JOURNAL OF ECONOMIC SURVEYS

doi: 10.1111/joes.12039

WHAT HAS 20 YEARS OF PUBLIC–PRIVATE PAY GAP LITERATURE TOLD US? EASTERN EUROPEAN TRANSITIONING vs. DEVELOPED ECONOMIES

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Abstract. This paper surveys the literature on public–private sector pay differentials based on 20 years of research in transitioning countries of Eastern Europe (EE) and compares the results with estimates obtained from developed market economies. The majority of empirical studies from EE economies found evidence of public sector pay penalties during the period of economic transition from a communist to market-based economy. In developed economies, however, the average differential is usually around zero or positive. The public sector pay inequality reducing effect relative to the private sector is greater in transitioning economies than in developed economies. Nevertheless, there is evidence that the sign of the public sector pay gap as well as the relative public sector pay distribution change with the progress of economic transition towards those usually observed in developed economies. Different pay-setting arrangements between private and public sectors and competition for workers seem to be major arguments for the existence of systematic pay differences between the two sectors.

Keywords. Earnings; Public and private sectors; Transitioning economies in Eastern Europe; Developed economies; Intercountry comparisons

1. Introduction

The issue of the public–private sector pay gap has been intensively empirically explored across countries over the last two decades. Comprehensive surveys on sectorial pay differences exist for market economies (such as Ehrenberg and Schwarz, 1986; Bender, 1998 and Gregory and Borland, 1999) but are now over 10 years old. Moreover, whereas the previous surveys included research from both developed and developing countries they did not cover countries transitioning from communist to market-based economies. This paper attempts to fulfil this gap in the surveys of the public–private sector literature.

The motivation for this work comes from the fact that negative public sector pay gap has been commonly estimated by studies in countries transitioning from a communist to a market system. This is in contrast to both developed and developing countries where a public sector pay gap is usually found to be positive. Furthermore, the public sector premium in developing countries is typically found to be larger than in developed economies.[1] In order to present this distinction in public sector pay gap, inherited from the communist period, this paper focuses on post-communist economies and considers developed countries as their labour market benchmark.

In this context, the process of transition in post-communist countries, largely located in Eastern Europe (EE), has been initiated in early 1990s, with the aim of achieving progress towards the labour market functionality of Western European and North American counterparts.[2] This process of transition from economies dominated by largely public sector wage-setting to economies characterized by market-based incentives is considered to be one of the major phenomena of the twentieth century (Svejnar, 1999). It involved large-scale privatization of public sector activities and allowed private sector competition for workers for the first time after half a century.

The purpose of this paper is to examine the literature on public–private sector pay differentials in the EE during large-scale privatizations in order to present differences in wage structures between public and private sectors in countries transitioning from communist to market-based economies. In addition, the paper builds on previous surveys of sector pay differentials by presenting relevant contribution from developed economies over the period of the last 20 years.

The results surveyed in this paper indicate that privatizations of public sector activities are related to increases in wage inequalities in transitioning economies, in both the public and private sectors with a greater prevalence in the private sector. The same is confirmed by the literature from developed economies based on estimates obtained during their waves of privatization in the 1980s and 1990s.[3]

On the other hand, the literature review of empirical studies presented in this paper highlights an important difference in sign of the estimated public sector pay gap between the EE and developed economies. However, empirical evidence from most EE economies also reveals changes in the public sector pay gap over the course of economic transition. Particularly, the average public sector pay penalty tends to disappear when economic transition reaches maturity. Moreover, the paper shows that the public sector pay is more compressed than the private sector pay in both transitioning and developed economies, but the public sector wage dispersion relative to the private sector is greater in developed countries.

Whereas in developed countries the public sector pay inequality reducing effect is caused by a greater premium at the bottom then at the top of the pay distribution, in the EE countries relative compression in public sector pay arises from larger pay penalties at the top then at the bottom of the pay distribution. Nevertheless, an increase in relative public sector wage dispersion towards that typically observed in developed economies appears to be a principal feature of labour markets during the economic transition.

The remainder of this paper is structured in stages. Firstly, the subsequent part of the paper reviews explanations offered by theoretical literature for the existence of systematic differences between the public and the private sector earnings. The next part describes the empirical methods and model specifications used in the public–private sector pay gap estimation. The survey of the empirical literature from the EE transitioning countries is presented in the succeeding part of the paper. Empirical results from developed economies obtained by studies over the period of the last two decades are presented in the following section. The final part concludes the paper with an overview of the main findings.

2. Theoretical Literature Review

The intention of this section is to present an overview of work on the rationale for the existence of differences in pay between the public and private sectors in both developed and transitioning economies. The arguments are organized into two sub-sections. The first sub-section summarizes the demand and supply points of view as to why public–private pay differentials might exist in market economies. The next sub-section focuses on economies transitioning from a communist to a market system.

2.1 *Why May There Be a Difference in Pay between the Public and the Private Sectors?*

In general, comprehensive surveys of estimates of public–private wage differentials by Ehrenberg and Schwarz (1986), Bender (1998) and Gregory and Borland (1999) found in developed economies average public sector premiums for women, less skilled workers, minorities and veterans.

In this context, the rationale for a public sector 'pay effect' may be related to political factors through the role of government as a 'good' employer, as suggested in Gregory (1990). Gregory (1990) argues that the empirical finding on public sector pay compression is because the government overpays unskilled workers and underpays skilled workers for egalitarian reasons.

In a closely related vein, Gunderson (1979) argues that the basic difference between the public and private sectors with respect to the wage determination process is that the private sector is profit constrained while the public sector is constrained by the public budget. Considering the politics of wage setting, Fogel and Lewin (1974) pointed out that the public sector demand curve is derived from the voter expressed demand for government services and through bargaining between government and unions rather than through the marginal revenue product curve.

