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Pre-crisis reforms, austerity measures and the public-private wage gap in two emerging economies

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Highlights

- We employ an extension to the OB method based on RIF regressions and reweighting.

- The public sector premium is present in both years and is three times higher in Serbia.

- There is a similar increase in the public-private sector wage gap in both countries during the crisis.

- The substantial public sector wage compression is further exacerbated by the crisis.

- Pre-crisis structural reforms played a decisive role in the countries' responses to the crisis.

Abstract

This paper analyzes crisis adjustments of the public and private sectors in two emerging market economies, Croatia and Serbia, during the 2008-2011 period. It focuses on public-private wage gaps at the onset of and during the crisis, decomposed into structural and composition effects using an extension to the Oaxaca-Blinder method based on Recentered Influence Function (RIF) regressions and reweighting. The main results indicate that at the beginning of the crisis public sector workers in both countries enjoyed a significant wage premium, with the premium in Serbia being about three times higher than in Croatia. During the crisis, both countries experienced a similar increase of the premium, with Croatia reaching the size of gap usually estimated for EU countries, while Serbia stayed largely ahead. The results also show that the wage distribution in the public sector is more compressed than in the private sector in both countries, which is further exacerbated by the crisis. Despite the introduced austerity measures, public sector workers continue to enjoy well-protected and privileged jobs in terms of wages relative to their private sector counterparts. Structural reforms undertaken prior to the crisis played a decisive role in determining the countries' responses to the crisis.

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1. Introduction

The recent global financial and economic crisis has turned the spotlight on the size and efficiency of public sectors worldwide. Private businesses were also forced to economize more on their costs. In a situation of output contraction and reduced aggregate demand, many countries have accumulated sizeable stocks of public and private debt or run into problems with repaying outstanding ones. The consequent need for deleveraging has threatened and continues to threaten the prospects for a successful recovery. In such circumstances, state administrations and both public and private enterprises have pursued, with more or less intensity and success, a variety of austerity policies.

Public sector structural reforms are much older than the recent austerity policies, however. For countries whose economies have transitioned from the communist to a market system over the past 25 years, public sector restructuring has largely taken the form of downsizing aimed at improving labor market functionality (see Lausev, 2014). The achievements are mixed, and it was the recent economic crisis that revealed how successful those countries were in reforming themselves.

The aim of this paper is to analyze how public and private sectors in two post-transition economies, Croatia and Serbia, responded to the crisis and how this altered their public-private wage gaps. Our interest in these two particular countries has a number of reasons. First, until 1991, Croatia and Serbia were parts of the same country, the Socialist Federative Republic of Yugoslavia (SFRY), but their paths diverged after the breakup of SFRY and the communist political and economic system. In spite of similar institutional backgrounds, these two countries experienced rather different processes and timings in their transformation from planned to market economies. Second, both countries faced hardships during the recent crisis, and their governments were forced to introduce certain austerity measures. Third, faced with fiscal problems brought by the crisis, the two countries chose different packages of consolidation measures. Whereas Croatia opted mainly

for tax increases, Serbia reacted mostly with cutting expenditures. The Labor Force Survey micro-data for Croatia and Serbia for the years 2008 and 2011 allow us to examine the gap between wages in the public and private sectors in a comparative manner. Therefore, the paper compares the gaps in two countries with different institutional settings before and after the start of the recent global economic crisis.

The contribution of this paper is threefold. First, it adds to the literature by examining the effect of the crisis on public-private sector wage differentials comparing two post-transition European economies. The current literature lacks studies that consider the effects of austerity measures on changes in the public-private wage gap for Eastern European countries that have recently transitioned from economies largely dominated by public sector wage-setting to economies with market-based incentives. Previous studies focused mainly on Western European economies with developed labor markets. A prominent example of a comparative analysis is the study by Lucifora and Meurs (2006), which explored the gap for Great Britain, France and Italy in 1998 and showed that institutional differences in wage regulation matter for the observed gap. Other more recent examples include studies across European Union countries (such as Christofides and Michael, 2013; de Castro et al., 2013; Depalo et al., 2013; and Giordano et al., 2011).

Our second contribution is methodological. Particularly, in order to decompose the wage gaps at the mean and at quantiles of the wage distribution, the paper combines the so-called recentered influence function (RIF) regressions, developed by Firpo et al. (2007, 2009), with DiNardo et al.'s (1996) reweighting procedure. This hybrid method provides more credible counterfactual wage distributions and allows for detailed decompositions of quantile gaps, but has so far been scarcely used in the literature on the public-private wage gap, and to the best of our knowledge never in studies on the topic for (post-)transition countries.

Finally, the results are important from a cross-country comparison perspective. Based on the analysis of two countries with the same background but different achievements in longer-term public sector restructuring, this paper confirms that the recent global crisis has revealed the

weaknesses of the pre-crisis reform processes. For both countries, rigidities of labor market institutions are the main factor in explaining difficulties in wage adjustments during the crisis. While before the crisis there was a sizeable wage premium favoring the public sector in both countries, it was considerably larger in Serbia than in Croatia, mainly reflecting Serbia's unsuccessful restructuring of the public sector. As a result, when the crisis broke out, Serbia suffered more. The paper highlights that the degree of success in structural reforms before the crisis played a decisive role in determining the country's readiness to properly respond to the crisis.

The paper is organized as follows. Section 2 describes the institutional background in Croatia and Serbia going back to the beginning of the 2000s and also delineating the more recent economic and labor market trends in both countries. Section 3 provides a brief review of the public-private wage gap literature, mainly focusing on empirical findings for European countries. The data and methodology are described in the fourth and fifth sections, respectively. Section 6 reports the main empirical results, while the final section concludes and offers some remarks on policy implications.

2. Institutional and economic background

2.1 Institutional background

Croatia and Serbia share a similar communist heritage that stems from being constituent republics of the former SFRY. After the breakup of the SFRY and the dual – political and economic – transition, their paths diverged. Croatia was hit by war in the first part of the 1990s and struggled with the transition to a market economy for the remaining part of the decade. Serbia, on the other hand, remained a pre-transition economy during most of the 1990s, reluctant to engage in large-scale privatization of public sector enterprises (Cerović, 2000). An important testimony of the fact that the two countries' paths diverged is that while Croatia joined the EU in 2013, Serbia only obtained the status of a candidate country in 2012. As argued by Subotic (2011), the political actors in these two countries showed rather opposite attitudes toward Europeanization, which determined

their different paths to EU accession; i.e., those in Croatia strategically emphasized shared norms and values with the EU and disregarded contradictory ones, whereas those in Serbia resisted the norms and rules of Europeanization and instead defined the national community.

In 2000, both countries experienced important political changes. In Croatia, after almost a decade-long dominance of the right-wing Croatian Democratic Union, the Social Democratic Party-led coalition came into power. In the same year, then Serbian president Slobodan Milošević was also defeated after a decade-long reign. Besides the effects of these changes in terms of improvements in democratic practice, they also marked the beginning of economic structural reforms, including those related to the labor market. However, despite improvements in the functioning of the labor markets in the first half of the 2000s, public sector wage-setting remained excessively complex. For example, in both countries the wage determination process in the public sector is based on a complicated system of so-called "coefficients"[1] and numerous wage supplements that are highly vulnerable to ad hoc changes under the pressure of labor unions. In the years before the global crisis, both countries showed evidence of higher public sector wages for workers with comparable characteristics to those in the private sector. Particularly, Nikolic (2014) showed that the average premium in Serbia increased from close to zero in 2004 to 19 percent for men and 12 percent for women in 2008. In Croatia, the average public sector premium is estimated at around 9 percent in 2003 (Nestić, 2005) as well as in 2008 (Rubil, 2013).

Lower public sector premiums in Croatia resulted mainly from a faster wage growth in manufacturing and a more cautious policy of public sector wages. Nevertheless, the presence of public sector premiums for certain skill levels in both countries might have led to negative spillover effects on the private sector by setting a 'reservation wage'.[2] In addition, collective agreements set effective wage floors by imposing 'base wages' specific to each formal skill level.

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[1] There are more than 600 of them in Serbia.

[2] Orsini and Ostojić (2015), for example, find evidence that wage dynamics in the private sector in Croatia may have been driven by demonstration effects from non-market public sectors, specifically from rising wages in the fast-growing education and health sector.

The rigidities of labor market institutions make wage adjustments in both countries more challenging. In Serbia, there are two major causes for these rigidities, the first of which is the dominance of the public sector in wage-setting and centralized wage bargaining. In particular, fiscal discipline is lacking, state-owned enterprises are protected and heavily subsidized and minimum wages are binding (IMF, 2013). Second, firing procedures are complex and costly and include a generous severance pay system. This lack of labor market flexibility effectively constrains the development of a dynamic private sector and its demand for labor (IMF, 2013).

Croatia faces similar problems. First, the employment protection legislation is rigid, despite efforts to increase flexibility in recent years (Matković and Biondić, 2003; Rutkowski, 2003; World Bank, 2011; Kunovac, 2014). Second, the tradition of collective bargaining makes the existing wage structure hard to change. Consequently, employment reduction strongly dominated wage reduction in the labor market's adaptation to the numerous shocks of the economic transformation, including privatization (Vehovec and Domadenik, 2003; Vujčić and Šošić, 2008; Tomić and Domadenik, 2012).

All this points to labor market duality as a common feature of both countries, with heavily protected public sector workers on the one side and private sector workers without collective agreements on the other (see Franičević, 2011, for Croatia, and Arandarenko and Avlijaš, 2011, for Serbia).

