University of Warsaw
Faculty of Economic Sciences

Working Papers
No. 13/2016(204)

GABRIELA GROTKOWSKA
LESZEK WINCENCIAK
TOMASZ GAJDEROWICZ

EVOLUTION OF THE PUBLIC-SECTOR WAGE PREMIUM IN POLAND

Warsaw 2016

University of Warsaw
Faculty of Economic Sciences

Evolution of the public-sector wage premium in Poland

Gabriela Grotkowska
Faculty of Economic Sciences
University of Warsaw
e-mail: ggrotkowska@wne.uw.edu.pl

Leszek Wincenciak
Faculty of Economic Sciences
University of Warsaw
e-mail: lwincenciak@wne.uw.edu.pl

Tomasz Gajderowicz
Faculty of Economic Sciences
University of Warsaw
e-mail: tgajderowicz@wne.uw.edu.pl

Abstract

The aim of this paper is to estimate the adjusted sectoral wage gap in Poland in the period 1999–2012. We use a set of individual data from the survey on the structure of earnings by occupations (SEO) carried out by Central Statistical Office in Poland (CSO) every two years for entities with more than nine employees. We apply quantile regression and the Ñopo decomposition method to address several methodological problems of wage differential analysis. We show that, after controlling for structural differences in employment, there is no clear trend in the evolution of the adjusted public-sector wage premium in Poland in recent years. The parametric approach indicates a positive and growing premium, with significant variations across different parts of wage distribution. The non-parametric approach yields different results, indicating a negative premium with no clear trend in the period 1999–2012, with a declining public-sector wage penalty in recent years.

Keywords:
wage differentials, public sector wages, quantile regression, Ñopo decomposition, Poland.

JEL:
J31, J45

Acknowledgements:
Paper prepared as a part of the project 'Public-sector wage premium in Poland: the role of employment structure', funded by the National Science Centre, granted by Decision No. 2013/11/D/HS4/03852.

1. Introduction

Despite the rapid growth of employment in the private sector during the last quarter-century, the public sector remains the biggest 'employer' in Poland: in the first quarter of 2015 it employed 3.8 million individuals which accounted for 24.2% of total employment. The role of the public sector in labour-market performance goes well beyond its borders, with the wage-setting mechanism being one of the main channels of its impact on other areas of the national economy. Consequently, it affects the overall competitiveness of the economy, the inflation rate and other macro-economic variables. The dynamics of public-sector wages are also crucial for the equilibrium of public finances, as wage bills remain one of the biggest expenditure positions of central and local government budgets.

Although in the public discourse public-sector employees often complain about being underpaid, it is an observed statistical regularity that the average wage in the public sector exceeds the average wage reported in the private one. According to CSO, the average monthly gross wage in the private sector in Poland in the first to third quarters of 2015 was PLN 3723.12, as opposed to PLN 4415.01 for the public sector (CSO, 2016). However, a simple comparison of raw average wages could lead to a misleading conclusion that the public sector offers higher wages than the private one. Generally, individuals' wages exhibit considerable heterogeneity due to large differences in the personal characteristics of earners that are relevant for the labour market (e.g. level of education, experience, etc.). Due to the specificity of its services, the public sector attracts individuals with a higher than average level of education than the private sector. Also, the average age and firm-specific job experience is much higher for public-sector employees. Moreover, public entities are usually bigger and often operate in less competitive markets (i.e. have higher monopoly power) than private firms. Nevertheless, the question remains: to what extent is the observed difference in wages between the private and the public sector a result of differences in the characteristics of its employees? What is the role of other factors such as firm size or its area of activity? And finally, what is the direction and size of an adjusted public-sector wage premium that can be attributed to unobservable characteristics of employees, firms or institutional differences between the two sectors? Any significant adjusted wage premium would be an indirect proof of non-wage benefits offered to workers or significant obstacles for labour force mobility (job switching costs) that may adversely impact economic efficiency and growth.

There are a number of possible reasons why earnings differentials between the private and the public sector exist. While profit maximization is commonly regarded as the main goal of private companies, a large part of the public sector is focused on delivering public goods and services, the redistribution of wealth and the realization of social and political goals. Consequently, wage formation mechanism in the public sector is to a large extent regulated by political considerations, while in the private sector it is strongly determined by profit constrains. In effect, wages in the public sector are weakly correlated to workers' marginal productivity (Fogel & Lewin, 1974). However, coexistence of both sectors on the same labour market (competition for workers) makes the public sector subject to economic mechanisms as well (Lausev, 2014). Wage structure in the public sector is more compressed, which rewards less skilled workers and puts restrictions on high-skilled salaries, especially for managers. Moreover, the principal-agent problem might be more relevant for the public sector. Better monitoring of effort might reduce the need to pay more, but in the public sector it is not always clear who the owner is and who should monitor the effects (Bebchuk & Fried, 2004).

The public and private sectors differ in the structures of their economic activity. Sections where the public sector dominates are characterized by a relatively stable demand for their services,

often determined by political decisions rather than market forces[1]. Public-sector wages are less related to the business cycle, while private ones seem to be strongly pro-cyclical. As a result, public-sector relative wages are counter-cyclical: they increase in times of economic slump, which would justify the potential attractiveness of public-sector employment in times of economic crises. The literature has also pointed out that public-sector wages are related to electoral cycles (Borjas, 1984). Moreover, the public sector is usually more unionized than the private, which strongly affects the wage-setting mechanism, giving more power to the labour-supply side in wage negotiations[2]. On the other hand, mostly in local labour markets, the public sector has a monopsony power, as it remains the only source of demand for workers with higher education (Mueller, 1998), which allows it to dictate wage levels. Lower wages can be somehow compensated by other employment benefits, like higher job security or more flexible hours.

Lastly, there are significant differences in institutions that may explain the observed empirical regularities in the wage distributions. (For a review of different wage-setting arrangements in a cross-country approach, see Silvestre & Eyraud, 1995; Elliott et al., 1999.) Although many countries implemented reforms to introduce more market-oriented mechanisms to the public sector, differences in the recruitment process, wage setting and collective bargaining coverage prevail. The public sector is characterized by a higher degree of job security, but also with strict rules of promotion and remuneration, related mainly to job tenure, not efficiency (Makepeace & Marcenaro-Gutierrez, 2006; Burgess & Metcalfe, 1999)[3].

The objective of this paper is to study the evolution of the public–private wage gap in Poland using a fairly comprehensive collection of data sets in the period 1999–2012. This covers thirteen years of the second phase of the economic transition from a centrally planned to a market economy.

An adequate estimation of the adjusted wage premium is crucial for reliable answers to the above questions. There are many statistical procedures that are used for wage-gap analyses which allow us to isolate the effects of so-called observables on differences in earnings. However, there is probably no single method that would allow us to address all the methodological issues that arise while studying intersectoral wage gaps. Three problems are commonly discussed in the literature. First of all, there is non-random selection, both in employment and public-sector employment. Not taking this problem into account may result in biased estimates of the wage premium. Second, if public-sector employees are on average better educated (have longer job tenure, work in bigger entities, etc.), standard parametric approaches to estimating the adjusted sector wage gap may yield misleading results, due to the common support problem. Namely, there may be no – or not enough – comparable private-sector employees to make the parametric estimates relevant. To address this problem, a non-parametric approach using the matching procedure may be used. Third, adjusted wage premiums may differ in different parts of the wage distribution. Conclusions drawn from simple ordinary least squares (OLS) estimates refer only to the average wage level and therefore may

[1] In Poland, almost two thirds of public-sector employees belong to one of three sectors: public administration and national defence, social security, or health and education. The transformation of the Polish economy resulted in partial privatization of the health and education section; however the public sector still retains its dominant position in these areas of the economy.

[2] According to the Public Opinion Research Center (CBOS) study of 2014, union membership is declared by roughly 12% of employees in Poland, with more than 35% of union members coming from the public sector.