Therefore, models that investigate the demand for labour and pay determination in the public sector are typically divided into social welfare, budget maximization, vote maximization and bargaining group of models.

Social welfare models consider a single decision-making unit which is assumed to choose the total per capita level of services (as in Ehrenberg, 1973). The employment demand function is obtained by maximizing the utility function subject to the constraint that the total employment budget is exhausted.

Recent social welfare models analyse how managers, workers and investors respond to various incentives (Hart *et al*., 1997; Rodrik, 2000). Considering different incentive designs in the public and private sectors, Tirole (1994) pointed out that low powered individuals' incentives in the public sector might be due to a lack of appropriate comparisons, heterogeneity of tastes of principals and career concerns about prospects of re-election or promotion.

Budget maximization models build upon the argument of bureaucratic ineffectiveness owing to the fact that resources are obtained through 'budget allocation' instead of market performance (Niskanen, 1975 and Tullock, 1965). In these models bureaucrats manipulate the decision-making process to obtain a desired pay and employment combination. This leads to oversupply of goods and organizational growth.

In vote maximization models, the demand for labour in the public sector, besides producing public sector output, is utilized for 'vote-producing activities' (Reder, 1975; Courant *et al*., 1979; Freeman, 1987). A special treatment of some groups of voters or political favouritism and increased hiring by the government that runs office are considered to explain public sector earnings' premiums or excessive employment.

In a particular theoretical model of Borjas (1980), the existence of wage differentials among similar workers between different administration units within the public sector is explained by the government choosing optimal values of wage and employment, subject to an exogenously given budget, in such a way as to maximize political support. Hence, pay differentials are linked to a number and organization of constituents and organization of the bureaucracy.

Bargaining models examine the role of public sector trades unions. A bargaining model developed by Leslie (1985) analyses the effect of cash limits on pay settlements in the public sector. In this model, a cash limit defined as the fixed amount of money available for the public sector wage bill and known to unions before negotiation, thereby presents a budget constraint with a unit constant elasticity. Furthermore, public–private sector wage differentials emerge from the bargaining process between sector-specific monopoly unions in models set by Holmlund (1993), Haskel and Szymanski (1993) and Haskel and Sanchis (1995). In Holmlund (1993) a government with utilitarian preferences decides about public sector employment and the tax rate on wages. A public sector pay premium arises from non-cooperative union wage setting.

On the other hand, Disney (2011) argues that whereas the rationale for the existence of a union wage differential is straightforward, treating public sector wage bargaining as equivalent to a 'mark-up' on the competitive wage is over-simplistic. In particular, the public sector as a unitary employer with potential monopsonistic power has a capacity to countervail the monopolistic power of public sector unions. The existence of potential monopsony power in the public sector is supported by Fogel and Lewin's (1974)

and by Boal and Ramson's (1997) survey of evidence on monopsony effect for specific occupations such as nursing and teaching, where a worker seeks employment in a relatively small geographic region or has few outside options.[4]

In this context, using models of 'vocation' developed elsewhere in the literature Disney (2011) explains why recruitment to the public sector may be relatively insensitive to fluctuations in the public–private sector pay differentials. This rigidity can also be linked to Manning's (2003) idea of 'dynamic monopsony' where employers have market power observed through the wage dispersion of identical workers. This market power appears due to the fact that workers do not quit immediately when their wage is lower than an outside wage. Manning (2003) argues that this disparity, in relation to public sector workers, may simply arise from limited information on outside options in the standard dynamic search model.

Furthermore, standard dynamic search framework is used in a group of models that incorporate labour supply responses given by workers' search decisions. In particular, Algan *et al.* (2002), Hörner *et al.* (2007) and Quadrini and Trigari (2008) study interactions between the public and private sector by analysing macroeconomic effects of public sector on labour market performance. Yet, these models do not explain the competition for workers between sectors.

The recent on-the-job-search model, composed by Burdett (2012), fills this gap in the literature. In this model the government minimizes its costs by offering a single wage after it has chosen to employ a given number of public sector workers in a steady-state. On the other hand, each private sector employer posts a wage given the wage-employment decision made in the public sector, the distribution of wages offered by other employers, and its beliefs about the search strategies of workers. The model predictions about changes in the public–private wage differential depend on the public sector position in the wage distribution.

2.2 *Explanations from the Sector Pay Differential Literature in Transitioning Economies*

Theoretical arguments summarized in the previous sub-section indicated that the magnitude and sign of the public sector pay effect in developed economies is inconclusive. In contrast, a general concern of the research from transitioning economies was related to the quality of the public sector workforce (namely problems such as corruption and moonlighting) due to difficulties to retain and recruit competent workers that were poached to private sector by significant pay premiums estimated at the start of economic transition. For this reason, the literature from transitioning economies mainly suggested explanations why private sector pay was higher than the public sector pay, especially during the first years of economic transition.

In this context, Adamchik and Bedi (2000) highlighted that at the initial stages of economic transition public sector was more subject to pay controls due to budget deficit, fiscal and inflationary pressures. Moreover, in contrast to developed economies, unions appeared to be weak, highly segmented and had modest influence for wage setting (Boeri and Terrell, 2002; Gorodnichenko and Sabirianova Peter, 2007). [5]

Other factors important in developed countries, such as the government as a 'good employer' and the 'large firm bias', seemed to have opposite effects on public–private wage differentials in transitioning economies. Particularly, Haltiwanger and Vodopivec (2002) showed that the hiring rates declined with the size of the enterprise, but the separation rates increased with the size of the firm. This is in contrast with firm behaviour in market economies where large employers have the lowest separation rates (for example Manning, 2003). Yet, this was not unusual for transitioning economies having in mind the over-employment in the so called 'dinosaur' (due to the giant size) firms created under central planning. In this context, a strand of theoretical literature (Commander and Tolstopiatenko, 1998 and Aghion and Commander, 1999) incorporated job-to-job movements from the public to private sector as a result of restructuring of state-owned firms. The restructuring implied decline in employment resulting in an increase in marginal product for remaining workers. These models did not detail the supply side of the labour market.