2.2 Economic and labor market trends

The early 2000s were characterized by strong economic growth in both countries. During the 2001-2008 period, the average real GDP growth rate was 4.3 percent in Croatia and 5 percent in Serbia. However, Croatia was well ahead in structural reforms, attracted more foreign investors and was more successful in employment creation than Serbia. In particular, Croatia completed its large-

scale privatization programs in the early 2000s,[3] while Serbia only started with similar reforms from 2001 onwards.

At the same time, fiscal consolidation in Croatia was moderate, with the deficit amounting to an average of 3.4 percent of GDP. It seems that in the first part of the 1990s privatization in Croatia was mainly motivated by changes in the ownership structure, whereas after the political turning point in 2000 it became largely motivated by the need to finance the budget deficit (Vehovec and Domadenik, 2003). In Serbia, the fiscal deficit relative to GDP started to grow from 2006 due both to decreases in revenues and increases in expenditures. In the period 2001-2008, both countries experienced an increase in real wages. However, unlike in Croatia, the average real wage in Serbia grew faster than productivity. Given these differences between the two countries during the pre-crisis period, it should come as no surprise that the impacts of the crisis, as well as the policy responses to it, were different.

The crisis reversed the trends in both countries (Table 1). The cumulative fall in Croatian real GDP over the period 2009-2011 was 9.4 percent, with a peak of -7.4 percent in 2009.[4] In Serbia, the real GDP growth rate in 2009 was -3.5 percent, but already turned positive in 2010. In the same period, inflation was rather moderate in Croatia (3 percent on average) and much higher in Serbia (9 percent).[5] The crisis also had a large impact on the labor market in both countries. As shown in Table 1, employment fell by a substantial amount, while the unemployment rates increased in both countries.

<insert Table 1 here>

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[3] Šošić (2008), for example, shows that after 2000 corporate restructuring in Croatia slowed down, with less job destruction, mostly in large, state-owned enterprises, and growth in total employment.

[4] It should be noted that the recession in Croatia lasted six consecutive years with a 13 percent cumulative fall in real GDP over the 2009-2014 period.

[5] Jovanovic and Peterski (2014) show that the main driver of price inflation during the crisis in CIS and SEE countries including Croatia and Serbia were wages, largely under the influence of trade unions, which are, in turn, dominant in the public sector.

Importantly, the start of the global crisis clearly coincided with post-privatization restructuring in Serbia. Structural changes were based on significant employment cuts rather than wage reductions (IMF, 2013). In particular, the Serbian government proscribed companies from shedding employees for three years following privatization. Given that privatization in Serbia peaked in 2005-06, layoffs started in 2008-09, largely coinciding with the onset of the crisis. Additionally, the Serbian tradable sector faced growing competition due to trade liberalization as part of the Stabilization and Association Agreement with the EU signed in 2008 (IMF, 2013). As a result of these factors, the number of employed workers in Serbia had decreased by around 250.000 in 2011 compared to 2008. Arandarenko and Avlijaš (2011) point out that job losses in the private sector were more pronounced for low-wage workers with less secure contracts, due to lower hiring and firing costs, especially following the minimum wage increase in January 2009. Supporting evidence on changes in the labor composition due to attrition of low-skilled workers is also provided by the IMF (2013). Private sector workers who kept their jobs were likely to experience wage cuts as an alternative strategy to coping with the negative impact of the crisis (Avlijaš et al., 2013).

As in Serbia, the distribution of employment cuts was not even across sectors in Croatia. Layoffs mostly occurred in the private sector.[6] Kunovac and Pufnik (2015) further confirm employment reduction as the dominant cost-cutting strategy of Croatian firms during the crisis. Similarly to Serbia, this strategy was either implemented through individual layoffs or through non-renewal of fixed-term contracts and a reduction of new hires.

Furthermore, the main instrument for deficit decline in Serbia was the restraint on wage bill because the government was reluctant to increase taxes and reduce other expenditures, such as pensions (WB, 2010). Given that public sector employment remained roughly constant, the wage bill was restrained via decreases in real wages. In particular, from 2009, the Serbian government introduced a nominal wage freeze and a partial freeze on recruitment for a period of two years. The

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[6] In contrast, the number of people employed in Croatian public services (public administration, education, health) increased slightly during the same period (Vukšić, 2014; Nestić et al., 2015).

freeze was maintained until April 2011, when wages were adjusted for inflation plus one half of the GDP growth rate over the following twelve months.

The Croatian government mainly opted for increasing the revenue side of the budget by increased borrowing and a heavier tax burden. For example, in 2009 the value added tax rate increased, a progressive "crisis tax" on net incomes was introduced, all tax reliefs in the personal income tax system were abolished and the excise duties on tobacco and fuel were increased. Non-wage compensations in the public sector, such as Christmas and holiday bonuses, were cut in 2010 and later abolished completely. Although the Croatian government already introduced some wage cuts in 2009 (10 percent wage cuts for state officials, 5 percent for managers in public companies and 6 percent in the base wage, which was temporarily frozen), the effects of these measures were modest (Franičević and Matković, 2013). As pointed out in Section 2.1, this downward nominal wage rigidity resulted from public sector trade union pressure (Tomić and Domadenik, 2012; Nestić et al., 2015). [7] As for the private sector, Nestić et al. (2015) find that in general low-pay jobs were lost during the crisis, leading to an increase in the sector's average salary. Given that the minimum wage was also frozen and the majority of those earning it work in the private sector (Nestić, 2010), public sector wages grew faster than private sector wages.

3. Literature review

Comprehensive surveys of public-private sector wage differentials summarize the ample academic debate on inter-sectoral differences in wage-setting (see Bender, 1998; Ehrenberg and Schwarz, 1986; Gregory and Borland, 1999; Lausev, 2014). These differences are shaped by economic, institutional and political factors. First, the public sector faces budget constraints while the private sector is "constrained" by its profit-maximization motive. Second, public sector wage bargaining is affected both by the monopolistic power of public sector unions and the monopsonistic power of the public sector as a sole employer for specific occupations. Third, the

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[7] For a detailed overview of the role of trade unions and collective agreements in the recent crisis in Croatia, see Franičević and Matković (2013).

public sector's political role of a "good employer" imposes a tradeoff between equality and efficiency.

Following the outbreak of the crisis in most European countries in 2008, this topic has gained even more importance, especially in countries facing more serious issues with public finances (see Christopoulou and Monastiriotis, 2014, 2016, for Greece, Ghinetti, 2014, for Italy, or Ramos et al., 2014, for Spain). In addition, cross-country studies by Christofides and Michael (2013), de Castro et al. (2013), Depalo et al. (2013) and Giordano et al. (2011) use large sets of European Union countries for comparison. These studies try to explain the differences in wages between the public and private sector in a wider context. For example, Christofides and Michael (2013) argue that institutional characteristics of the labor market (such as the wage determination mechanism, the degree of centralization in the public sector, the differences in recruitment procedures, the power of trade unions, the law on the minimum wage and minimum wage coverage, and employment protection regulations) are important in explaining the inter-sectoral wage gap. In a study that is empirically similar to ours, de Castro et al. (2013) show that the average difference between public and private sector wages in the EU in 2010 was about 10 percent, where about four percent is unexplained difference. However, there are striking differences between countries. The average gap spans from negative in Finland and Denmark (and Hungary, but insignificant) to more than 50 percent in Cyprus and Portugal. The unexplained part, or the wage structure effect, goes from -16 percent in Hungary and -15 percent in Estonia, to more than 20 percent in Luxembourg, Cyprus and Ireland.

Focusing on countries that transitioned from central planning to a market system, Lausev (2014) finds a consensus among studies regarding changes in the public-private sector wage differential. In particular, a public sector wage penalty (i.e., public sector workers are on average paid less than those in the private sector) estimated in most Eastern European countries at the start of economic transition vanishes or turns into a public sector wage premium with the advance of large-scale privatizations. A non-exhaustive list of reasons for the existence of the public-private

wage gap and its changes during economic restructuring includes competition for workers, efficiency wages, the first mover advantage and the compensating differentials for less job security and non-wage benefits. Lausev (2014) argues that a principal feature of labor markets during the structural reforms was the development of the public and private sector wage distributions typically observed in developed market economies.

In this context, the average public sector wage premium estimated for Croatia in several studies (Nestić, 2005; Nestić et al., 2015; Rubil, 2013) is in a comparable range to other EU countries. Controlling for relevant observed characteristics, Nestić (2005) and Rubil (2013) find a public sector premium of around 9 percent in 2003 (that decreases with increasing levels of wage and education) and in 2008, respectively. In a more recent study, Nestić et al. (2015) estimate the premium in 2012 to be 5 percent for the "core" public sector (public sector administration, education and health) and 7 percent for state-owned companies, both relative to the private sector.

On the other hand, previous studies for Serbia suggest that the average public sector wage premium is about two times greater in Serbia than in Croatia in recent years. Using the Serbian Labor Force Survey data, and controlling for worker and job characteristics, Nikolic (2014) shows that in the 2004-2008 period the average premium increased from close to zero to 19 and 12 percent for men and women, respectively. This is consistent with Ognjenović (2011), who shows that in the 2003-2007 period the gap turned from negative (public sector penalty) to positive (public sector premium) at around 20 percent, using another source of data (the Living Standard Measurement Survey). Therefore, at the onset of the crisis the public sector wage premium in Serbia was substantially higher than in Croatia.