[3] Theoretical models explaining mechanisms of wage formation in the public sector include social welfare models (e.g. Ehrenberg, 1973; Tirole, 1994; Rodrik, 2000); budget maximization models (e.g. Tullock, 1965); vote maximization models (e.g. Reder, 1975); bargaining models (e.g. Leslie, 1985; Holmlund 1993; Haskel & Szymanski, 1993; Haskel & Sanchis, 1995); and dynamic search models (e.g. Algan et al., 2002; Horner et al., 2007; Quadrini & Trigari, 2008).

be highly misleading. Quantile regression is a methodological approach that may help to address this problem.

In this paper, we use quantile regression method and the Ñopo (2008) decomposition method to estimate the public-sector wage premium. We show that, after controlling for structural differences in employment, there is no clear evidence concerning the sign and trend of the adjusted public-sector wage premium in Poland. The parametric approach indicates a positive and growing premium, with significant variation across different parts of wage distribution. The non-parametric approach, however, yields different results, indicating a negative premium with no clear trend in the years 1999–2012. To the best of our knowledge, this is the first study on the public-private wage gap over this period and also the first paper applying the methodology of non-parametric decomposition to the problem of public-sector wage premiums in Poland.

The paper is structured as follows. First, we discuss the relevant literature, focusing on the previous research on the Polish labour market and methodological aspects of estimating the adjusted sector wage premium. Second, we describe the properties of the dataset survey on the structure of earnings by occupations (SEO) and discuss differences in employment structures between the two sectors of the Polish economy. Finally, we report the estimates of an adjusted wage gap. At the preliminary stage, the simple Mincerian wage equation is used (Mincer, 1974), then quantile regression estimates are discussed. Since the results of the parametric approach are not fully reliable in the context of significant differences between the employment structures of the two sectors, we refer to the non-parametric analysis using the methodology proposed first by Ñopo (2008) for gender wage-gap analysis. The paper ends with conclusions and a discussion of ideas for further studies.

2. Conclusions from the literature review

Empirical research on the public-sector wage premium has gone through significant methodological evolution. Among empirical techniques applied for the estimation of the public–private sector wage gap there are both macro- and micro-econometric methods. The macro-econometric approach is based on calculations of published macro-level panel data (Katz & Krueger, 1991; Elliott & Duffus, 1996; Friberg, 2007; Lamo et al., 2012). Micro-econometric methods use individual-level data to estimate adjusted wage gaps using worker and job characteristics. They include single-equation wage models (estimated by OLS) with sector dummy variables (Jacobsen, 1992; Dustmann & Van Soest, 1997; Disney & Gosling, 2003); quantile regression models (Koenker & Basset, 1978; Lucifora & Meurs, 2006); double-equation models with Oaxaca-Blinder decomposition (Oaxaca & Ransom, 1994); and absolute differential measures (Belman & Heywood, 2004) as the development of the latter and switching regression (Adamchik & Bedi, 2000; Jovanović & Lokshin, 2003, 2004; Falaris, 2004; Heitmueller, 2006; Tiagi, 2010). Some of the above methods were applied with the Heckman selection model (Heckman, 1979) to deal with non-random sector sorting (Dustmann & Van Soest, 1998; Melly, 2006; Depalo & Giordano, 2011; Chernozhukov & Hansen, 2005).

For the majority of developed countries, evidence for positive public-sector wage premiums has been documented, although its magnitude varies between the studies. Generally, low wage earners benefit mostly from employment in a public sector, while individuals with relatively high salaries earn more in the private. Most of the findings indicate that employment in the public sector is generally beneficial for women and people with lower levels of education. On the other hand, research for developing countries generally reveals a negative public wage premium, which seems to vanish over the years when countries reach economic maturity (Lausev, 2014).

Transition economies seem to be an interesting case of how changes in institutional environment affects the sector pay gap. Different methodological approaches have been used, but a common feature of these studies is that the results are largely inconsistent with the findings for developed countries. The following transition economies have been researched by the authors in brackets: Romania (Christou et al., 2007); Poland (Keane & Prasad, 2006; Lehmann & Wadsworth, 2000; Newell & Socha, 1998, 2007; Adamchik & Bedi, 2000; Adamchik et al., 2003); Russia (Brainerd, 2002; Jovanović & Lokshin, 2004; Lehmann & Wadsworth, 2000); Serbia and Montenegro (Jovanović & Lokshin, 2003; Krstić et al., 2007; Bulgaria (Falaris, 2004); Ukraine (Gorodnichenko & Sabirianova, 2007; Hungary (Lausev, 2012; Telegdy, 2006; and Estonia (Leping, 2006).

It seems that the initial period of transformation adversely affected the public-sector wage premium (the wage gap estimated to be on average about 20% in favour of the private sector). With progress in the transition process, the absolute value of the wage gap decreased over time to zero and became positive in some countries.

One of the most oft-cited papers in the literature is by Adamchik and Bedi (2000). It uses individual data from the Polish Labour Force Survey of February, 1996. The authors applied the endogenous switching regression model in order to control a selection of public-sector employment. As an instrument, they used age and whether an individual entered the labour market post or prior to 1989. Results revealed a significant public pay gap (-7% for men and -10% for women). The gap was particularly large for tertiary graduates (-22% for men and -21% for women for individuals of five years' work experience). The authors concluded that due to the low-wage attractiveness of public-sector jobs, the public sector would face serious difficulties in attracting and retaining qualified employees. In addition, low wages could encourage moonlighting, which might deteriorate the efficiency of the public sector.

Several studies of the sectoral wage gap in the Polish labour market were undertaken by Socha. In his study conducted with Newell (1998), based on the LFS data from 1992 and the single equation estimation, a positive private-sector wage premium was revealed (5.1% for men and 8.6% for women). However, the data from the year 1996 didn't confirm this result. In the study by Socha and Weisberg (2002), LFS data for November 1995 was used to show that, after controlling for employees' characteristics, wages in the private sector are higher by approximately 9.8% compared to the public sector. Moreover, variables measuring human capital were found to be stronger determinants of wages in the private sector than in the public. A similar type of analysis with LFS data was conducted also by Lehmann and Wadsworth (2000), Adamchik et al. (2003) and Newell and Socha (2007). The fact that the private sector in Poland offers higher rewards for higher qualifications than the public sector was also confirmed by Rutkowski (1996, 1997), who showed that each additional year of schooling is associated with the rate of return of 0.8–0.9 percentage points higher in the private sector than in the public.

A different approach was implemented by Keane and Prasad (2006) who used a household budget survey (HBS) to estimate public–private wage premiums. Although an HBS includes information on wages (based on declarations) and a vast range of personal characteristics, it does not include data on working hours. It is then impossible to calculate an hourly wage rate. However, the results of this study were consistent with those based on LFS data. The public-sector wage premium was found to be negative at the early stage of transformation (equal on average at -13% in 1991 and -9% in 1992).

In recent years, the research on public–private wage differentials in Poland has been scarce. Grotkowska and Wincenciak (2014) use LFS data for Poland for 2010 to show that in spite of 15 years of economic transition, public-sector wage premiums in Poland are still negative. They

use a similar methodology to the majority of earlier studies (Mincerian wage regression); however, they addressed the problem of selection in employment (adding a Heckman correction) and the potential variation of the premium across different parts of wage distribution (by using quantile regression). The public-sector wage penalty was found to be particularly strong for women, young people and those with higher levels of education. The size of the penalty is clearly differentiated along the wage distribution: for a large part of the distribution it is not significantly different from zero.