However, Boeri and Terrell (2002) argued that labour reallocation between the public and the private sectors in transition could only be explained by adopting a theoretical perspective that allows for heterogeneity in the workforce and a variation of labour supply responses. In the model set up in Boeri (1998) public sector managers could not disentangle high from low productivity workers and hence are assumed to pay all workers the same average wage. On the other hand, private employers could measure the productivity of each new worker being hired, and consequently could offer wages equal to productivity. Boeri (1998) showed that different pay for similar workers emerged as a result of private sector pay strategies to 'poach' workers away from public sector jobs.[6]

Apart from the private sector poaching good public sector workers – a kind of 'brain drain' out of the public sector and into the private sector; productive workers from either sector may have left the country altogether for better opportunities in other countries.[7] In this case the public sector pay gap may narrow as a result of compensating changes in workforce quality (a phenomenon documented by Nickell and Quintini, 2002 for the UK).

Furthermore, Brainerd (2002) argued that workers might demand a wage premium for work in the private sector if they perceived that job security was lower in the private than in the public sector. Complementing these arguments a literature proposed that the private sector might pay more to induce harder work in new jobs ('efficiency wage') or to compensate for fewer non-wage benefits (Brainerd, 2002; Jovanović and Lokshin, 2004). In contrast, Gorodnichenko and Sabirianova Peter (2007) suggested that bribes could explain a significant part of the wage gap rather than non-pecuniary characteristics of public sector jobs such as efforts, in-kind benefits, job security, job satisfaction and multiple job holdings. On the other hand, Jurajda and Terell (2003) suggested that the public sector pay penalty might be caused by a self-selection process because the first movers from the public to the private sector early in transition were the most capable ones; hence this first mover advantage shrank over time with the increase of private employment. Finally, Disney and Lausev (2011) showed that the negative public sector pay gap might close with the progress of economic transition simply due to the weakening capacity of the state to extract surplus from more skilled workers.

3. Empirical Methods of Public–Private Sector Pay Gap Estimation

Current literature groups empirical methods that measure the public–private sector pay differential into macro and micro econometric techniques. In macroeconometric studies the average sector pay per employee is typically calculated from published sources of macro level data, usually available for a long number of years. A strand of those studies analyse changes in the ratio of public to private sector wages with an emphasis on specific groups of similarly qualified workers (as in Katz and Krueger, 1991 and Elliott and Duffus, 1996). Another strand of macro studies does not measure public–private wage differences but rather investigates the public–private sector wages causality by using the cointegration techniques and vector error correction framework (Jacobsson and Ohlsson, 1994; Lindquist and Vilhelmsson, 2006; Friberg, 2007; Lamo *et al*. 2012). The main drawback for macro studies in the analysis of public and private sector average wages is a lack of specific data (job and worker profiles). On the other hand, micro studies use individual level data in the Mincerian equation (Mincer, 1974) to account for differences in worker and job characteristics between the two sectors. For this reason, we first summarize issues related to the model specification that are due to a selection of covariates, and then discuss various microeconometric approaches.

3.1 *Model Specification*

In order to control for the compositional differences between the public and private sectors researchers typically estimate the public sector pay gap conditional on worker's age (or labour force experience),

education and gender (in some cases nationality/race and marital status are added). In addition, regression specification is often expanded to include controls for job characteristics such as tenure, part-time/full-time job and occupation. Nevertheless, tenure may be potentially endogenous. Likewise, whether detailed controls for workers' occupational classifications should be used is debatable given that certain occupations traditionally reside only in the public sector (see Moulton, 1990 for the sensitivity of results). Another controversial variable which may be an outcome of workers' sectoral choice is firm size (see Lee, 2004). Furthermore, controlling for the union status is important in market countries where changes in public sector unionism relative to that in the private sector may alter the estimated public–private sector wage differential. However, this does not seem to be the case in transitioning economies (see Gorodnichenko and Sabirianova Peter, 2007). In these countries changes in industry branch composition of the public sector workforce during the period of large-scale privatizations are found important. Moreover, a set of regional dummies and settlement type (i.e. urban/rural) variables are used to control for locational characteristics in countries with a huge geographical heterogeneity. Related to this, one might either use an *F*-test on the coefficients of dummies (see Falch and Strom, 2006) or run separate regressions by geographical area and inspect whether, or what, coefficient is different. Finally, variables such as workers' ability and quality would be useful (see Lee, 2004 on the use of test scores) but typically unavailable. In general, the larger the set of covariates, the smaller the pay gap.

3.2 *Microeconometric Methods*

Focusing on cross-sectional methods a common microeconometric estimation approach pools data across workers in both sectors in the 'single equation' model. The single equation includes a public sector dummy variable taking the value one if an individual works in the public sector and zero otherwise. In the case when this model is estimated by the ordinary least squares (OLS) the differences in rates of payment between public and private sector are limited to an intercept shift whereas the returns to characteristics are constrained to be equal across sectors. This model is given by

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

where $\ln w_i$ is the log of real hourly earnings for the ith individual which is explained by x_i set of observed worker and job characteristics with the parameter vector β, $\hat{\gamma}$ is the 'average' estimate of the public sector pay gap equivalent to an intercept shift and ε_i is an error term uncorrelated with x_i.