4. Data, definitions and descriptive statistics

The empirical analysis is based on cross-sectional data from the Croatian and Serbian Labor Force Surveys (LFS) for 2008 and 2011. The year 2008 represents the pre-crisis period and the year 2011 a period in which the effects of the crisis had already occurred. The LFS data are collected on

a quarterly basis in Croatia and semi-annually in Serbia.[8] The working samples are restricted to full-time employees aged 15-64 who reported non-zero monthly wages and non-zero hours of work for their main job only.[9] Applying these restrictions, we are left with 5,863 observations in 2008 and 3,926 observations in 2011 in the case of Croatia, and with 4,416 and 4,465 observations in 2008 and 2011 respectively for Serbia.

In this paper, the public sector is defined as including all ownership types other than private. This means that the public sector includes public sector education, health and administration, as well as the state- and socially-owned enterprises. The same distinction between sectors is used in other studies that measure public-private sector wage differentials in Croatia and Serbia (e.g., Bejaković et al., 2011; Jovanović and Lokshin, 2003; Nikolic, 2014; Reilly, 2003). Although defined in this way the public sector can be perceived as overly heterogeneous, for the sake of comparison with other studies we decided to keep this wider definition. Also, it could be argued that due to privatization the structure of public sector employment may have changed during the observed period. However, privatization was slowed significantly during the crisis and hence should not have a significant impact on our results. According to this classification, public sector workers comprise around 42 percent of the (restricted) Croatian sample for both 2008 and 2011 and somewhat more at around 46 percent of the (restricted) Serbian sample for both years. The wage measure is the real hourly wage net of taxes, pensions and any payments by the worker into welfare plans.[10] It is important to mention that the Serbian LFS for 2011 does not provide a continuous wage variable. Instead, individuals are allocated to fourteen wage ranges. Following the approach used in the literature on the public-private wage gap (e.g., Christopoulou and Monastiriotis, 2014), a

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[8] In Croatia the "2(2)2" design is used: a person is interviewed for two consecutive quarters, then left out for two quarters, and then again interviewed in two quarters. To ensure that no person appears twice, we dropped all repeating observations. For Serbia, we use the April data.

[9] More precisely, we take only those with 31-79 work hours a week. Usually full-time employment is considered to be 40 hours per week. However, even if employed full-time, some may work less than 40 hours per week (see, e.g., Christofides and Michael, 2013).

[10] The nominal-to-real conversion is done through division of the nominal values by the consumer price index. To get the hourly wage, the monthly wages reported in the surveys are divided by the reported usual monthly hours of work. Since the survey reference period was a week prior to the interview we multiply the reported usual weekly hours by the average number of weeks in a month (i.e., 4.25) and assume that the number of hours worked was uniform in the month prior to the interview.

pseudo-continuous wage variable is created as the mean value of the upper and lower bounds of the reported wage range. The same approach is applied by Avlijaš et al. (2013), who study the gender wage gap using Serbian LFS data. We acknowledge that this data limitation may affect the results of the analysis, and for that reason a robustness test was performed. Specifically, by varying the lower bound of the lowest range and the upper bound of the highest range, a number of seemingly reasonable pseudo-continuous wage distributions were created and the whole analysis was repeated with each of them. In constructing the alternative wage distributions, particular care was taken to ensure that these distributions were reasonable in terms of how low the lower bound of the lowest and how high the upper bound of the highest wage range should be. None of the main results – reported in Section 6 below – changes to an extent that would imply different conclusions from those we draw.[11]

The observable characteristics are divided into personal and job characteristics, as is usual in the literature (e.g., Christopoulou and Monasteriotis, 2014). Personal characteristics comprise gender, age, marital status, settlement type, education, experience, and tenure. Job characteristics include occupation (ISCO classification), type of contract (temporary or permanent), supervision status (supervises others or not), establishment/firm size (small, medium, large), type of activity (the NACE classification), and location (NUTS2 classification) of the establishment.[12] Unfortunately, due to unavailability of the household identification variable, no household (as opposed to personal) characteristic could be used. The means of these variables by sector are given in Tables 2 and 3.

First, we observe longer working hours in the private sector, especially in Serbia. In both countries the average weekly working hours significantly decreased in the observed period only in the private sector, likely due to a crisis-induced reduction in demand for goods and services. The

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[11] Unfortunately, we were unable to test the robustness of our results by using interval regression. The reason is that we opted for hourly instead of monthly wages: the original wage ranges are given on a monthly basis, and thus we could apply interval regression only with monthly rather than hourly wages.

[12] Since in Serbia's LFS there is no information on the location of the establishment itself, we use the location of the worker, assuming that the two coincide often enough. The assumption seems reasonable given the fact that everyday long-distance commuting is rather rare.

wages are also significantly lower in the private sectors of both countries. The nominal wages grew in both sectors. As for real wages, in Croatia they grew only in the public sector, but on a much lesser scale due to moderate inflation (Table 1), suggesting no real impact of the introduced measures on wages in the public sector. The real wages in Serbia decreased in both sectors, but more so in the public sector, indicating that the austerity measures were effective in real terms.

In both countries and years there are, on average, significant inter-sectoral differences in personal and job characteristics. For example, while the genders are virtually equally represented in the public sector, in the private sector there are notably fewer females. Public sector workers are on average 5-6 years older and better educated. Workers in both sectors mostly work in small establishments (<50 employees), as expected more so in the private sector. Regarding the occupational structure, most public sector employees are professionals, technicians, or clerks, whereas in the private sector most are craftsmen, plant/machine operators, or deal with services and sales. Temporary contracts are more prevalent in the private sector, while slightly more public sector workers have a supervising position. We do not use all economic sectors, but only those perceived to be 'the most important' for the overall economy – manufacturing, construction, wholesale and retail trade, transport and communication, and financial intermediation, treating the remaining ones as one group. In both countries, more than half of the private sector employees work in manufacturing and trade, while about 70 percent of those employed by the public sector work in its 'traditional' part (administration, health and education), included in the above-mentioned group of 'other' sectors. In Croatia, most employees are located in the Northwest region (including Zagreb, the capital), while in Serbia most are located in Šumadija and West Serbia. Finally, we note that with the exception of characteristics measured in years (age, experience, and tenure), the changes over the considered period are quite small (mostly insignificant) for both sectors, especially in the case of Serbia. This should not come as a surprise, given that the time span is too short for significant structural changes.

<insert Tables 2 and 3 here>

5. Methodology

To estimate and decompose the mean and quantile wage gaps, we rely on Firpo et al.'s (2007, 2011) extension to the standard Oaxaca-Blinder (OB) decomposition (Blinder, 1973; Oaxaca, 1973). This extension combines the so-called recentered influence function (RIF) regressions of Firpo et al. (2009) and the reweighting procedure of DiNardo et al. (1996), allowing one to perform exact and path-independent detailed OB-type decompositions for any distributional statistic that has its influence function (IF). The role of reweighting is to provide more credible counterfactual.

Let $\theta(F_y)$ denote either the mean, $\theta(F_y) = \mu(F_y)$, or a τ-quantile, $\theta(F_y) = Q_\tau(F_y)$, of a distribution of log wages, y, with the cumulative distribution function F_y and density f_y. The RIF for a distributional statistic is defined as the sum of the statistic and its IF.[13] The RIFs for the mean and a quantile are given as $\mathrm{RIF}(y; \mu; F) = y$ and $\mathrm{RIF}(y; Q_\tau; F) = Q_\tau(F_y) + \left(\tau - \mathrm{I}\left[y \le Q_\tau(F_y)\right]\right) / f_y(Q_\tau(F_y))$, respectively, where $\mathrm{I}[.] = 1$ if the condition in brackets holds and zero otherwise. Firpo et al. (2007, 2009) assume that the RIFs can be approximated by the linear function $\mathrm{RIF}(\theta; y; F) = X\beta + \varepsilon$, where $\mathrm{E}[\varepsilon \,|\, X] = 0$, which implies $\mathrm{E}[\mathrm{RIF}(\theta; y; F)] = \mathrm{E}[X]\beta$. Thus, the OLS regression of $\mathrm{RIF}(\theta; y; F)$ on X is called the RIF regression for the statistic θ.[14]

Denoting the public (private) sector by *PUB* (*PRI*), the total or raw wage gap $\Delta^\theta \equiv \theta_{PUB} - \theta_{PRI}$ at the mean ($\theta = \mu$) or at τ-quantile ($\theta = Q_\tau$) can be expressed as

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[13] IF of a distributional statistic is the effect of a small perturbation in the distribution on this statistic. For details and a formal definition, see Essama-Nssah and Lambert (2012) and Firpo et al. (2007, 2009).

[14] Note that the RIF regression for the mean is equivalent to the standard mean regression. However, RIF regressions for quantiles are not equivalent to the standard (conditional) quantile regressions of Koenker and Basset (1978); while the former model unconditional quantiles, the latter model conditional quantiles. For illustrations of interpretational differences see Borah and Basu (2013) and Fournier and Koske (2012).

$$\Delta^{\theta} = (\overline{X}_{REW}\hat{\beta}_{REW} - \overline{X}_{PRI}\hat{\beta}_{PRI}) + (\overline{X}_{PUB}\hat{\beta}_{PUB} - \overline{X}_{REW}\hat{\beta}_{REW}) = \Delta_{C}^{\theta} + \Delta_{WS}^{\theta}, \tag{1}$$

where $\overline{X}$ is the vector of average characteristics and $\hat{\beta}$ is the vector of RIF regression parameter estimates for the corresponding sector. *REW* denotes the sample of private sector workers reweighted in such a way that its distribution of characteristics resembles that of the public sector as closely as possible. The reweighting is done using reweighting factors à la DiNardo et al. (1996), based on the parametrically estimated propensity score (in this case the probability of working in the public sector, conditional on observables). Essentially, private sector workers with characteristics similar to those in the public sector get weighted more heavily. Combined with such reweighting, an OB-type decomposition is a variety of the so-called doubly-robust estimator, providing consistent estimates if either the conditional expectation function (here the RIF regression) or the propensity score model is specified correctly (e.g., Kaiser, 2015; Słoczyński and Wooldridge, 2014).