A critical analysis of the literature on the public-sector wage premium in Poland thus leads us to the following conclusions:

- There is relatively strong evidence that in the first years of economic transition the public-sector wage premium was negative, particularly for persons with tertiary education and women.
- There is not much evidence for development in the public-sector wage premium in the second and the third decades of economic transition; some preliminary results indicate that the premium is still negative, although it varies in different parts of the wage distribution.
- The majority of the research in this area used simple parametric techniques (based on the Mincerian wage equation), estimated with OLS, that approximates the conditional mean of the response variable, given certain values of the predictor variables. Only in few studies a selection process (in employment and the public sector) was taken into account and alternative measures of central tendency and statistical dispersion were used to obtain a more comprehensive analysis of the wage differences between the two sectors (quantile regression).
- The studies for Poland used LFS or HBS data that – apart from wage information – provide comprehensive data on an employee's characteristics; however, wage data in both sources is based on respondents' own declarations. Furthermore, the scale of missing information on wages is significant (e.g. 27.6% in 2013 for LFS) and possibly non-random distribution of missing data can be expected; SEO seems to be an interesting alternative to the supply-side labour market surveys.
- With severe data limitations, modelling the selection to the public sector is quite challenging (if possible at all), and therefore alternative non-parametric methods that would ensure the comparability of populations in both sectors seem an interesting methodological option.

In this paper we want to address some of the above issues; first, by using wage data reported by firms (SEO); and second, by confronting a parametric approach with non-parametric methods that allow us to deal with a common support problem, which seems to be a severe methodological obstacle in the analysis of public–private sector wage differentials.

3. Data and empirical analysis

3.1.Data and empirical strategy

Firm survey data is an interesting alternative, although it has been used incidentally to asses sector wage differentials. As for transition economies, several papers used the firm-level harmonized Hungarian Wage Survey (e.g. Telegdy, 2006; Lausev, 2012). In Poland – to the best of our knowledge – this paper is the first to use firm survey data to investigate the nature of the public–private wage gap.

The SEO dataset is based on a large-scale firm survey carried out by CSO with a biennial frequency. It is a sample survey and it covers entities of national economy with the number of

the employees exceeding nine persons (full- and part-time employees). Details of the survey methodology may be found in CSO (2015).

The SEO data provides information about gross wages (basic remuneration, payment for overtime work, duty or work seniority duty allowances, earnings for periods longer than one month recalculated per month, bonuses). One of its advantages is that it is a large dataset comprising several hundred thousand observations. In 2012 (the last year for which the individual data is available) the sample included data for 725,200 employees. The biggest advantage of this dataset is accurate information on gross salaries and its ingredients. It is more accurate than declarative information available in the LFS or HBS, where a problem of approximation often occurs. However, the information on the personal characteristics of employees is less comprehensive than in the LFS (e.g. no information on family background or labour market history). Information on a worker's human capital is also limited and includes level of education, job tenure and occupation. There is also some basic information on firm characteristics (size by number of employees, type of industry). One should also bear in mind that wage data in SEO, since it is reported by the employer, may be somehow biased and not fully reliable. Since the shadow economy is limited only to the private sector, we could suppose that data on wages (and on working time) might be underestimated.

Since SEO includes information only on employees, it is not possible to control for selection in employment. There is also a considerable problem in finding an appropriate instrument to control for selection in public-sector employment. A selection equation in the switching equation model requires at least one variable that affects the probability of employment in the public (or private) sector but has no direct impact on the wage level. Moreover, it needs to be a variable not related to a worker's current employment status[4] but to the moment of undertaking their current job. Since we failed to find an appropriate instrument, we decided not to control for selection in the parametric approach. An attempt to model selection in employment in the public sector may be found in the paper by Grotkowska et al. (2016), where LFS data was used and information on the learned profession was used as an instrument.

Our empirical strategy included two stages. In the first we applied a parametric approach, focusing on the problem of the variation of the adjusted wage premium across wage distribution. In the preliminary stage, we used a simple OLS single equation model to choose explanatory variables. Then, a quantile regression model was used in order to estimate the public-sector premium parameters across the wage distribution. Comparison of results of estimations on the SEO data sets for the years 1999–2012 allowed us to analyse the evolution of the public-sector wage premium in Poland, not only for an average level of wages, but also for different moments.

Due to the significant differences in employment structures and lack of an adequate instrument to control for selection, in the second stage we decided to use a non-parametric method of wage distribution analysis proposed by Ñopo (2008).

3.2.Comparing the incomparable? Employment structures in public and private sectors

The average wage in the public sector is heavily affected by the specific structure of employment in this part of the economy. Therefore, before estimating the size of the public-

[4] It cannot be for instance an industry dummy, although it is highly correlated with the ownership sector, since the decision about choosing industry of occupation is simultaneous to the decision about sector choice. In previous studies using switching regression approach different variables have been used. They included: respondent's opinion on trade unions and their role in economy (Heitmueller, 2004), respondent's parents' sector of employment (Dustmann, van Soest, 1998).

sector wage premium in Poland, we wanted to determine the extent to which both populations of workers are similar and comparable.

Table 1 reports key structural characteristics of workers in the public and private sectors in Poland. For the sake of brevity we report data for 2012 in the table. One of the most characteristic features of the public sector is its feminization. According to the data in our sample, almost 65% of employees in the public sector are women. In the private sector this share is slightly above 40%. Due to changes in the structure of economic activity in the public sector (the decline of industrial production and rise of non-market services, which are highly feminized), the structure of employment by sex has changed significantly over the last decades with significant increase in the share of women.

The public sector employs, on average, older workers: a much higher share of employment in this sector (compared to the private sector) is attributed to people of immobile age and the age of formal retirement, although the share of the latter group in employment is negligible. The average age of a worker in the public sector is 43.8 years, and 38.9 in the private.

Perhaps the most important aspect of the difference in the structures of employment in the public and private sectors is related to qualifications, and in particular, to the level of education and occupations. In our sample (SEO 2012 data), more than half of the public-sector workers have higher education and almost 30% have vocational secondary education or post-secondary education. In the private sector, the largest group are workers with vocational education (or lower). Simultaneously, the public sector remains the main source of demand for higher qualifications (although its position is less monopsonic than at the beginning of the transition period).

Structural change in the public sector and an increase in the average level of education of its employees led to a significant change in the occupational structure of the population of workers. In recent years, the share of craft and related trade workers and technicians and associate professionals fell, seeing an expansion in the share of professionals. It is now the largest group of public-sector workers (44%). On the other hand, the private sector has a more dispersed structure in terms of occupations, with craft and related trade workers, professionals, machine operators and salesmen being most numerous.

Currently (SEO 2012 data) more than 70% of employees in the public sector work in one of three sectors (public administration and national defence, social security, or health and education). Employment in the private sector is concentrated almost exclusively on the manufacturing industry, construction and market services (66%). Surprisingly, there is not much difference between workers in the public and private sectors in terms of size of their employer. However, our sample is restricted to entities employing 10 persons or more.