Apart from the conditional mean a 'single equation' model can be applied across the whole earnings distribution. This is done by using quantile regression methods where ϑ^{th} is the regression quantile, $0 < \vartheta < 1$, defined as a solution to the problem of minimizing a weighted sum of absolute residuals and computed by

$$\min_{\beta \in R^k} \left\{ \sum_{i:\ln w_i \geq \beta_\vartheta' x_i + \gamma_\vartheta P_i} \vartheta \left| \ln w_i - \beta_\vartheta' x_i - \gamma_\vartheta P_i \right| + \sum_{i:\ln w_i < \beta_\vartheta' x_i + \gamma_\vartheta P_i} (1-\vartheta) \left| \ln w_i - \beta_\vartheta' x_i - \gamma_\vartheta P_i \right| \right\} \tag{2}$$

The quantile regression method introduced by Koenker and Basset (1978) provides a richer understanding of the data due to a more complete picture than OLS. This is especially important for public sector pay gap estimation when the public sector pay is expected to be more compressed relative to the private sector pay distribution.

As opposed to a 'single equation' method earnings equations can be estimated for the public and private sector samples separately. This method is therefore named the 'double equation' model:

$$\text{Private sector}: \ln w_i^{NP} = \alpha^{NP} + \beta'^{NP} x_i + \varepsilon_i^{NP} \tag{3}$$

$$\text{Public sector}: \ln w_i^P = \alpha^P + \beta'^P x_i + \varepsilon_i^P \tag{4}$$

where *NP* and *P* denote non-public (that is private) and public sectors respectively.

Unlike a 'single equation' method, a two equations method allows for different intercepts and returns to characteristics across sectors. Two equations are typically an intermediate step for the Oaxaca-Blinder (OB; 1973) decomposition. Studies using this method usually decompose the sector pay gap into the 'explained' part (due to differences in observed characteristics) and 'unexplained' part (due to differences in returns to characteristics). Oaxaca-Blinder (1973) decomposition is possible at the mean and at different quantiles. However, decomposing differences in distribution is more complex because the quantile of a linear function is not equal to linear function of the quantile contrarily to the mean (see Melly, 2006).

The generalization of the decomposition model at the mean can be presented following Oaxaca and Ransom (1994):

$$\ln \bar{w}^P - \ln \bar{w}^{NP} = [(\bar{x}^P - \bar{x}^{NP})\hat{\beta}^*] + [\bar{x}^P(\hat{\beta}^P - \hat{\beta}^*) + \bar{x}^{NP}(\hat{\beta}^* - \hat{\beta}^{NP})] \tag{5}$$

where the first square bracket represents the effect of differences in characteristics evaluated at the wage β^* that an individual at random would get in the whole economy and the second square bracket represents the effect of differences in returns to characteristics if private and public sector workers maintained their own characteristics but were going to be paid like a randomly chosen individual. This second term could be interpreted as public sector earnings premium or penalty. The model in (5) can be used to generate many different kinds of decompositions given by alternative weighting. For example, weighted average expression $\beta^* = \Omega\beta^P + (I - \Omega)\beta^{NP}$ where $\Omega = 1$ corresponds to $\beta^* = \beta^P$, $\Omega = 0$ corresponds to $\beta^* = \beta^{NP}$, $\Omega = \omega I$ is a weighting corresponding to the share of the two groups in the population and $\Omega^* = (X'^{NP}X^{NP} + X'PX^P)^{-1}X'^{NP}X^{NP}$ captures the sample variation in the characteristics of public and private sector workers.

Several studies used this approach based on quantile regression techniques (see Lucifora and Meurs, 2006 for application of the method proposed by Machado and Mata, 2005). However, it suffers from problems related to detailed decomposition that were solved by recently proposed methods (see Fortin *et al*., 2011 for a general review).

In addition, Belman and Heywood (2004) construct the absolute differential measure as a variant of OB decomposition. They argue that the average concept is not the concept of wage comparability because it conceals a degree of dispersion. Two other alternative measures are also suggested: a share of workers in a comparability band and mean squared deviation (MSD).

Finally, in all approaches mentioned so far, there is the issue of sector sorting. Instrumental variable procedures are usually used to correct for non-random sector sorting. Instrumental variable methods require plausible instruments that identify the worker's sector choice but which are uncorrelated with earnings. This can be written as

$$P_i = \delta' z_i + \nu_i \quad \text{and} \quad E(\varepsilon_i \mid z_i) = 0 \tag{6}$$

where z_i are characteristics (in other words instruments) that indicate sectoral attachment P_i but are uncorrelated with earnings and δ is the parameter vector. Equation (6) is typically used in the first stage of a Heckman selection model (Heckman, 1979) or assuming $\hat{\beta} = \hat{\beta}^P = \hat{\beta}^{NP}$ in (1) in a linear probability model in the first step of a two stage least squares instrumental variable procedure. The issue of sector sorting has been studied at the mean (see Dustmann and Van Soest, 1998 for a treatment that analyses the possible endogeneity of other covariates besides sector sorting) and, recently, at quantiles (see Melly, 2006 and Depalo and Giordano, 2011 for application of the instrumental variable quantile regression method proposed by Chernozhukov and Hansen, 2005).

Moving to the panel data approach again there are methods at the mean (see Disney and Gosling, 2003) and at the quantiles (as proposed by Koenker, 2004 and applied in Bargain and Melly, 2008). Researchers

usually use 'fixed effects' methods in order to net out individual unobserved characteristics, y_i. The model by which we can track each individual i over time t can be written as

$$\ln w_{it} = \beta' x_{it} + \gamma P_{it} + y_i + \varepsilon_{it} \quad \text{for} \quad i = 1, \ldots, N \quad \text{and} \quad t = 1, \ldots, T \tag{7}$$

The unobserved effect, fixed over time, y_i, disappears by estimating the following model by pooled OLS:

$$\ln(w_{it} - \bar{w}_i) = \beta'(x_{it} - \bar{x}_i) + \gamma(P_{it} - \bar{P}_i) + (\varepsilon_{it} - \bar{\varepsilon}_i) \tag{8}$$

However, although much of the individual specific selection bias is purged from the 'fixed effect' estimator, $\hat{\gamma}$, the coefficients may still be inconsistent if sector choice depends on time-variant unobservables (see Vella, 1998 for the review of approaches on the process driving the selection bias and heterogeneity). This may be especially important in the context of large-scale privatizations (see Disney and Gosling, 2003 for the UK privatization and issues of endogeneity of job moves and measurement error on reported sector status).

