pay a premium for these unobserved characteristics. In this context future reasearch would substantially benefit from panel data in order to account for individual-specific effects.

Acknowledgements:

The author is especially grateful to Božidar Cerović, Mihail Arandarenko and Milena Jovičić for helpful discussions and to Gorana Krstić for helpful comments and suggestions while working with the data. The author thanks the Statistical Office of the Republic of Serbia for providing data on the labour market. The author greatly benefited from discussions with Richard Disney and Richard Upward from the University of Nottingham and David Blackaby from Swansea University in the United Kingdom.

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Received: November 17, 2011
Accepted: January 29, 2012