Table 1 Structures of workers' populations: public versus private sectors (%)

	Private	Public
Sex		
Men	58.37	35.39
Women	41.63	64.61
Education level		
Tertiary	29.15	53.53
Secondary vocational	28.12	24.35
General secondary	10.04	5.44
Basic vocational	26.17	12.52
Primary and Lower	6.53	4.17
Age		
Up to 30 years	27.37	12.36
31 to 40 years	31.62	25.34
41 to 50 years	21.59	31.94
51 to 60 years	17.82	28.22
More than 60 years	1.60	2.14
Occupation		
Managers	9.13	6.36
Professionals	16.39	44.37
Technicians	10.40	14.17
Clerks	9.06	10.08
Service and sales workers	13.58	4.61
Farmers	0.16	0.17
Craft, related trades workers	18.74	5.22
Machine operators	14.64	5.98
Elementary occupations	7.90	9.05
Firm size		
10 to 50 workers	26.23	23.71
50 to 250 workers	29.22	32.69
250 to 1000 workers	22.95	20.93
More than 1000 workers	21.60	22.67
Industry		
Agriculture, forestry and fishing	0.65	1.03
Mining and quarrying	1.11	3.72
Manufacturing	37.39	2.12
Electricity, gas, steam and air conditioning supply	1.90	1.96
Water supply; sewerage, waste management	0.69	2.78
Construction	7.20	0.41
Wholesale and retail trade; repair of motor vehicles	21.48	0.12
Transportation and storage	3.82	8.39
Accommodation and food service activities	1.81	0.46
Information and communications	3.32	0.38
Financial and insurance activities	6.33	1.61

Real-estate activities	1.74	1.11
Professional, scientific and technical activities	2.76	1.84
Administrative and support service activities	4.58	0.29
Public administration and defence; social security	0.00	17.21
Education	1.69	31.50
Human health and social work activities	2.86	22.19
Arts, entertainment and recreation	0.25	2.83
Other service activities	0.43	0.04
Total	100.00	100.00

Source: Author's computation based on SEO data, 2012

3.3.Public-sector wage premium: unadjusted wage gap and preliminary OLS estimates

Table 2 provides statistics on the distribution of hourly wages in the population of workers, in both public and private sectors in our sample (SEO 2012 data). Average hourly wage is generally higher in the public sector, with the average wage ratio equal to 1.21. The difference is even more substantial if we compare the median wages (1.34). The difference is higher for women and for older workers. It is also more substantial for individuals with vocational education, for craft and related trade workers and plant or machine operators and assemblers. The gross public-sector wage premium is also relatively high for individuals employed in the smallest entities in the sample (10–50 workers). There are only few labour force groups with negative gross public-sector wage premium. These are individuals with tertiary education, managers, technicians and persons performing elementary occupations.

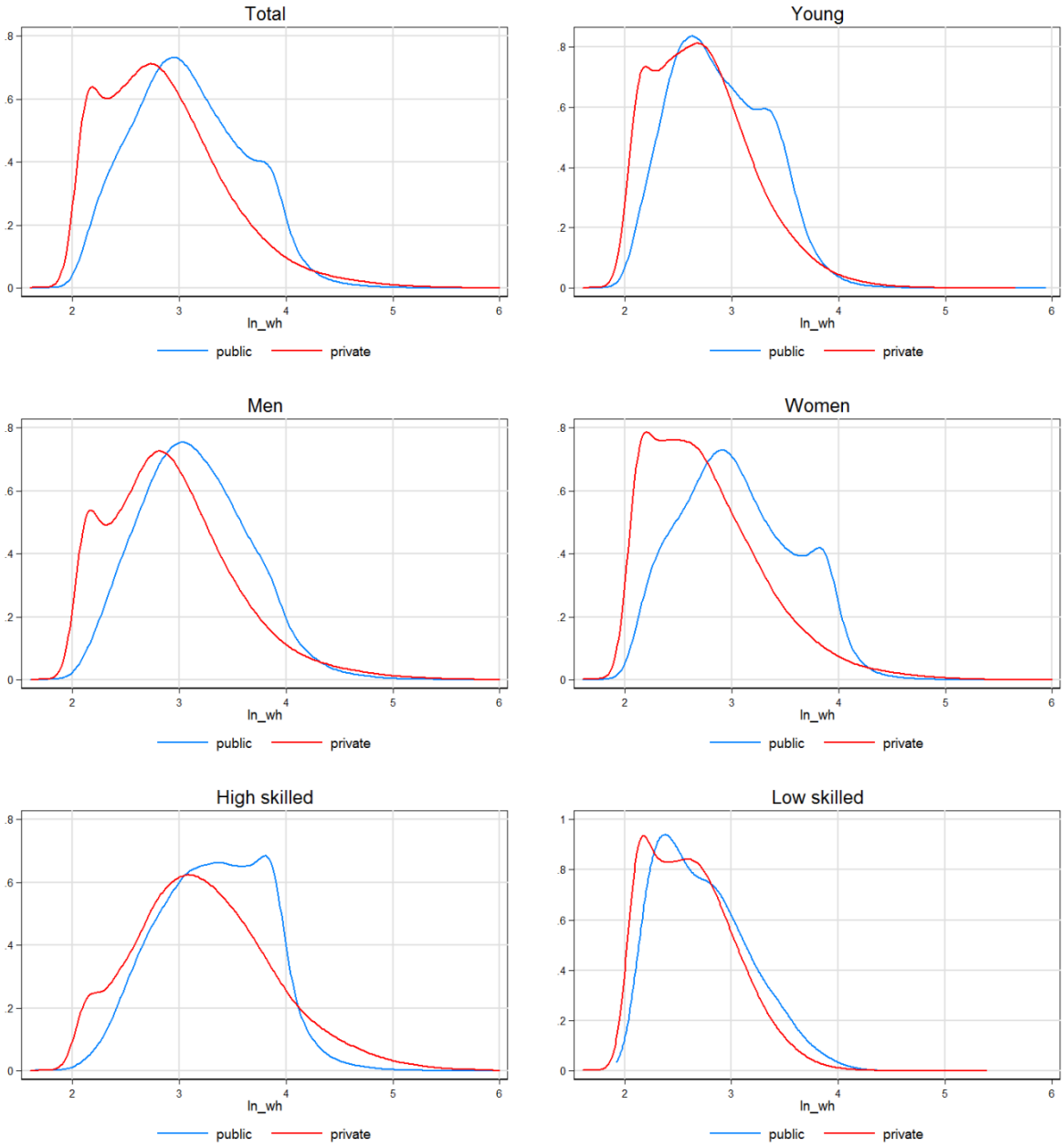
Distribution of wages in the public sector is less dispersed (as compared to the private), with considerably smaller relative standard deviation for women and individuals performing occupations typical for lower levels of education (see Figure 1).

Table 2 Wage distribution characteristics: public versus private sector

	Public sector			Private sector			Publ/ Priv ratio
	mean	sd	p50	mean	sd	p50	
Total	25.536	15.399	21.219	21.108	20.458	15.798	1.210
Sex							
Men	26.851	17.085	22.731	22.683	22.735	17.000	1.184
Women	24.815	14.341	20.388	18.898	16.501	14.247	1.313
Education level							
Tertiary	31.629	16.739	28.686	32.484	31.443	23.913	0.974
Secondary vocational	19.749	9.330	18.092	18.143	11.739	15.356	1.088
General secondary	18.069	13.129	16.130	16.880	12.866	13.816	1.070
Basic vocational	17.429	9.138	14.525	14.980	8.087	13.043	1.163
Primary and lower	15.177	7.575	12.592	14.146	6.711	12.485	1.073
Occupation							
Managers	37.143	20.822	31.000	46.978	47.477	32.854	0.791
Professionals	31.914	15.091	29.278	29.124	19.466	24.425	1.096
Technicians	20.332	14.404	17.646	22.196	13.007	19.351	0.916
Clerks	17.997	6.948	16.769	17.269	10.142	15.040	1.042
Service and sales workers	14.255	6.488	12.257	12.561	6.035	10.870	1.135
Farmers	15.901	6.909	13.893	13.517	6.468	11.522	1.176
Craft, related trades workers	21.951	9.340	19.749	16.232	7.720	14.565	1.352
Machine operators	23.485	10.122	21.190	16.549	7.811	14.811	1.419
Elementary occupations	11.993	4.505	10.682	12.393	4.949	10.905	0.968
Age							
Up to 30 years old	20.018	10.519	17.244	17.160	10.663	14.358	1.167
31 to 40 years old	26.047	14.757	22.142	23.622	22.375	17.327	1.103
41 to 50 years old	27.559	16.387	22.800	22.372	25.524	15.955	1.232
51 to 60 years old	24.818	15.431	20.364	20.784	19.336	15.978	1.194
More than 60 years old	30.610	21.043	25.297	25.468	30.498	16.603	1.202
Firm size (number of employees)							
10 to 50	26.030	14.917	22.284	16.735	15.253	12.250	1.555
51 to 250	26.732	15.427	21.847	20.359	19.854	15.364	1.313
251 to 1000	22.957	13.657	19.491	22.796	20.791	17.660	1.007
More than 1000	25.673	17.013	21.953	25.636	24.802	19.154	1.001