4. Empirical Evidence from EE Countries in Economic Transition

The studies on public–private sector pay differentials in the countries of Eastern Europe covered the period from the early 1990s when the public sector faced private sector competition for workers for the first time after half a century. Table 1 summarizes the main results in the empirical literature on public–private sector pay differential in the EE transitioning economies. Nearly all empirical studies, irrespective of econometric method applied, found evidence of public sector pay penalties which tended to diminish with the progress of transition towards market economy.

The empirical studies applied different econometric techniques, mostly on cross-sectional data. This was simply because panel data had not been collected in most of these countries. It is also important to acknowledge the main difficulties in comparison across studies. For this reason we first summarize the main difficulties in public–private sector pay gap estimation in transitioning economies and then we discuss the main findings of studies reviewed in Table 1.

4.1 *Difficulties in Public–Private Sector Pay Gap Estimation in Transitioning Economies*

4.1.1 *Definition of Public and Private Sectors*

The way the public and private sectors are defined varies across countries. For example, Jovanović and Lokshin (2004), using the Russian Labour Force Survey for Moscow, classified respondents as working in the private sector if they worked in a new private, privatized enterprise with the majority of ownership in private hands or in an enterprise with another form of ownership (mostly foreign owned and joint-venture enterprises). In this study public sector employees worked in state-owned enterprises and institutions, municipal services and privatized enterprises with the majority of ownership still under state control. Similar definition was used by studies that used the Labour Force Survey data in other countries.

On the other hand, some of the studies (such as Brainerd, 2002 for Russia) compared workers' earnings only in the commercial sphere, namely between enterprises of different ownership types. Finally, in the Hungarian Harmonised Wage Survey used by Telegdy (2006) and Lausev (2012) the public sector includes only budgetary institutions whereas all production units (including state-owned) were classified in the private sector. The empirical results from these studies indicated a more negative public–private sector pay differentials.

Table 1. Summary of the Empirical Literature on Public–Private Sector Pay Gap in EE Transitioning Economies.

Study	Country	Data source	Years covered	Methodology	Results
Christou, Klemm and Tiffin (2007)	Romania	Romanian Statistical Office	1993–2006	Vector autoregressive model	Bi-directional causality between public and private monthly gross wages
Newell and Socha (1998)	Poland	Labour Force Survey	1992, 1996	Single equation: OLS	Hourly after tax pay gap: −5.1% (−8.6%) in 1992 and 7.9% (−0.2%) in 1996 for men (women). In 1996 men with university degree: −8%.
Adamchik and Bedi (2000)	Poland	Labour Force Survey	1996	Selection technique: endogenous switching regression	Monthly after tax pay gap: −7% (−10%) for full-time men (women) and −22% (−21%) for men (women) with university degree and 5 years of work experience. Instruments: age and whether the individual entered post-1989 labour market.
Lehmann and Wadsworth (2000)	Poland Russia	Labour Force Survey	1994–1996	Single equation OLS	State and private firms in Poland offer the same weekly after tax wages to new recruits.
	Russia	Russian Longitudinal Monitoring Survey	1994–1996	OLS	Weekly after tax wage gap between the new state sector jobs relative to new private sector jobs in Russia −13%.
Brainerd (2002)	Russia	All-Russian Centre for Public Opinion Research	1993, 1994, 1997, 1998	Single equation: OLS	Workers in the state relative to the private enterprise: −27% in 1993; −23% in 1994; −21% in 1997 and −16.5% in 1998.
				Quantile regression	The pay gap in the 1st through 3rd deciles about −16% and in the 9th decile −47% in 1993.
Adamchik, Hyclak and King (2003)	Poland	Labour Force Survey	1994, 2001	Single equation: OLS	Monthly after tax earnings gap: −9% (−6.3%) in 1994 and −3.4% (−4.5%) in 2001 for men (women).
Jovanović and Lokshin (2003)	Serbia and Montenegro	Labour Force Survey	2000	Selection technique: endogenous switching regression	Hourly after tax earnings gap: −9.4% (−4%) for men (women). Instruments: marital status and number of jobholders in the household.