In equation (1), Δ_{C}^{θ} is the 'composition effect' (or the 'explained' part of the gap), reflecting inter-sectoral differences in the average characteristics, while Δ_{WS}^{θ} is the 'wage structure effect' (or the 'unexplained' part of the gap) that reflects the effect of inter-sectoral differences in marginal rewards to the characteristics (regression coefficients). More precisely,

$$\Delta_{WS}^{\theta} = \overline{X}_{PUB}(\hat{\beta}_{PUB} - \hat{\beta}_{REW}) + (\overline{X}_{PUB} - \overline{X}_{REW})\hat{\beta}_{REW} = \Delta_{WS,TRUE}^{\theta} + \Delta_{WS,ERROR}^{\theta}, \tag{2}$$

$$\Delta_{C}^{\theta} = (\overline{X}_{REW} - \overline{X}_{PRI})\hat{\beta}_{PRI} + \overline{X}_{REW}(\hat{\beta}_{REW} - \hat{\beta}_{PRI}) = \Delta_{C,TRUE}^{\theta} + \Delta_{C,ERROR}^{\theta}, \tag{3}$$

where $\Delta_{WS,TRUE}^{\theta}$ and $\Delta_{C,TRUE}^{\theta}$ are the true effects, whereas $\Delta_{WS,ERROR}^{\theta}$ and $\Delta_{C,ERROR}^{\theta}$ are, respectively, the reweighting and misspecification errors. Each of the two true effects can be further decomposed into the contributions of each of the observable characteristics or groups of them.[15] An important advantage of the 'Firpo et al. procedure' when it comes to quantile decompositions is that the

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[15] For categorical characteristics, the effects depend on the choice of the omitted category (Oaxaca and Ransom, 1999). To ensure invariance of the effects to that arbitrary choice, we follow Yun (2005), who proposes a solution that yields the results that would be obtained if one performed the decompositions for all possible choices of the omitted category and averaged all the results.

detailed decompositions are path-independent, in the sense that the contributions of particular characteristics are invariant to the order in which these contributions are calculated, which is not the case in the standard quantile decomposition procedure of Machado and Mata (2005).

The decomposition approach entails two identifying assumptions: (i) people are selected into sectors based only on observables; (ii) distributions of the observables for the two sectors overlap. The first assumption ensures that neither effect is confounded by inter-sectoral differences in the conditional distribution of unobservables. The second rules out any observable characteristic which completely identifies an individual as a member of either sector.

While the first assumption is not problematic (in fact, we found no characteristic worth including among the observables that is also a perfect identifier of the sector), the second one may be problematic because of the possibility that some unobservables can partly drive the individual choice of sector. Thus, there is a possibility of biased results if those reflect to a significant extent the effects of selection based on unobservables.

Although we acknowledge this issue, unfortunately there is hardly anything we can do to address it properly. In the literature, the issue is standardly handled by applying a method that takes selection into account by modeling it, usually Heckman's two-step procedure. For the estimation of the selection equation, a proper instrumental variable is required, one that correlates significantly with the sector choice but is rightly excluded from the wage equation. Unfortunately, in our LFS data we were unable to find variables for which we could claim with reasonable credibility that they satisfy both requirements. A number of different variables have been used in the literature for that purpose. It is common to these variables that they serve as proxies for the preference for public sector employment but seem irrelevant for the wage determination within a given sector. For example, some authors used education or occupation of the respondent's parents (Bender, 2003), perception and importance of labor unions (Heitmueller, 2006), or the sector of employment of

other household members (Christofides and Pashardes, 2002). Neither these nor similar variables that would serve the purpose were available in both Croatian and Serbian LFS data.[16]

Even if we had appropriate instruments, it is not clear that combining the 'Firpo et al. mean decomposition procedure' (Oaxaca-Blinder with reweighting) with Heckman's two-step procedure is econometrically a "legitimate" exercise. Although at first sight the two may seem legitimately combinable, taking this at face value boils down to using an estimator with formally still unexplored properties. In contrast, the usage of Heckman's approach in the standard Oaxaca-Blinder mean decompositions is by now well-established. In the case of quantile decompositions, there are also extensions of the standard Machado-Mata approach (Machado and Mata, 2005) that enable one to control for selection in quantile decompositions (e.g., Albrecht et al., 2009), although these are not based on Heckman's two-step approach (e.g., Buchinsky, 1998). These quantile decomposition procedures are, however, for conditional quantiles, and thus it is not clear whether the control for selection used in these procedures can be used in the 'Firpo et al. quantile decomposition', which is for unconditional, rather than conditional, quantiles.

We emphasize, however, that in our case the problem of unavailability of a proper instrument is prior to the problem of unknown properties of the estimator that would be obtained by combining Heckman's approach to selection with the 'Firpo-Fortin-Lemieux decomposition procedure'. If the instruments were available, then it would in principle be worth assessing the pros and cons of dropping the 'Firpo et al. procedure' and using a standard procedure without reweighting for the sake of being able to combine it safely with Heckman's two step procedure. The chief advantage of the standard approach would be the ability to control for selection, while the disadvantages would consist in losing (i) the double robustness of the 'Firpo-Fortin-Lemieux decomposition procedure' and (ii) the possibility to perform exact and path-independent detailed quantile decompositions. Both (i) and (ii) are important: the former in light of ignorance as to whether the conditional expected wage function can be safely assumed to be linear, and the latter in

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[16] Christofides and Michael (2013) do not control for selection into the sector for similar reasons, namely the insufficient richness of the data (in their case the EU-SILC).

light of the difficulties in interpreting the results of detailed decompositions when the contributions of particular contributions are not invariant to the order in which they are calculated and when these do not add up to the total gap.

Finally, issues with data and estimator aside, the practice of controlling for selection as it is commonly done in the public-private wage gap literature is usually hardly convincing. The choice of instruments tends to be rather ad hoc, lacking credibility beyond that based on rather casual arguments which essentially show only that the instrument choice is not completely nonsensical, rather than that is really credible. Natural experiments would provide proper instruments, but these are scarce and it is questionable how generalizable the results are, given that estimates based on instrumental variables under certain assumptions can usually be interpreted only as locally (for a specific subpopulation), rather than globally, valid (Angrist and Imbens, 1994).

6. Results

We estimate the public-private wage gap at the mean and at selected quantiles along the wage distribution for Croatia and Serbia in 2008 and 2011. Using counterfactual decompositions, we further estimate the sources of total wage gaps and the principal drivers of changes in the gaps over the period considered.

6.1 Wage gap at the mean

Public-private wage gaps may be largely determined by different worker and job characteristics. The most straightforward way to obtain the average wage gaps conditional on the observed characteristics is to pool both sectors' data together and run an OLS wage regression with a public sector dummy as one of the covariates. Although this simple approach restricts the coefficients (i.e., marginal returns) on the characteristics to be the same across sectors so that the gap amounts to an intercept shift only, we nevertheless use it as a first quick assessment of the size of the conditional gap. The results are presented separately for each year and country in Table A.1

in the Appendix. In accordance to our previous observations from the descriptive statistics (Tables 2 and 3) there is a significant public sector premium in both countries, which is higher in 2011 than in 2008.

We then proceed by relaxing the constraint of equal returns across sectors by performing the OB-type counterfactual decomposition described in Section 5 to decompose the total public-private wage gap into (i) a component that is due to differences in the mean values of characteristics (the 'composition effect' or the 'explained part') and (ii) a component that is due to differences in the coefficients, that is, the returns to characteristics (the 'wage structure effect' or the 'unexplained part'). As usual in the literature, we interpret the latter as the conditional-on-observables public sector premium (if positive) or penalty (if negative). Unlike in the pooled regression approach, the coefficients are no longer necessarily equal across the sectors here, since otherwise the wage structure effect would be zero by construction. The results are presented in Table 4.

<insert Table 4 here>

Table 4 shows that the total gap, which represents the raw inter-sectoral difference in average (log) wages, is positive and statistically significant in both years and both countries. Although this gap is not adjusted for personal and job characteristics, its direction of change over the considered period is in accordance with the evolution of labor market developments in both countries; increasing in Croatia and decreasing in Serbia. This indicates a larger rise in public sector wages in Croatia and a larger fall in public sector wages in Serbia as compared to the private sector.

Before proceeding with the decomposition results, note first that the total error is small and insignificant in all decompositions, indicating that the composition and wage structure effects are consistently estimated.[17]

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[17] Since the decomposition method we use is 'doubly robust', insignificant errors indicate that either the conditional expectation function (RIF regression) or the logit model of the conditional probability of working in the public sector or both are well-specified (see Section 5).

The results for Croatia in both years show that both the composition and wage structure effects are significantly positive (gap-increasing). The total gap is predominantly explained by inter-sectoral differences in characteristics: the composition effect accounts for about 85 percent of the total public sector premium in both years. Thus, a rather small part of the total premium comes from the inter-sectoral differences in returns to characteristics. Although small relative to the composition effect, the wage structure effect (the 'unexplained' part of the gap or the 'conditional' gap) is 0.044 and 0.055 log points (approximately 4.4 and 5.5 percent) in 2008 and 2011, respectively, which is comparable to the average of about 4 percent for other EU countries estimated by de Castro et al. (2013). Considering the change over the analyzed period, the total gap increased, driven by changes in both effects, with neither change being notably dominant, as evidenced by the virtually unchanged structure of the total premium in terms of the relative contributions of the two effects. Both effects changed little, however, and consequently the total premium changed only little.