Source: Author's computation based on SEO data, 2012

Figure 1 Wage distributions in public and private sectors



Explanatory note: Young = individuals aged 30 years old or less; High skilled = individuals with tertiary education; Low skilled = individuals with education levels lower than secondary

Source: Author's computation based on SEO data, 2012

Moving to the econometric analysis, we started with a simple Mincerian wage equation estimated with the OLS method:

$$\ln w_j = X_j\beta + u_j, u \sim N(0, \sigma).$$

Our explanatory variable $\ln w_j$ was a log of an hourly wage rate, while explanatory variables (X_j) included the basic demographic variables of sex and age (specification 1), supplemented by the human capital variables of level of education and tenure with current employer (specification 2), dummies for occupational groups (2-digit ISCO classification, specification

3), employer's characteristics (dummy variable for the size of a firm measured with the number of workers and dummy variables for industries – specification 4), and contract characteristics (dummy variable for the type of contract: permanent versus temporary and dummy variable for non-standard working time organisation – specification 5). Specification 5 is the most comprehensive (with the highest level of explanatory power); however, we will treat specification 4 as the benchmark, since the conditioning variables used in this specification were also included in earlier editions of the SEO. It will be possible then to compare the results for 2012 with earlier periods.

Table 3 shows the estimates for all five specifications. For the sake of brevity, we omitted the parameters for occupational and industry dummies. The results are consistent with the expectations. As for control variables, all of them were found to be significant and sensible predictors of wages (negative sign for women, positive returns to education and firm size, concave relationship to age and tenure). Each specification revealed the positive public-sector wage premium. It is worth noting that adding simple demographic variables makes an adjusted premium even higher than observed in the raw data, while controlling for human capital variables makes it significantly lower. It suggests that the public sector attracts relatively more workers with characteristics of human capital being better rewarded in the labour market. Including the employer and contract characteristics resulted in an adjusted wage gap of 5–7%. These results suggest that public-sector employment is concentrated in firms of the size and industry offering, *ceteris paribus*, lower wages.

Table 3 Estimates of wage equations for public and private sectors, SEO, 2012

	(1)	(2)	(3)	(4)	(5)
Public	**0.2336****	**0.0285****	**0.0331****	**0.0684****	**0.0595****
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Women	-0.1414**	-0.2296**	-0.1628**	-0.1377**	-0.1340**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Age	0.0607**	0.0433**	0.0326**	0.0307**	0.0273**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Age squared	-0.0007**	-0.0005**	-0.0004**	-0.0003**	-0.0003**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Education, tertiary		0.7452**	0.3044**	0.3041**	0.2957**
		[0.000]	[0.000]	[0.000]	[0.000]
Education, secondary vocational		0.2449**	0.0761**	0.0795**	0.0726**
		[0.000]	[0.000]	[0.000]	[0.000]
Education, seconday general		0.2393**	0.0945**	0.0950**	0.0915**
		[0.000]	[0.000]	[0.000]	[0.000]
Education, basic vocational		0.0338**	-0.0075**	-0.0047*	-0.0071**
		[0.000]	[0.001]	[0.034]	[0.001]
Tenure		0.0258**	0.0211**	0.0200**	0.0120**
		[0.000]	[0.000]	[0.000]	[0.000]
Tenure squared		-0.0004**	-0.0004**	-0.0004**	-0.0002**
		[0.000]	[0.000]	[0.000]	[0.000]
Firm size				0.0000**	-0.0000
				[0.009]	[0.942]
Contract: permanent					0.1533**
					[0.000]
Working time organization: non-standard					0.0604**
					[0.000]
Occupation dummies	No	No	Yes	Yes	Yes
Industry dummies	No	No	No	Yes	Yes
Constant	1.6658**	1.5579**	2.8340**	2.8749**	2.8654**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	725,239	725,239	725,239	725,239	725,239
R-squared	0.080	0.359	0.488	0.522	0.533
pval in brackets					

** p<0.01, * p<0.05

Source: Own computation based on SEO, 2012.

3.4.Public-sector wage premium: results of quantile regression

The econometric approach reported in the previous subsection relied on averages. The quantile regression approach allows us to extend the analysis for the whole distribution of wages. It is a well-documented fact for various countries and periods that the public-sector wage premium differs for different parts of the wage distribution, usually being positive for individuals with low wages and negative for the right tail of the wage distribution.

Again, let $\ln w_j$ be the log of hourly wage, while X_j the vector of regressors capturing individual characteristics of employees as well as the job attributes. The quantile regression model estimates the θ-th quantile of the distribution of $\ln w_j$ conditional on X_j as a linear function of the regressors:

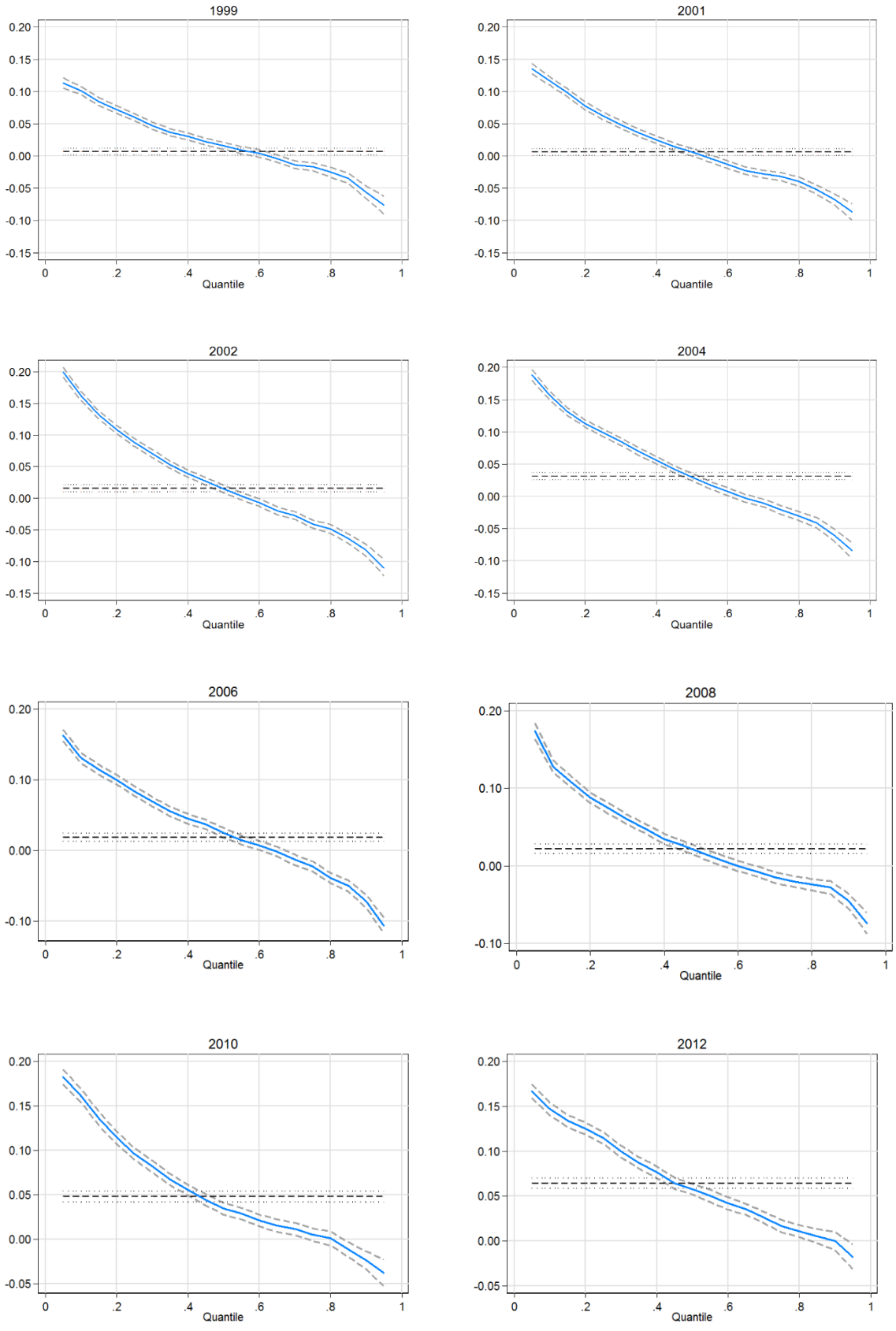
$$Q_\theta(\ln w_j | X_j) = X_j \beta_\theta, \text{ where } \theta \in (0,1).$$