Journal of Economic Surveys (2014) Vol. 28, No. 3, pp. 516–550

Table 1. *Continued.*

Study	Country	Data source	Years covered	Methodology	Results
Falaris (2004)	Bulgaria	Integrated Household Survey	1995	Selection technique: endogenous switching regression	Positive selectivity in both sectors for men. For women positive selectivity in the public but negative selectivity in the private sector. Instrument: farm land received in the restitution program increases the probability of employment in the private sector.
Jovanović and Lokshin (2004)	Russia (Moscow)	Labour Force Survey	1997	Selection technique: endogenous switching regression	Hourly after tax pay gap for men (women): −14.3% (−18.3%) and for men (women) with university degree: −44% (−22%). Instruments: industry employment prior in 1991, marital status and number of children in the household.
Keane and Prasad (2006)	Poland	Household Budget Survey	1985–1992 and 1994–1996	Single equation: OLS	Quarterly labour income gap in 1986: −7.5%,1988: −5.9%,1989: −6.7%, 1990: −8.2% 1991: −13% 1992: −9%. Monthly labour income gap: Public sector relative to small private firms in 1994: 8.7%, 1995: 11%, 1996: 10.2%. Public sector relative to large private firms in 1994: −18% 1995: −19.8% 1996: −18.3%.
Leping (2006)	Estonia	Labour Force Survey	1989–2004	Single equation: quantile regression	Monthly pay gap in 1989: −23%, −31.2%, −76.8%; 1998: 13%, 0%, −9.4%; 2002: 2.4%, −4.6%, −7.1%; 2004: 0%, −2.8%, −11.4% at 10th, 50th, 90th percentile respectively.
Telegdy (2006)	Hungary	Harmonized Hungarian Wage Survey	2000–2004	Single equation: OLS	Monthly gross pay gap: −27% in 2000, −25.7% in 2001, −20.5% in 2002, 7% in 2003 and 8.4% in 2004. Difference in returns:−13.4% (14%); −13.3% (13.7%); −22% (9.8%); −43.2% (−3.7%) for primary school or less; vocational; high school; university, respectively in 2000 (2004).

Table 1. *Continued.*

Study	Country	Data source	Years covered	Methodology	Results
Gorodnichenko and Sabirianova Peter (2007)	Ukraine	Ukrainian Longitudinal Monitoring Survey	1997–2003	Single equation: OLS and Fixed effects (FE)	Monthly wage gap after tax between public sector and private enterprises: All workers: −25.8% OLS and −21.4% FE Men: −20.5% OLS and −22.6% FE Women: −30.9% OLS and −20.4% FE Monthly after tax wage gap between public sector and state-owned enterprises: All workers: −16.5% OLS and −12.5% FE Men: −15.5% OLS and −16.5% FE Women: −15.6% OLS and −8.7% FE
				Quantile regression	Lower wages in public than in private sector at all percentiles of the wage distribution. The greatest gap among the most productive workers.
				Double equation: decile decomposition	The magnitude and the distributional shape of the wage gap largely determined by the differences in prices of worker characteristics rather than by sectoral differences in observable characteristics.
Krstić, Litchfield and Reilly (2007)	Serbia	Labour Force Survey	1996–2003	Single equation: OLS	Monthly after tax pay gap for men: −28.5% in 1996, −27.2% in 1997, −38.6% in 1998, −28.4% in 1999, −40.2% in 2000, −15.1% in 2001, −12.8% in 2002, −8.1% in 2003.
Newell and Socha (2007)	Poland	Labour Force Survey	1994–2004	Single equation: OLS	Hourly after tax pay gap: −11% in 1994, −8% in 1998 and 0% in 2002 and 2004

Table 1. *Continued.*

Study	Country	Data source	Years covered	Methodology	Results
				Quantile regression	−3%, −5%, −5%, −6%, −10% on 10th, 25th, 50th, 75th and 90th percentile respectively in 1998 and 8%, 5%, 0%, 0%, −6% on 10th, 25th, 50th, 75th and 90th percentile respectively in 2002.
				Selection technique: Heckman corrected wage equation for participation	−6% in 1998 and 0% in 2002.
Lausev (2012)	Hungary	Harmonized Hungarian Wage Survey	1995–2003	Single equation:	Monthly gross pay gap for men (women):
				OLS	1995–1999: −19.5 (−14.4) and 2001–2003: −16.4 (−10.6)
				Quantile regression	1995–1999: −3.7 (5.9); −21.4 (−13.9); −34 (−30.5) at 10th; 50th; 90th 2001–2003: 2 (9.1); −15.2 (−6); −30.5 (−25.2) at 10th; 50th; 90th percentile
				Double equation:	1995–1999: 0 (3.4); −20.4 (−14.3); −47.2 (−44.3) at 10th; 50th; 90th
				Decile decomposion	2001–2003: −0.2 (4.6); −16 (−12); −40.6 (−43.9) at 10th; 50th; 90th

4.1.2 *Changes in Employment Patterns*

Unlike developed economies, where the public sector pay and employment levels are generally fairly stable, this was certainly not the case for transitioning countries. Hence, changes in wage patterns might correlate to big changes in employment patterns. These changes might be especially important in state-owned relative to privatized enterprises given the former control that the public sector had over the 'private sector' before the transition occurred but this issue was rarely addressed in the literature due to lack of data (Svejnar, 1999).

4.1.3 *Earnings Definition*

Considering many workers were paid monthly in transitioning economies, many studies used the concept of monthly wages (Adamchik and Bedi, 2000; Krstić *et al*., 2007). Additionally, when working hours were not available, the private sector premium might be caused simply by longer working hours. However, Table 1 shows that the overall findings between monthly and hourly estimates are not materially altered (for example Newell and Socha, 2007). This is because the studies using monthly wages either controlled for monthly hours in an earnings equation and/or focused on full-time employees only.

Moreover, the public sector pay gap might be altered because the differences in social contributions, such as health care insurance and pension, were consistently not available. If the after tax wages were used, the gap might be affected depending upon the level of progressivity or regressivity of the tax code, relative characteristics of the two sectors, and the ability of private sector employers to avoid taxes.

Empirical studies could differ based on addition or lack of non-wage components, such as meal and travel allowances, subsidies, payments in-kind and bonuses – which were prevalent in the public sector (Jovanović and Lokshin, 2004). Finally, the sector pay gap might be affected by wage arrears if they were not randomly distributed between sectors (see Earle and Sabirianova, 2002 and Krstić *et al*., 2007).

4.1.4 *Measurement Error*

Finally, the estimated public–private sector pay differential in studies that used self-reported microdata (all studies in Table 1 except employer provided data used by Telegdy, 2006 and Lausev, 2012) might be biased due to a measurement error in public sector status. In her study on Russia, Brainerd (2002) suggested that the measurement error was more likely during economic transition due to a speed of mass privatization and workers' confusion over the employers' ownership status.