In Serbia, the two effects are significantly positive too. The composition effect dominates only in 2008, accounting for about 70 percent of the total premium. The relative contributions of the two effects change in 2011, when the wage structure effect starts to dominate, accounting for about 60 percent of the total gap. Thus, compared to Croatia, the composition effect is more important, especially so in 2011. The wage structure effect amounts to 0.145 log points in 2008 and 0.179 log points in 2011, which is three times larger than in Croatia and other EU countries. Its change from 2008 to 2011 contributes little to the change in the total gap. Greater changes in the employment structure and lower payments for the same characteristics than in the public sector suggest that the private sector in Serbia was hit more by the financial crisis in spite of public sector austerity measures.

These results are in accordance with our argument that the crisis is only part of a longer-running story. The greater public-private wage gap in Serbia than in Croatia, both unconditional (total) and conditional (wage structure effect), likely reflects differences in the engagement in

structural reforms between the two countries. Croatia started large-scale privatizations earlier than Serbia and was generally more successful with the structural reform process. Whereas wages before the crisis in Serbia grew above productivity and the public sector generated a significant premium, Croatia had faster growth of wages in the private sector that reflected productivity growth and the government pursued a more cautious policy of public sector wages. Moreover, the timing of the crisis caught Serbia at the peak of post-privatization restructuring.

This analysis of two countries with similar institutional backgrounds, but different levels of progress in longer-term public sector restructuring, seems to confirm that the recent global crisis simply revealed existing weaknesses of the reform process in both countries, which were more pronounced in Serbia than in Croatia. As pointed out in a volume of studies edited by Vaughan-Whitehead (2013), it may not be a coincidence that countries that were reluctant to take up deep public sector restructuring earlier on suffered more severely from the crisis.

6.1.1 Detailed decompositions

Detailed decompositions of the composition and wage structure effects allow us to 'unpack' them and look at the contributions of different characteristics and their marginal returns to the aggregate composition and wage structure effects. The results in Table 4 show that public sector workers in both countries are on average employed in higher paid occupations and have a higher level of education and more experience than private sector workers. For example, differences in educational qualifications and experience account for around 31 percent of the composition effect in 2008 in both countries. Inter-sectoral differences in the type of work contract, sector of economic activity, size or region of establishment are rather important in explaining the wage gap, especially in Croatia. On the other hand, differences in the gender structure across the sectors have a negligible contribution to the wage gap.

Furthermore, detailed decompositions of the wage structure effect suggest that the public sector paid more than the private sector for the same level of education in both countries in 2008,

but less for the same experience and occupation. In Serbia these differences narrowed over the considered period, but still remained in 2011. In Croatia experience is valued more in the public sector in 2011, likely due to the fact that wages in the public sector increase automatically every year based on years of service due to previously agreed collective agreements with trade unions. In Serbia, some other job characteristics, such as the sector of economic activity or the size of the establishment, are valued more in the public sector.

6.1.2 Wage gap by gender

The results from the OLS regressions, presented in Table A.1 in the Appendix, suggest that female workers in general are paid less than male workers in both countries and in both years.[18] In order to reveal additional effects of the crisis on the public-private wage gap we further disaggregate data by gender, as presented in Table 5. In discussing the results, we focus on the conditional gap, that is, the wage structure effect.

<insert Table 5 here>

Whereas in Croatia over the period 2008-2011 the public sector premium for men changes only marginally (from 6 to 7 percent), for women it increases from zero to 4 percent. Male workers in Serbia have a 14 percent premium in both years, which is twice as high as in Croatia. The difference in the public sector wage premium between Croatia and Serbia is even greater for female workers. Particularly, women employed in the Serbian public sector receive a 10 percent premium in 2008, which increases to 22 percent in 2011.

These results imply, first, that the most vulnerable group during the crisis were women employed in the private sector and, second, that in spite of the introduced austerity measures, public

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[18] The male-female wage gap (presented in Table A.1 in the Appendix) increased in Croatia between 2008 and 2011, whereas it declined in Serbia. These results, however, reveal neither the gender gap in the sectors (public and private) nor the public-private gap across genders.

sector workers, especially women, enjoy not only well-protected but also privileged jobs in terms of wages relative to their private sector counterparts.

6.2 The public-private sector wage gap across the pay distribution

The public-private sector wage gap at different points of the wage distribution, estimated by unconditional quantile regressions, provides a richer understanding of the data due to a more complete picture than decompositions at the mean. Obtaining estimates along the wage distribution is especially important when the public sector wage is expected to be more compressed relative to the private sector wage distribution. This means that the public sector tends to reduce wage inequality more than the private sector. Lausev (2014) shows that in transition economies the public sector wage distribution is more compressed than the private sector wage distribution, and that this difference is higher than in developed economies.

Moreover, we would like to see if there were any changes in the degree of wage compression during the crisis. For this purpose, we proceed by looking at the public-private wage gap at selected percentiles along the distribution, namely the 10th, 25th, 50th, 75th and 90th percentile.

First, we briefly assess the appropriateness of the linearity assumption and the quality of reweighting (see Figure A.1 in the Appendix). We note that the total error is generally larger than it was in the mean decompositions, reaching as much as 0.10 log points at some quantiles, both above and below zero. However, for both countries and years, and at all of the selected percentiles, virtually the whole error is accounted for by the misspecification error. Thus, the reweighting error is very small, indicating that the reweighting is properly done.[19] This indicates that reweighting is more important for decompositions at quantiles than for those at the mean (Firpo et al., 2007) and that without it the estimates would be inconsistent.

The results of the quantile decompositions are shown in Figure 1. For both years and both countries, the total gap mainly declines from the bottom towards the top of the distribution.

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[19] In other words, the logit model for the conditional probability of being a public sector worker is well-specified, which is a sufficient condition for consistency of the estimates (see Section 5).

However, differences in characteristics between the two sectors are lower at the bottom than at the top of the wage distribution. This indicates that workers are more similar across sectors at the bottom than at the top. As previously shown in Tables 2 and 3, public sector workers have, on average, more favorable job and personal characteristics than private sector workers. This analysis shows that these differences in characteristics are greater at the higher than at the lower end of the wage distribution, a result typically found in the literature on the public-private sector wage gap.

The conditional part of the differential, the wage structure effect, varies along the distribution according to the usual pattern observed in most countries. In particular, positive differences in returns to the same characteristics between public and private sectors are smaller for higher percentiles. Therefore, the wage inequality reducing effect in the public sector is present in both years and countries. This means that the public sector premium is largest below the median of the wage distribution and approaches zero or translates into a penalty at higher percentiles.

<insert Figure 1 here>

Compared to the wage gap at the mean (Section 6.1), we observe that the premium at and below the median of the wage distribution in Croatia is larger than at the mean. At the same time, top paid workers in the public sector receive substantially lower returns to the same characteristics compared to their private sector counterparts. This result is in accordance with Nestić et al. (2015), who find that in Croatia the gap is larger for low and middle income workers, but diminishes significantly for higher wages. In particular, Figure 1 shows an increase in the public sector wage premium for workers at the 10th percentile from 16 percent in 2008 to 20 percent in 2011. The public sector premium at the 25th percentile of the wage distribution is almost 18 percent and remains unchanged over the considered period. At the median, the public sector wage premium increases from 7 percent in 2008 to 13 percent in 2011. Workers at the 75th percentile of the wage

distribution fare similarly across sectors, and those at the top (i.e., at the 90th percentile) face a 23-percent wage penalty from having a public sector job in both years.

Serbian public sector workers enjoy even higher premiums at lower percentiles of the wage distribution than their Croatian counterparts. In 2008, the public sector rewards workers at the 10th and 25th percentiles with returns that are more than a quarter higher than in the private sector. The same workers perceive a small further increase in their premium in 2011. At the median, the gap remains similar over time at around 20 percent. Public sector workers at the 75th percentile enjoy about a 10 percent premium in 2008, but this vanishes until 2011. Only at the 90th percentile are public sector workers penalized relative to those in the private sector; in 2008 the penalty amounts to about 19 percent, but disappears completely until 2011. This could be due to wage income bands in the data, which impose an upper limit on the reported maximum wage.

In Croatia, the premium increases the most at the median in 2011 relative to 2008. Nestić et al. (2015) argue that, through different linear wage increments and different wage supplements, the public sector wage policy actually favors those with wages around the median. Furthermore, the premium also increased at the bottom percentile but remained unchanged above the median. These results point to a number of conclusions. First, the public sector is less responsive to changes in labor market circumstances. This lack of responsiveness results from strong trade unions that prevented wage structural changes. Another reason could be a political need to show that the state is a "good employer", especially for those who normally earn less (Nestić et al., 2015). Second, the public sector is less exposed to pressures on efficiency improvement than the private sector. Third, the private sector responded to the crisis by reducing the demand for workers with lower qualifications and cutting wages for workers at and below the median. At the same time, the fact that the gap above the median remained unchanged shows that the private sector successfully competes for such workers with the public sector. Moreover, the workers with the highest wages still fare better in the private sector.

Most of these observations hold for Serbia as well. However, public sector workers seem to be in an even better position than in Croatia at all percentiles of the wage distribution. Looking at 2008, the public sector wage premium is around 10 percentage points higher across the wage distribution in Serbia than in Croatia, with the largest differences at the median (about 13 percentage points). The difference is smaller only for workers at the 90th percentile, but this shows that in Serbia even those at the top have a lower public sector penalty than in Croatia.