The set of regressors in X_j include the variables used in specification 4 above. A full set of estimates for the model are available from the authors on request, and for the sake of brevity are not included in this paper as in reporting the results we focus on the ownership dummy only (Figure 2).

Starting with analysis for the year 2012, the last for which data is available, there is a clear relationship between the wage decile and an adjusted public-sector wage premium. It is the highest for individuals with lowest wages (first decile), where it is equal to 13.3% and it monotonically falls with growing income. For the fifth decile (median) it is positive, but it is equal only to 5.4%. For wages in the upper half of the distribution, it falls even further to become negative for top-earners (ninth decile). However the penalty for working in the public sector does not seem to be severe, since it is equal only to 1.3%.

When we compare the adjusted wage premium for different deciles in 2012 with previous years, we notice a significant upward shift of its curve (Figure 2). Top earners working in the public sector are definitely the group that benefited the most from the wage structure changes in recent years (as compared to their counterparts form the private sector). Between 1999 and 2012 the share of earners that exhibited the negative public-sector wage premium diminished gradually: yet in 1999 the public-sector wage premium was negative for about 40% of workers, while in 2012 the respective share was only equal to 17%.

Figure 2 **Adjusted public-sector wage premium across deciles of wage distribution, 1999–2012**



Source: Author's computation based on SEO data 1999–2012

3.5.Non-parametric approach: Ñopo decomposition

All parametric estimations of wage differentials rely heavily on the overlap assumption, which is rarely empirically verified. There may be combinations of characteristics for which it is possible to find workers in the public sector but not in the private, and vice versa[5]. In such cases, parametric estimations may become useless. Moreover, the decision as to whether the overlap is sufficient in the multivariable context is discretionary. The second issue is the selection problem resulting in endogeneity of how individual and employer characteristics affect each other and how they affect wages. In such a case the parametric estimates may be biased.

Ñopo (2008) proposed a solution to avoid the problem of common support by constructing an implicit decomposition based on matching. It is based on a technique allowing the researcher to find matched samples with 'similar' observable features, except for one particular characteristic, the 'treatment', which is used to divide observations into two sets, the treated and the control group. After controlling for differences in observed characteristics, it is possible to measure the impact of treatment alone. Ñopo (2008) considered the gender variable as a treatment and used matching to select sub-samples of males and females in such a way that there were no differences in observable characteristics between 'matched' males and 'matched' females. Afterwards, the wages of each woman were compared with the average wages of men having exactly the same characteristics. The same procedure may be applied to sectorial wage differentials analysis.

The advantage of the decomposition approach is to split the difference in the earnings between the public and private sector workers into a part attributable to differences in endowments and a part attributable only to different pricing of these characteristics across the two sectors. In gender wage-gap studies, the differences in pricing are usually considered to be 'unjustified', or interpreted as discrimination (or its upper boundary). In case of public-sector wage premiums, the interpretation could be different. In fact, it is either an indirect proof of significant obstacles for intersectoral labour force mobility, or a proof of non-wage benefits associated with employment in the sector characterized by a negative wage premium.

In the case of parametric methods, it is assumed that estimates of the wage equations are also valid from the support of the observable characteristics for which they are estimated. It may result in an overstatement of that part of the wage differential unexplained by differences in endowments. Ñopo in his decomposition proposes to break down the wage differential into four terms, two of which are analogous to the elements of the traditional decomposition technique proposed by Oaxaca-Blinder (Oaxaca, 1973), while the other two account for differences in the supports.

Adopting the Ñopo methodology in the case of public-sector wage premiums, the public–private sector wage differential can be expressed in terms of four additive elements:

$$\Delta = (\Delta\text{EXP} + \Delta\text{PUB} + \Delta\text{PRIV}) + \Delta\text{UNEXP}$$

where ΔEXP is the part of the average public-private sector wage gap (Δ) that can be explained by differences in the distributions of the characteristics of workers in the public and private sectors over the common support; ΔPUB is the part of the wage gap that is explained by the existence of public-sector employees that cannot be found in the common support of the distributions of characteristics; and ΔPRIV is the part of the wage gap that can be explained by the presence of private-sector workers out of the common support. Finally, ΔUNEXP is the unexplained part of the wage gap (i.e. that part of the difference that is attributed to unobservable characteristics or to different returns between the two groups in the observable

[5] An extreme example of this situation is the lack of public administration workers employed in the private sector.

characteristics). The sum of the first three elements may be understood as the component 'explained' by differences in the characteristics, while the fourth term corresponds to the 'unexplained' component.

The Ñopo (2008) procedure involves applying matching methods to simultaneously identify the common support (i.e. groups of workers in the public and private sectors with similar observable characteristics) and decompose the wage differential into four components without imposing any restrictions on the way in which the explanatory variables affect the dependent variable. The main drawback of the method is the problem of high dimensionality. The inclusion of a large number of explanatory variables for matching may substantially reduce the number of observations found in the common support.

The most important advantage of Ñopo's methodology of decomposition is that it accounts for differences in the supports of the distribution. If the unmatched public-sector workers have average wages above the average wages of their matched peers, then estimating earnings equations for public-sector workers without accounting for this regularity tends to overestimate the unexplained component (ΔUNEXP). On the other hand, if there are private-sector workers that exhibit characteristics that the labour market rewards to a greater extent than public-sector workers (as was probably the case at the beginning of the transition period), the unexplained component could be actually underestimated.

The raw observed wage gaps for the years 1999–2012 are in the range of 18.2% to 28.8%. Controlling for matching variables significantly reduces the value of the gap as reported in Table 4. Inclusion of sex and age is generally not enough to explain the difference as the unexplained gap remains close to the raw value. Extending the specification for human capital variables (level of education and job experience) allows us to explain much of the raw gap as the unexplained part generally turns even negative. It allows us to conclude that public-sector employees are endowed with human-capital characteristics which would justify even higher wage differentials than observed in the raw data. The inclusion of occupation dummies (at the 2-digit level) generally does not produce a significant impact on the unexplained wage differential. However, adding variables related to job characteristics (industry and firm size) brings about a large decrease in the value of the unexplained wage gap. The common support in this case is however severely limited, which suggests that public and private employment is much more differentiated over these characteristics than any other.

Contrary to the results of the parametric approach (in which the problem of common support is neglected), even in recent years the average adjusted public-sector wage premium is still negative. Moreover, there is no clear trend when we look at the results for the period 1999–2012.