4.2 *Review of the Results from Empirical Literature on EE Transitioning Economies*

Acknowledging the issues in public–private sector pay gap comparison across transitioning economies, the rest of the section will present the main findings of empirical studies from the EE countries. The only macro study from the entire transitioning period (Christou *et al*., 2007) showed evidence that private sector wages led wages in the government sector according to Romanian data from 1993 until 2006. On the other hand, an increase in government wages affected an increase in private sector wages in later stages of economic transition (i.e. from 1998). This suggested a rise in competition for educated and skilled staff between the two sectors.

Generally, micro studies from transitioning economies, that use single equation OLS approach, found on average a 20% penalty for public sector workers at the beginning of economic transition. In most countries, this penalty declined to approximately 10% in the mid-transition and approached 0% by the final phase of economic transition.

Studies that estimated earnings' equations for the public and the private sector samples separately, found that human capital and demographic variables had a higher impact on wage determination in the private than in the public sector (Newell and Socha, 2007 for Poland; Brainerd, 2002 for Russia; Lausev, 2012 for Hungary). Consequently, studies applying a 'single equation' quantile regression approach found that the sector gap differs across pay distributions. In particular, the disparity between higher private and lower public sector wages increases with higher percentiles of the pay distribution. This suggests a greater pay compression in the public than in the private sector. For example, at the beginning of economic transition in Russia in 1993, Brainerd (2002) reported a 16% public sector penalty at the lower part of the earning distribution and a 47% penalty at the top end.

Moreover, studies that considered the whole transition period revealed greater wage increases for public sector workers at the top then at the bottom of the wage distribution relative to their private sector counterparts. In this context, Leping (2006) provided evidence of increasing public sector pay dispersion over the period of economic transition in Estonia. Particularly, this study estimated a 23% public penalty at the 10th percentile and a 76.8% at the 90th percentile in 1989. Ten years later, in 1998, workers at the 10th percentile were found to enjoy a 13% public premium, whereas for those at the 90th percentile the penalty declined to a 9.4%.

The 'double equation' quantile regression approach reveals the source of the sectoral differences in wages. For example, Gorodnichenko and Sabirianova Peter (2007) found that the magnitude and the distributional shape of the wage gap are mainly determined by the differences in returns to worker characteristics (i.e. prices) rather than by sectoral differences in observable characteristics. Indeed, using Ukrainian data from 1997 until 2003, they showed that the wage gap would be around zero if characteristics of the public sector workers were rewarded as in the private sector.

Another strand of empirical literature attempted to correct for sector selection bias by applying instrumental variable procedures. For example, Adamchik and Bedi (2000) argued that economic transition allowed younger individuals greater access to the private sector and lower entry costs. Hence, their switching regression model included dummy for individuals entering the post-1989 labour market as sector identification variable. They reported that in 1996 Poland, public sector wages were 7% and 10% lower than in the private sector for men and women, respectively. In addition, a public sector pay penalty for workers with a university education and with a 5-year work experience was estimated to be 22% for males and 21% for females.

Furthermore, using Serbian data for the year of 2000, Jovanović and Lokshin (2003) argued that the number of jobholders in the household might have accounted for the importance of a secure job and associated benefits. This study reported an average public sector penalty of 9.4% for men and 4% for women after correcting for sector sorting.

On the other hand, Jovanović and Lokshin (2004), using data for Moscow in 1997, utilized a worker's industry of employment in 1991 (that is before the start of the economic reform in 1992) as identification of the sector choice. Their estimates showed that the public sector paid 14.3% less for men and 18.3% less for women than the private sector. These results appear to be close but lower than baseline OLS estimates (i.e. a 21% penalty was estimated by Brainerd, 2003 for the same year). The larger wage gap between the public and private sector for women is argued to indicate the greater importance of sector-specific non-wage benefits for women's choice of sector.

In general, the results imposing exogeneity indicated that workers in the public sector may have a lower unobserved earning potential than workers in the private sector because penalties appeared to be lower than OLS estimates. Finally, Gorodnichenko and Sabirianova Peter (2007) exploited the panel nature of the Ukrainian micro-data by applying fixed effects (FE) methods. This study found that a 20.5% estimated public sector penalty for male workers is hardly influenced by fixed effects, whereas for female workers a 30.9% public sector pay penalty, estimated by OLS, declined to a 20% when using the FE method. Hence, they concluded that endogenous sorting into the public sector might be more important for female than for male workers.

5. Empirical Evidence from Developed Economies

Whereas studies in countries transitioning from a communist to a market system commonly estimated negative public sector pay differential, in developed countries that is not the case. Moreover, previous section showed that the public sector penalty disappeared and wage dispersion increased in most countries when economic transition reached maturity. The purpose of this section is to emphasize an initial difference between transitioning and developed countries, in the sign of the differential, from negative to positive, thus pointing to their later convergence. This is done by reviewing empirical studies conducted over the last two decades in developed economies. The main findings of studies are summarized in Table A1 in the Appendix and discussed in following sub-sections according to the empirical approach applied.

5.1 *Public Sector Pay Gap from Time Series Data*

Using macro level data Elliott and Duffus (1996) revealed that the relative pay of public sector non-manual workers in the UK declined in the period after 1980 until1992. On the other side, they found that manual workers fared better in the public than in the private sector. Similarly, Katz and Krueger (1991) found that a sharp rise in skill differentials in the 1980s in the United States was mainly a private sector phenomenon. This study documented that education differentials and wage inequality barely increased in the government sector. Moreover, Lamo *et al*. (2012) showed that privatization of government services and public enterprises, primarily in low-skilled occupations, in 1980s and 1990s caused an increase in an overall public to private pay ratio in most of the 18 OECD countries considered in this study.[8] To examine how premiums differ across characteristics, we continue with the review of studies that used microeconometric methods.