Regarding the impact of the crisis, quantile decompositions reveal that due to austerity measures introduced in the public sector, in Serbia only workers with wages at the 75th percentile lost relative to their private sector counterparts. The fact that the wage gap at the lower end of the wage distribution increased further during the crisis despite public sector austerity measures and minimum wage increases suggests a substantial response of the private sector to the crisis through both wage cuts and employment restructuring. Although governments have undertaken some measures that were expected to decrease the public-private wage gap, these were not enough to offset the austerity measures pursued in the private sector. This paper thus reveals some of the major weaknesses of the Serbian labor market. One can argue that workers will effectively continue to queue for public sector jobs as the private sector simply does not offer an equally attractive alternative for most of them. At the same time, the private sector took advantage of the circumstances in the labor market during the crisis to start post-privatization restructuring via significant layoffs and wage cuts.

The main conclusions from this part of the analysis are the following. First, significant public sector wage premiums at the lower part of the wage distribution, coupled with zero premiums or penalties at the upper part of the wage distribution, indicate a substantial compression of the public sector wage distribution relative to the private sector in both countries. And, second, the crisis exacerbated the differences between public and private sector wage distributions even further, leading to even more wage compression in the public sector.

On the whole, the results in this section confirm that public sector workers remained quite privileged during the crisis despite the governments' efforts to hold down public sector wages[20] and that the structural reforms undertaken prior to the crisis played a decisive role in determining a country's readiness to respond to the crisis.

7. Conclusions and policy implications

Although Croatia and Serbia have chosen different ways to adjust to the crisis, the impact on the conditional public-private sector wage gap in these two countries is similar when measured as a relative increase in the public premium between 2008 and 2011. The only major difference is that the initial premium at the mean and at percentiles along the wage distribution was larger in Serbia than in Croatia, which consequently caused a greater increase in the wage gap in absolute terms. This result suggests that structural reforms undertaken prior to the crisis played a decisive role in determining the countries' responses to the crisis.

However, the public sector wage premium in Croatia remains in the range estimated for most other EU countries (5 percent versus 4 percent for the EU), while the premium in Serbia is about three times higher than that in Croatia. The results also suggest that the most vulnerable group during the crisis were women employed in the private sector. Hence, in spite of the introduced austerity measures, public sector workers, especially women, not only enjoyed well-protected but also privileged jobs in terms of wages relative to their private sector counterparts.

The unconditional quantile regressions applied in this paper raise concerns for policymakers regarding overpaid public sector workers in both countries in the lower parts of the wage distribution. Namely, significant public sector wage premiums in the lower part of the distribution, coupled with zero premium or penalties in the upper part, indicate a substantial compression of public sector wages relative to the private sector in both countries. The crisis exacerbated the

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[20] Maczulskij (2013), using Finnish microeconomic data, also shows that the public sector wage premium is highly counter-cyclical, with local government workers and those working at lower skill levels benefiting the most from deteriorating conditions on the labor market.

differences between public and private sector wage distributions even further, leading to more public sector wage compression.

Particularly for Croatia, our work shows a significant public sector premium at and below the median of the wage distribution, accompanied by a significant penalty for having a public sector job for workers at the top percentiles of the wage distribution. Thus, the public sector in Croatia suffers from wage compression and may face difficulties in recruiting top skilled workers while paying above market returns to workers at the lower end of the wage distribution.

On the other hand, our results suggest that real wage declines, caused by wage freezing measures in the Serbian public sector, were coupled with even greater private sector wage cuts. The estimates for Serbia indicate that the crisis led to further worsening in living standard conditions especially for private sector workers at and below the median of the wage distribution. These workers not only faced greater job insecurity, but also saw an increase in their wage disadvantage when compared to workers with the same characteristics in the public sector.

The paper concludes that public sector workers remained quite privileged during the time of the crisis despite government efforts to hold down the public sector wage bill in both countries. This indicates that the countries' willingness to undertake deep public sector restructuring prior to the crisis affected their readiness to respond to the crisis. We also argue that the impact of the crisis was more painful in Serbia than in Croatia due to the fact that Serbian large-scale post-privatization restructuring coincided with the onset of the crisis.

How will high public sector premiums impact policies in the fiscal domain for these countries in the future? The increasing public sector wage premium shown in this paper sheds light on workers' flow efficiency between the public and private sectors and the ability to finance public sector wages, especially in Serbia. Although Croatia resisted adjusting public sector wages to the overall state of the economy in order to preserve the social dialogue with the trade unions and its status as a 'good employer', after joining the EU in 2013 it has to adhere to additional supranational rules asking for reductions in both the budget deficit and public debt. Similar requirements await

Serbia, but in a longer time period. The first challenge will be the continuation of the privatization process that started just before the crisis. This paper reveals a significant venue for policymakers to explore in order to meet these demands by lowering public sector wages and/or employment.

Acknowledgments

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Appendix

Table A.1. Pooled regressions with public sector dummy

	Croatia				Serbia			
	2008		**2011**		**2008**		**2011**	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Public sector	0.046***	0.011	0.071***	0.012	0.136***	0.020	0.145***	0.018
Personal characteristics								
Age	0.004	0.004	0.002	0.005	0.004	0.008	0.010	0.007
Age^2/1000	-0.050	0.051	-0.039	0.056	-0.009	0.009	-0.014	0.008
Female	-0.149***	0.009	-0.166***	0.010	-0.151***	0.016	-0.107***	0.015
Married	0.015	0.010	0.0271*	0.011	0.011	0.018	-0.001	0.016
Medium-skilled – ref.								
Low-skilled	-0.105***	0.014	-0.090***	0.016	-0.133***	0.025	-0.104***	0.024
High-skilled	0.153***	0.015	0.108***	0.017	0.218***	0.026	0.177***	0.022
Master's and Doctor's	0.333***	0.042	0.266***	0.039	0.483***	0.101	0.538***	0.063
Experience	0.008**	0.003	0.004	0.003	0.006	0.004	0.004	0.004
Experience^2/1000	-0.102	0.060	-0.014	0.063	0.002	0.011	-0.004	0.009
Tenure	0.002	0.002	0.005**	0.002	0.002	0.003	0.001	0.003
Tenure^2/1000	-0.070	0.044	-0.103*	0.047	-0.010	0.009	0.000	0.008
Urban settlement	0.049***	0.009	0.025*	0.010	0.037*	0.016	0.029*	0.014
Job characteristics								
Technician – ref.								
Manager	0.357***	0.034	0.352***	0.039	0.186***	0.048	0.126**	0.042
Professional	0.130***	0.017	0.189***	0.020	0.174***	0.031	0.102***	0.027
Clerk	-0.142***	0.015	-0.097***	0.017	-0.096**	0.030	-0.158***	0.027
Service & sales	-0.271***	0.015	-0.223***	0.017	-0.286***	0.027	-0.285***	0.024
Agriculture	-0.345***	0.044	-0.218***	0.053	-0.110	0.106	-0.408***	0.071
Craftsman	-0.209***	0.016	-0.152***	0.019	-0.202***	0.028	-0.210***	0.026
Plant/machine operator	-0.267***	0.017	-0.205***	0.018	-0.157***	0.031	-0.162***	0.027
Elementary	-0.369***	0.019	-0.292***	0.021	-0.283***	0.031	-0.347***	0.030
Temporary contract	-0.074***	0.014	-0.097***	0.016	-0.173***	0.029	-0.212***	0.025
Supervising	0.077***	0.014	0.149***	0.014	0.128***	0.021	0.144***	0.019
Small firm – ref.								
Medium firm	0.031**	0.010	0.015	0.011	0.042*	0.019	0.036*	0.018
Large firm	0.069***	0.010	0.061***	0.011	0.117***	0.027	0.119***	0.025
Other – ref.								
Manufacturing	-0.059***	0.013	-0.075***	0.015	-0.074**	0.024	-0.055*	0.021
Construction	0.005	0.017	-0.020	0.020	-0.042	0.036	-0.077*	0.034
Wholesale and retail...	-0.033*	0.014	-0.060***	0.016	-0.078**	0.026	-0.034	0.024
Transport, storage...	0.110***	0.016	0.073***	0.016	-0.021	0.029	-0.012	0.025
Financial intermed. ...	0.150***	0.026	0.166***	0.028	0.284***	0.050	0.188***	0.043
Zagreb – ref.								
Northwest Cro.	-0.048***	0.013	-0.074***	0.015				
Central and Eastern Cro.	-0.122***	0.012	-0.147***	0.014				
Adriatic Cro.	-0.023*	0.012	-0.062***	0.013				
Šumad. & W. Serb – ref.								
Belgrade					0.323***	0.019	0.192***	0.016
Vojvodina					0.091***	0.018	0.070***	0.016
Constant	3.133***	0.075	3.182***	0.085	4.773***	0.136	4.593***	0.120
Adjusted R-squared	0.529		0.560		0.379		0.372	
F	181.4		152.4		85.3		83.7	
Observations	5293		3926		4416		4465	

Notes: * p<0.05, ** p<0.01, *** p<0.001.

Source: Authors' calculations based on Croatian and Serbian LFS, 2008 and 2011.