Table 4 Results of Ñopo decompositions depending on conditioning variables

	Raw difference	Unexplained difference	Standard error for unexpl. diff.	Explained difference			% public	% private
				Public	Private	DX		
2012								
Basic variables (sex and age)	19.00%	16.14%	0.16%	.	.	2.86%	100,00%	100,00%
+ human capital (education and tenure)	19.00%	-1.91%	0.16%	0.00%	0.01%	20.90%	100,00%	99,97%
+ occupation	19.00%	-1.55%	0.17%	-0.52%	1.58%	19.50%	98,48%	94,03%
+ firm characteristics (size and NACE)	19.00%	-3.17%	0.22%	-13.92%	14.21%	21.87%	51,74%	42,53%
2010								
Basic variables (sex and age)	28.77%	24.62%	0.17%	.	.	4.15%	100,00%	100,00%
+ human capital (education and tenure)	28.77%	0.23%	0.18%	0.00%	0.01%	28.54%	100,00%	99,98%
+ occupation	28.77%	-1.07%	0.19%	-0.05%	1.55%	28.34%	97,24%	93,99%
+ firm characteristics (size and NACE)	28.77%	-6.87%	0.29%	-16.14%	14.01%	37.77%	49,54%	38,94%
2008								
Basic variables (sex and age)	19.95%	15.95%	0.18%	.	.	4.00%	100,00%	100,00%
+ human capital (education and tenure)	19.95%	-4.77%	0.18%	0.00%	0.00%	24.72%	100,00%	99,99%
+ occupation	19.95%	-5.21%	0.19%	0.23%	1.74%	23.19%	98,60%	94,79%
+ firm characteristics (size and NACE)	19.95%	-8.70%	0.28%	-9.86%	12.16%	26.35%	55,61%	47,97%
2006								
Basic variables (sex and age)	19.36%	13.78%	0.20%	.	.	5.58%	100,00%	100,00%
+ human capital (education and tenure)	19.36%	-8.32%	0.20%	0.00%	0.01%	27.67%	100,00%	99,98%
+ occupation	19.36%	-9.39%	0.22%	0.27%	2.13%	26.35%	98,36%	94,15%
+ firm characteristics (size and NACE)	19.36%	-12.47%	0.30%	-10.46%	12.63%	29.66%	51,97%	51,89%
2004								
Basic variables (sex and age)	25.57%	18.47%	0.22%	.	.	7.10%	100,00%	100,00%
+ human capital (education and tenure)	25.57%	-2.93%	0.22%	0.00%	0.00%	28.50%	100,00%	99,99%
+ occupation	25.57%	-4.01%	0.23%	1.16%	1.77%	26.64%	97,68%	95,31%

+ firm characteristics (size and NACE)	25.57%	-7.42%	0.33%	-7.90%	12.18%	28.72%	49,63%	53,60%
2002								
Basic variables (sex and age)	25.71%	20.09%	0.21%	.	.	5.62%	100,00%	100,00%
+ human capital (education and tenure)	25.71%	0.10%	0.22%	0.00%	0.00%	25.61%	100,00%	99,99%
+ occupation	25.71%	-2.77%	0.22%	0.57%	0.81%	27.10%	97,94%	97,52%
+ firm characteristics (size and NACE)	25.71%	-11.13%	0.32%	-4.10%	11.01%	29.92%	53,52%	56,42%
2001								
Basic variables (sex and age)	18.16%	13.78%	0.19%	.	.	4.39%	100,00%	100,00%
+ human capital (education and tenure)	18.16%	-2.95%	0.19%	0.00%	0.00%	21.11%	100,00%	99,99%
+ occupation	18.16%	-2.67%	0.20%	2.01%	0.60%	18.22%	96,18%	97,60%
+ firm characteristics (size and NACE)	18.16%	-8.03%	0.25%	-2.64%	8.25%	20.58%	51,28%	58,95%
1999								
Basic variables (sex and age)	24.24%	19.99%	0.20%	.	.	4.25%	100,00%	100,00%
+ human capital (education and tenure)	24.24%	-0.02%	0.20%	0.00%	0.00%	24.26%	100,00%	99,99%
+ occupation	24.24%	-0.13%	0.20%	2.80%	0.52%	21.06%	94,76%	98,01%
+ firm characteristics (size and NACE)	24.24%	-5.78%	0.25%	-16.17%	7.04%	39.15%	41,65%	61,62%

Source: Author’s computation based on SEO data, 1999–2012

4. Conclusions and open issues

The objective of this paper was to investigate the evolution of the public–private wage gap in Poland using a collection of data sets covering the span of 1999–2012. We applied the quantile regression method and the Ñopo (2008) decomposition method to show that, after controlling for structural differences in employment, there is no clear evidence concerning the signs and trends of the adjusted public-sector wage premium in Poland. We used samples of individual wages reported by firms, as a representative dataset on wages in Poland, although only companies employing more than nine persons are surveyed. Small companies are concentrated in the private sector and the positive wage returns to the firm size is well documented in the literature. This probably leads to underestimation of the raw wage gap in our study.

The parametric approach indicates a positive and increasing premium, with significant variation across different parts of wage distribution. Quantile regression results indicate that the public-sector wage premium for the median earner was in the range of 0.6% in 2001 and 5.0% in 2012. The non-parametric approach yields different results, indicating a negative wage premium with no clear trend in the period 1999–2012. However, we might see a declining public wage penalty in the years 2006–2012. To the best of our knowledge, this is the first study on the public–private wage gap over this period, and also the first paper applying the methodology of the non-parametric decomposition to the problem of the public-sector wage premium in Poland.

The results obtained here are clearly different from the findings of the studies for developed economies, although quite typical for countries in transition. The public-sector wage penalty is particularly strong for top earners. Further analysis should however include quantile selection models to check whether non-random selection process affects quantile effects for wage premiums. This would require a different dataset, covering more detailed labour force characteristics, enabling the identification of reliable instruments to control for the selectivity.

Our results raise several new questions. One of them is related to the non-wage benefits of employment, particularly in the public sector. One might expect some compensating benefits of employment in the public sector for those particularly affected by strong wage penalties. These can come in the form of higher job security, stability of employment, prestige, career perspectives and personal development, flexibility of working hours, and many others. Another open issue is the question of barriers for intersectoral labour mobility and its limitations.

References

Adamchik, V. & Bedi, A. (2000) Wage differentials between the public and the private sectors: evidence from an economy in transition. *Labour Economics*, 7, 203–224.

Adamchik, V., Hycak, T. & King, A. (2003) The wage structure and wage distribution in Poland, 1994–2001. *International Journal of Manpower*, 24, 916–946.

Algan, Y., Cahuc, P., & Zylberberg, A. (2002). Public employment and labour market performance. *Economic Policy*, *17*(34), 7-66.

Bebchuk, L. A., & Fried, J. M. (2004). Stealth compensation via retirement benefits, working paper (10742), National Bureau of Economic Research.

Belman, D. & Heywood, J. (2004) Public-sector wage comparability: the role of earnings dispersion. *Public Finance Review*, 32, 567–587.

Borjas, G. J. (1984). Electoral cycles and the earnings of federal bureaucrats. *Economic Inquiry*, *22*(4), 447-459.

Brainerd, E. (2002) Five years after: the impact of mass privatization on wages in Russia, 1993–1998. *Journal of Comparative Economics*, 30, 160–190.

Burgess, S., & Metcalfe, P. (1999). The Use of Incentive Schemes in the public and private sectors: evidence from British Establishments. *CMPO Working Paper*, 99/015.

Chernozhukov, V. & Hansen, C. (2005) An IV model of quantile treatment effects. *Econometrica*, 73, 245–61.

Christou, C., Klemm, A. & Tiffin, A. (2007) Wage dynamics in the Romanian economy. *IMF Article IV*, 34–50.

CSO (2015) Zatrudnienie i wynagrodzenia w gospodarce narodowej w I–III kwartale 2015 r.

Depalo, D. & Giordano, R. (2011) The public–private pay gap: a robust quantile approach. *Giornale degli Economisti e Annali di Economia*, 70, 25–64.

Disney, R. & Gosling, A. (2003) A new method for estimating public sector pay premia: evidence from Britain in the 1990s. Centre for Economic Policy Research, *(CEPR) discussion paper*, 3787.

Dustmann, C. & Van Soest, A. (1997) Wage structures in the private and public sectors in West Germany. *Fiscal Studies*, 18, 225–247.

Dustmann, C. & Van Soest, A. (1998) Public and private sector wages of male workers in Germany. *European Economic Review*, 42, 1417–1441.

Ehrenberg, R. G. (1973). The demand for state and local government employees. *The American Economic Review*, *63*(3), 366-379.

Elliott, R. F. & Duffus, K. (1996) What has been happening to pay in the public-service sector of the British economy? Developments over the period 1970–1992. *British Journal of Industrial Relations*, 34, 51–85.

Elliott, R., Lucifora, C., & Meurs, D. (Eds.). (1999). Public sector pay determination in the European Union, Springer.

Falaris, E. (2004) Private and public sector wages in Bulgaria. *Journal of Comparative Economics*, 32, 56–72.

Fogel, W., & Lewin, D. (1974). Wage determination in the public sector. *Industrial and Labor Relations Review, 27*, 410-431.

Friberg, K. (2007) Intersectoral wage linkages: the case of Sweden. *Empirical Economics*, 32, 161–184.

Gorodnichenko, Y. & Sabirianova, P. K. (2007) Public sector pay and corruption: measuring bribery from micro data. *Journal of Public Economics*, 91, 963–991.

Grotkowska, G. & Wincenciak, L. (2014) Public-sector wage premium in Poland: can it be explained by structural differences in employment? *Ekonomia: Rynek, Gospodarka, Społeczeństwo*, 38, 47–72.

Grotkowska, G., Wincenciak, L. & Gajderowicz, T. (2016) From dead-end jobs to dream jobs: public–private wage premium in Poland 25 years after transition. Unpublished paper.

Haskel, J., & Sanchis, A. (1995). Privatisation and X-inefficiency: a bargaining approach. *The Journal of Industrial Economics*, 43(3), 301-321.

Haskel, J., & Szymanski, S. (1993). Privatization, liberalization, wages and employment: theory and evidence for the UK. *Economica,*, 60, 161-181.

Heckman, J. (1979) Sample selection bias as a specification error. *Econometrica*, 47, 153–61.

Heitmueller, A. (2006) Public-private sector pay differentials in a devolved Scotland. *Journal of Applied Economics*, 9, 295–323.

Holmlund, B. (1993) Wage setting in private and public sectors in a model with endogenous government behaviour. *European Journal of Political Economy*, 9, 149–62

Hörner, J., Ngai, L. R., & Olivetti, C. (2007). Public Enterprises and Labor Market Performance. *International Economic Review*, 48(2), 363-384.

Jacobsen, J. (1992) Spillover effects from government employment. *Economic Letters*, 39, 101–104.

Jovanović, B. & Lokshin, M. (2003) Wage differentials and state–private sector employment choice in Yugoslavia. *Economics of Transition*, 11, 463–491.

Jovanović, B. & Lokshin, M. (2004) Wage differentials between the state and private sectors in Moscow. *Review of Income and Wealth*, 50, 107–123.

Katz, L. & Krueger, A. B. (1991) Changes in the structure of wages in the public and private sectors. *Research in Labor Economics*, 12, 137–172.

Keane, P. M. & Prasad, E. S. (2006) Changes in the structure of earnings during the Polish transition. *Journal of Development Economics*, 80, 389–427.

Koenker, R. & Bassett, G. (1978) Regression quantiles. *Econometrica*, 46, 33–50.

Krstić, G., Litchfield, J. & Reilly, B. (2007) An anatomy of male labour market earnings inequality in Serbia, 1996–2003. *Economic Systems*, 31, 97–114.

Lamo, A., Perez, J. J. & Schuknect, L. (2012) Public or private sector wage leadership? An international perspective. *Scandinavian Journal of Economics*, 114, 228–244.

Lausev, J. (2012) Public–private earnings differentials during economic transition in Hungary. *Budapest Working Papers*, 2012/2.

Lehmann, H. & Wadsworth, J. (2000) Tenures that shook the world: worker turnover in Russia, Poland, and Britain. *Journal of Comparative Economics*, 28, 639–664.

Leping, O. (2006) Evolution of the public–private sector wage differential during transition in Estonia. *Post-Communist Economies*, 18, 419–436.

Leslie, D. (1985). The economics of cash limits as a method of pay determination. *The Economic Journal*, *95*(379), 662-678.

Lucifora, C. & Meurs, D. (2006) The public-sector pay gap in France, Great Britain and Italy. *Review of Income and Wealth*, 52, 43–59.

Makepeace G., Marcenaro-Gutierrez O. (2006) The earnings of workers covered by pay review bodies: evidence from the labour force survey. *Report for the Office of Manpower Economics.*

Melly, B. (2006) Public and private sector wage distributions controlling for endogenous sector choice. S*wiss Institute for International Economics and Applied Economic Research*. *Working Paper*, 1788.

Mincer, J. (1974). Schooling, experience, and earnings. *Human Behavior & Social Institutions*, 2.

Mueller R (1998) Public-private sector wage differentials in Canada: evidence from quantile regressions. *Economics Letters*, 60, 229–235.

Newell, A. & Socha, M. (1998) Wages distribution in Poland: the roles of privatization and international trade, 1992–96. *Economics of Transition*, 6, 47–65.

Newell, A. & Socha, M. (2007) The Polish wage inequality explosion. *Economics of Transition*, 15, 733–758.

Nõpo, H. (2008). Matching as a tool to decompose wage gaps. *Review of Economics and Statistics*, 90 (2), 290–299.

Oaxaca, R. (1973) Male–female wage differentials in urban labor markets. *International Economic Review*, 14, 693–709.

Oaxaca, R. & Ransom, M. (1994) On discrimination and the decomposition of wage differentials. *Journal of Econometrics*, 61, 5–21.

Quadrini, V., & Trigari, A. (2007). Public Employment and the Business Cycle. *The Scandinavian Journal of Economics*, 109(4), 723-742.

Reder, M. (1975) The theory of employment and wages in the public sector. In: D. Hamermesh (ed.), Labor in the Public and Nonprofit Sectors. Princeton University Press, 1-48.

Rodrik, D. (2000) What drives public employment? *Review of Development Economics* , 4, 229–243.

Rutkowski, J. (1996) High Skills Pay Off: The Changing Wage Structure During the Transition in Poland, *Economics of Transition*, 4, 89–111.

Rutkowski, J. (1997). Low Wage Employment in Transitional Economies of Central and Eastern Europe. *MOST: Economic Policy in Transitional Economies*, 7(1), 105-130.

Silvestre, J. J., & Eyraud, F. (1995). Pay Determination in the Public Sector: An International Comparison Between France, Great Britain, & Italy (Vol. 6). International Labour Office.

Socha M. W., Weisberg J. (2002) Earnings in Poland: The Private versus the Public Sector, *Journal of Entrepreneurial Finance and Business Ventures*, 7(3), 17-37.

Telegdy, A. (2006) The effect of the public-sector wage increase on the public–private relative wages. In: Galasi, P. & Kzdi, G. (eds.) *The Hungarian Labour Market*, pp. 60–68. Budapest, Institute of Economics, Hungarian Academy of Sciences.

Tiagi, R. (2010) Public-sector wage premium in Canada: evidence from labour force survey. *Labour*, 24, 456–473.

Tirole, J. (1994). The internal organization of government. *Oxford economic papers* , 56(1), 1-29.

Tullock, G. (1965) The Politics of Bureaucracy, Washington, DC, Public Affairs Press.

Faculty of Economic Sciences
University of Warsaw
44/50 Długa St.
00-241 Warsaw
www.wne.uw.edu.pl