Figure A.1. True composition and wage structure effects and the decomposition of the total error into reweighting and misspecification errors
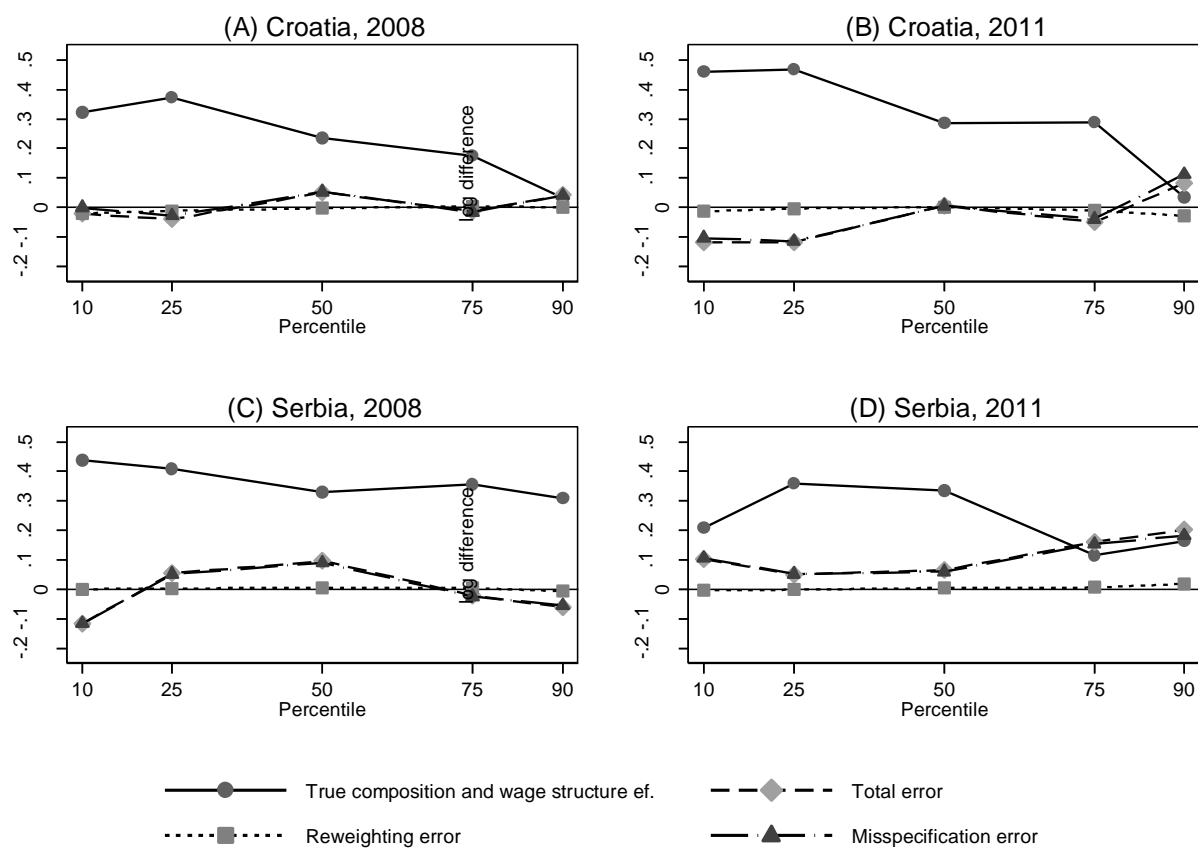
Notes: The decompositions are based on Firpo et al.'s (2007) approach (see Equations 1 to 3). Yun's (2005) procedure is used to ensure invariance of the results to the choice of the omitted category for categorical characteristics.

Source: Authors' calculations based on Croatian and Serbian LFS, 2008 and 2011.

Table 1. Basic macroeconomic indicators for Croatia and Serbia, 2008-2011

	CROATIA				SERBIA			
	2008	2009	2010	2011	2008	2009	2010	2011
Real GDP growth rate	2.1	-7.4	-1.7	-0.3	3.8	-3.5	1.0	1.6
Inflation (CPI)	6.1	2.4	1.1	2.3	12.5	8.2	6.2	11.2
General government deficit (% GDP)	-2.7	-5.8	-5.9	-7.5	-2.6	-4.4	-4.6	-4.8
Total no. of employed (000)								
- total	1555	1499	1432	1411	1999	1889	1795	1746
- legal entities	1252	1211	1168	1160	1428	1396	1354	1342
Employment rate*	57.8	56.6	54.0	52.4	53.7	50.4	47.2	45.4
Unemployment rate*	8.6	9.3	12.1	13.9	14.4	16.9	20.0	23.6
Real wages (chain indices)								
- gross	100.9	99.8	98.5	99.2	n/a	104.1	98.8	102.3
- net	100.8	100.2	99.5	99.6	n/a	103.8	98.9	102.2

Notes: * Based on ILO methodology for the age group 15-64; n/a – not available.

Sources: Eurostat, Croatian Bureau of Statistics, Statistical Office of the Republic of Serbia.

Table 2. Means of observables for Croatia

	2008			2011			Diff. sig. b/w years	
	Public	Private	Diff. sig. b/w sectors	Public	Private	Diff. sig. b/w sectors	Public	Private
Personal characteristics								
Age	44.51	38.70	***	46.50	40.43	***	***	***
Female	0.50	0.43	***	0.51	0.43	***		
Married	0.73	0.63	***	0.70	0.61	***		
Low-skilled	0.10	0.14	***	0.11	0.11			**
Medium-skilled	0.57	0.73	***	0.54	0.74	***	*	
High-skilled	0.31	0.13	***	0.33	0.14	***		
Masters and Doctors	0.02	0.00	***	0.03	0.01	***	*	
Experience	21.66	16.10	***	23.16	17.31	***	***	***
Tenure	16.85	9.24	***	17.98	10.21	***	***	***
Urban settlement	0.65	0.52	***	0.63	0.54	***		**
Job characteristics								
Manager	0.02	0.01	***	0.02	0.01			
Professional	0.17	0.06	***	0.27	0.08	***	***	*
Technician	0.27	0.14	***	0.19	0.13	***	***	
Clerk	0.16	0.14	**	0.15	0.12	***		*
Service and sales	0.09	0.19	***	0.10	0.23	***		***
Agriculture	0.01	0.01	**	0.01	0.00	***		
Craftsman	0.10	0.18	***	0.08	0.16	***	**	
Plant/machine operator	0.08	0.19	***	0.07	0.18	***		
Elementary occupation	0.10	0.08	**	0.10	0.08	**		
Temporary contract	0.06	0.14	***	0.05	0.13	***		
Supervising	0.14	0.11	***	0.14	0.13			*
Small firm (<50)	0.37	0.53	***	0.40	0.56	***	*	**
Medium firm (50-200)	0.28	0.24	***	0.27	0.21	***		***
Large firm (>200)	0.35	0.23	***	0.33	0.23	***		
Manufacturing	0.10	0.35	***	0.08	0.34	***	***	
Construction	0.03	0.12	***	0.02	0.10	***		***
Wholesale and retail trade...	0.02	0.25	***	0.01	0.23	***		**
Transport, storage...	0.11	0.05	***	0.11	0.08	***		***
Financial intermediation...	0.01	0.03	***	0.02	0.04	***		
Zagreb	0.23	0.19	***	0.20	0.17	***		**
Northwest (without Zagreb)	0.16	0.25	***	0.16	0.24	***		
Central and Eastern Croatia	0.30	0.27	***	0.28	0.26		**	
Adriatic	0.31	0.28	***	0.36	0.33	**	**	***
Wages/hours worked								
Usual hours per week	40.66	41.82	***	40.58	41.26	***		***
Log hourly wage	3.26	3.04	***	3.30	3.05	***	***	
No. of observations	**2194**	**3099**		**1640**	**2286**			

Notes: "Diff. sig. b/w sectors (years)" is "Difference significance between sectors (years)". *, **, and *** denote significance at the 10, 5 and 1 percent level, respectively.

Source: Authors' calculations based on Croatian LFS, 2008 and 2011.

Table 3. Means of observables for Serbia

	2008			2011			Diff. sig. b/w years	
	Public	Private	Diff. sig. b/w sectors	Public	Private	Diff. sig. b/w sectors	Public	Private
Personal characteristics								
Age	43.25	38.50	***	44.63	40.06	***	***	***
Female	0.48	0.42	***	0.48	0.42	***		
Married	0.74	0.65	***	0.72	0.65	***	*	
Low-skilled	0.10	0.14	***	0.10	0.11			***
Medium-skilled	0.56	0.73	***	0.55	0.74	***		
High-skilled	0.33	0.14	***	0.33	0.15	***		
Masters and Doctors	0.01	0.00	***	0.02	0.01	***	***	***
Experience	19.52	14.94	***	19.88	15.35	***		
Tenure	15.68	8.67	***	16.41	9.35	***	**	**
Urban settlement	0.69	0.63	***	0.68	0.64	***		
Job characteristics								
Manager	0.03	0.03		0.04	0.03			
Professional	0.21	0.06	***	0.21	0.07	***		
Technician	0.27	0.13	***	0.26	0.14	***		
Clerk	0.10	0.08	***	0.10	0.09			
Service and sales	0.09	0.25	***	0.10	0.25	***		
Agriculture	0.00	0.01		0.01	0.01	**		**
Craftsman	0.10	0.23	***	0.10	0.20	***		**
Plant/machine operator	0.07	0.13	***	0.09	0.14	***	*	
Elementary occupation	0.12	0.09	***	0.11	0.07	***		*
Temporary contract	0.05	0.10	***	0.07	0.12	***	*	**
Supervising	0.20	0.16	***	0.19	0.15	***		
Small firm (<50)	0.65	0.80	***	0.65	0.81	***		
Medium firm (50-250)	0.24	0.14	***	0.24	0.12	***		
Large firm (>250)	0.11	0.07	***	0.10	0.06	***		
Manufacturing	0.11	0.36	***	0.10	0.36	***		
Construction	0.02	0.08	***	0.02	0.06	***		**
Wholesale and retail trade...	0.02	0.29	***	0.02	0.27	***		*
Transport, storage...	0.10	0.06	***	0.10	0.08	***		***
Financial intermed. ...	0.02	0.03	***	0.01	0.04	***		
Belgrade	0.27	0.20	***	0.27	0.22	***		
Vojvodina	0.21	0.31	***	0.20	0.29	***		
Sumadija & West Serbia	0.52	0.49	**	0.52	0.49	**		
Wages/hours worked								
Usual hours per week	41.00	44.17	***	40.95	43.80	***		**
Log hourly wage	5.16	4.79	***	5.02	4.69	***	***	***
No. of observations	**2015**	**2401**		**2027**	**2438**			

Notes: "Diff. sig. b/w sectors (years)" is "Difference significance between sectors (years)". *, **, and *** denote significance at the 10, 5 and 1 percent level, respectively.

Source: Authors' calculations based on Serbian LFS, 2008 and 2011.

Table 4. Decompositions of the mean wage gap

	Croatia				Serbia			
	2008		2011		2008		2011	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE
1. Mean wage: public	*3.263*	0.007	*3.303*	0.008	*5.157*	0.012	*5.020*	0.012
2. Mean wage: private	*3.036*	0.008	*3.046*	0.009	*4.792*	0.012	*4.694*	0.011
3. Total gap	*0.227*	0.024	*0.256*	0.026	*0.366*	0.042	*0.325*	0.039
3.1. True comp. and w. str. effects	*0.234*	0.017	*0.273*	0.019	*0.391*	0.030	*0.317*	0.028
3.1.1. True composition effect	*0.190*	0.015	*0.218*	0.017	*0.246*	0.026	*0.138*	0.024
3.1.2. True wage structure effect	*0.044*	0.008	*0.055*	0.008	*0.145*	0.015	*0.179*	0.014
3.2. Total error	-0.007	0.017	-0.017	0.018	-0.025	0.029	0.008	0.028
3.2.1. Misspecification error	-0.003	0.015	-0.007	0.016	-0.027	0.027	0.004	0.026
3.2.2. Reweighting error	-0.004	0.008	-0.011	0.009	0.002	0.011	0.005	0.010
3.1.1. True composition effect	*0.190*	0.015	*0.218*	0.017	*0.246*	0.026	*0.138*	0.024
3.1.1.1. Gender	0.001	0.001	-0.001	0.002	0.002	0.002	*-0.011*	0.003
3.1.1.2. Education	*0.028*	0.004	*0.014*	0.004	*0.051*	0.007	*0.037*	0.006
3.1.1.3. Experience	*0.031*	0.011	**0.021**	0.010	**0.025**	0.012	*0.039*	0.012
3.1.1.4. Occupation	*0.084*	0.006	*0.088*	0.008	*0.092*	0.011	*0.044*	0.010
3.1.1.5. Other	**0.046**	0.018	*0.097*	0.019	*0.076*	0.027	0.030	0.026
3.1.2. True wage structure effect	*0.044*	0.008	*0.055*	0.008	*0.145*	0.015	*0.179*	0.014
3.1.2.1. Gender	*0.006*	0.002	0.001	0.001	-0.002	0.003	**-0.002**	0.001
3.1.2.2. Education	*0.098*	0.019	*-0.054*	0.013	0.063	0.045	0.058	0.034
3.1.2.3. Experience	-0.059	0.065	0.107	0.068	*-0.264*	0.087	-0.112	0.082
3.1.2.4. Occupation	**-0.019**	0.009	-0.012	0.009	**-0.058**	0.023	-0.023	0.020
3.1.2.5. Other	0.019	0.068	0.014	0.071	*0.406*	0.104	*0.258*	0.092

Notes: The decompositions are based on Firpo et al.'s (2007) approach (see Equations 1 to 3). Yun's (2005) procedure is used to ensure invariance of the results to the choice of the omitted category for categorical characteristics. Bold, italicized and bold-and-italicized indicate significance at the 5, 1 or 0.1 percent level, respectively.

Source: Authors' calculations based on Croatian and Serbian LFS, 2008 and 2011.
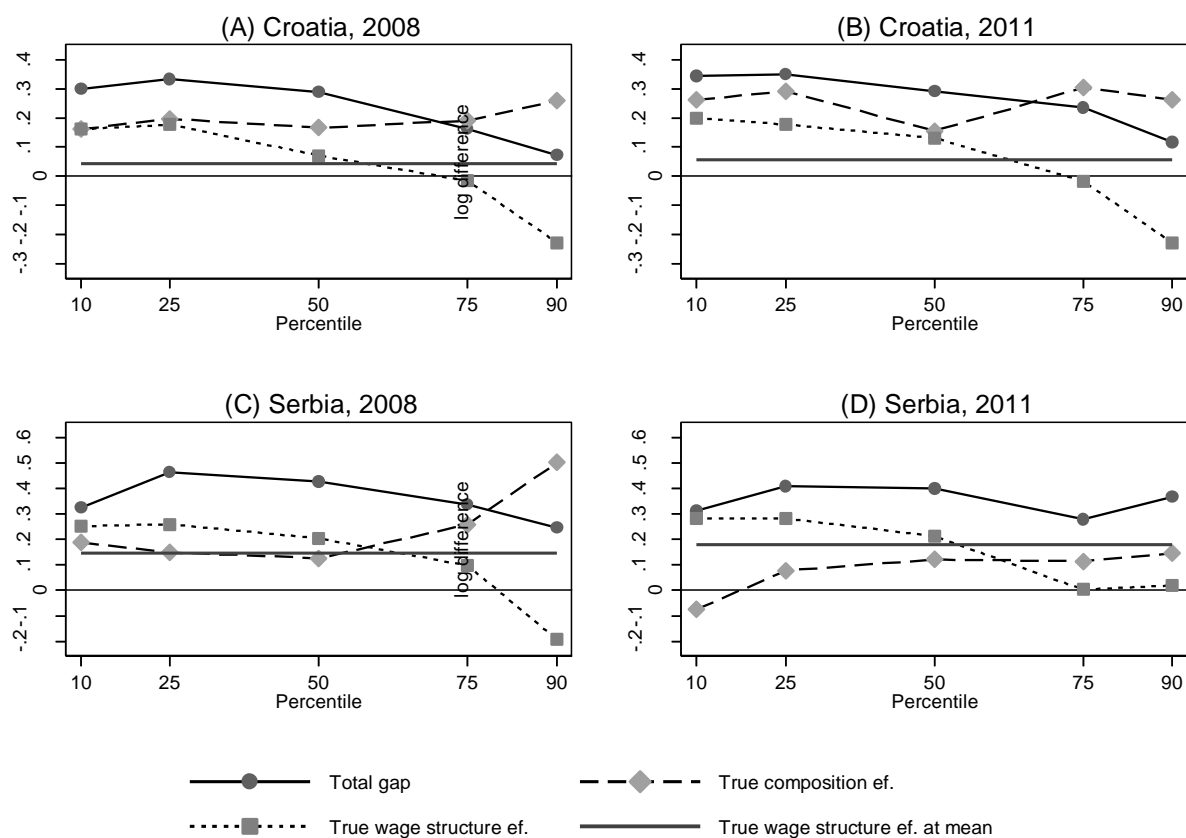
Table 5. Decompositions of the mean wage gap by gender

	2008				2011			
	Male		Female		Male		Female	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Croatia								
Total gap	*0.191*	0.030	*0.286*	0.036	*0.210*	0.033	*0.332*	0.045
1. True comp. and w. str. effects	*0.198*	0.022	*0.270*	0.026	*0.193*	0.023	*0.382*	0.032
1.1. True composition effect	*0.137*	0.018	*0.269*	0.024	*0.123*	0.020	*0.339*	0.030
1.2. True wage structure effect	*0.061*	0.012	0.001	0.010	*0.070*	0.012	*0.043*	0.012
2. Total error	-0.007	0.021	0.016	0.024	0.018	0.023	-0.050	0.031
2.1. Misspecification error	-0.003	0.018	-0.019	0.021	0.016	0.020	-0.028	0.027
2.2. Reweighting error	-0.003	0.010	*0.036*	0.012	0.001	0.011	-0.022	0.016
Serbia								
Total gap	*0.315*	0.051	*0.441*	0.065	*0.314*	0.047	*0.349*	0.070
1. True comp. and w. str. effects	*0.345*	0.036	*0.444*	0.047	*0.336*	0.033	*0.276*	0.050
1.1. True composition effect	*0.201*	0.031	*0.344*	0.042	*0.197*	0.027	0.056	0.045
1.2. True wage structure effect	*0.144*	0.019	*0.100*	0.022	*0.139*	0.019	*0.220*	0.021
2. Total error	-0.030	0.036	-0.003	0.045	-0.022	0.033	0.073	0.050
2.1. Misspecification error	-0.010	0.033	-0.062	0.041	-0.022	0.030	0.058	0.047
2.2. Reweighting error	-0.020	0.014	*0.059*	0.018	0.000	0.014	0.015	0.016

Notes: The decompositions are based on Firpo et al.'s (2007) approach (see Equations 1 to 3). Yun's (2005) procedure is used to ensure invariance of the results to the choice of the omitted category for categorical characteristics. Bold, italicized and bold-and-italicized indicate significance at the 5, 1 or 0.1 percent level, respectively.

Source: Authors' calculations based on Croatian and Serbian LFS, 2008 and 2011.

Figure 1. Quantile decompositions of the public-private wage gap

Notes: The decompositions are based on Firpo et al.'s (2007) approach (see Equations 1 to 3). Yun's (2005) procedure is used to ensure invariance of the results to the choice of the omitted category for categorical characteristics.

Source: Authors' calculations based on Croatian and Serbian LFS, 2008 and 2011.