5.2 *Public Sector Pay Gap at the Mean*

Starting from a 'single equation' OLS model, the UK researchers estimated that in the early 1980s there was around 10% of the public sector wage premium. This premium has changed over time. For example, after controlling for age and education, Disney and Gosling (1998) found that the public sector male premium declined from 5% in 1983, to 1% in the early 1990s. At the same time, the public sector female premium increased from 11 to 14%. In Germany, over the period from 1984 until 1993, only female workers collected a public premium of around 11%, whereas male workers obtained a 6.5% penalty (conditional on age, education and marital status as estimated by Dustmann and Van Soest, 1997). Dustmann and Van Soest (1997) argued that this indicates that the public sector wage determination in Germany was linked more to market forces. Hence, substantial reforms in pay mechanisms and privatizations undertaken in the UK were not required in Germany.

On the other hand, in Australia, Birch (2006) pointed that the premium appeared to be around 10% in early 1980s for male workers and has not changed by the end of 1990s. Similar estimates were obtained by Jacobsen (1992) for federal government male workers in the United States in 1980.

However, including the standardized residuals of test scores to control for potential omitted ability, in the 'single equation' OLS model Lee (2004) showed that simple OLS estimates for US federal government workers were biased upward for men and downward for women. In addition, Cai and Liu (2011), also using the 'single equation' approach, showed that after correcting for worker's choice whether to participate on the labour market, public sector male workers obtained a 3.2% penalty and female workers a 3.9% premium during the 2001–2006 period in Australia. Same study estimated that these results changed to a 4.9% penalty for men and to a 2.6% premium for women using 'double equation' approach. The main reason for differences in results obtained from 'single' and 'double' equation approaches was attributed to

superior human capital endownments in the public sector (similar is demonstrated by Moore and Raisian, 1991 for the United States). The next sub-section presents estimates across the pay distribution.

5.3 *Public Sector Pay Gap across the Pay Distribution*

As soon as we consider quantiles, the pay gap declines, from lower to upper quantiles, with both the 'single' and 'double' equation methods. Hence, a common finding across countries is that the public sector pay is more compressed than the private sector pay.

Starting from the 'single equation' approach, Disney and Gosling (1998) investigated the role of privatization and compulsory competitive tendering in the United Kingdom, based on the British Household Panel data. They found that the wage distribution conditioned on age and education increased from 1983 until the early 1990s in both the public and the private sectors, but more in the private sector. They also estimated that the public sector pay compression was the largest for university graduates.

Considering the same period (specifically 1982–1994) but using Portuguese data, Machado and Mata (2001) showed that the wage inequality of state-owned enterprises increased during the period of structural reforms and privatizations in Portugal. In Sweden, considered the primary example of prevailing public sector pay determination, Albrecht *et al*. (2003) showed that in 1998 public sector workers fared the same if they were males and better if they were females than their private sector counterparts at the bottom percentile. However, those at higher percentiles fared worse.

Other studies used various decomposition methods.[9] A common finding across these 'double equation' models was that differences in returns to characteristics could explain a substantial portion of the wage gap at the lower part of the wage distribution, while differences in observed individual and job characteristics were greater at the upper part of the wage distribution.

For example, Lucifora and Meurs (2006) obtained cross-country estimates on public–private sector pay differentials for France, Italy and the United Kingdom in 1998. The same technique was applied on 1990 Canadian data by Mueller (1998) and on 2001 German data by Melly (2005). Conclusions from these studies could be summarized as follows, the public sector workers were found to collect the largest premiums at the lower-end of the earnings distribution. The relationship between earnings and public sector status was negative for workers earning very high wages. This pattern held for both men and women in Canada and Germany but with female workers obtaining a greater premium or lower penalty than men. For female workers in the United Kingdom, France and Italy the earnings advantage occured across the whole pay distribution but declined to a zero as one moved towards the top-end.

Nevertheless, simply comparing wages between public and private sectors from cross-sectional data may produce biased estimates, largely because of a non-random sector selection. Hence, the next sub-section summarizes the results from studies that correct for sector sorting.

5.4 *Public Sector Pay Gap in the Presence of a Non-random Sector Sorting*

Given that workers could select whether to work for a public or a private sector, there is a potential for sector sorting bias in both 'single' and 'double' equation methods estimated by the OLS. For this reason, a group of studies useed different forms of instrumental variable procedures (for example a two stage least squares (2SLS), Heckman, 1979; Lee, 1978 correction for selectivity, endogenous switching regression models). Results of these studies suggested less agreement about the size of the public–private pay differential. This may be largely due to different identification assumptions and instruments used in the analysis.

For example, Van Ophem (1993) used the level of workers' education and age as an identification strategy. This study found that the estimated 11.4% public sector premium in 1986 in Netherlands translated into a penalty after controlling for sector sorting. On the other hand, also for Netherlands but

for the year 1983, Hartog and Oosterbeek (1993) used worker background characteristics, such as the number of siblings, parental occupation and education variables. As opposed to Van Ophem (1993) they did not find considerable differences between the mean estimates before and after controlling for sector sorting.

In this context, Dustmann and Van Soest (1998) using German data in 1984 showed that correcting for non-random sector sorting, not based on instruments reflecting parental background characteristics, led to significantly different conditional sector pay differentials. Using a number of family background variables, the sector selection models employed in this study suggested that workers self-selected sectors where they had the greatest comparative advantage.

Many other studies explored various instruments to correct for a worker sector sorting. For the United Kingdom, Bender (2003) was able to estimate the public sector premium in 1986 by using workers' attitudes towards unionization and the fathers' occupation as instruments for sector sorting. Bender (2003) found that the premium was greater after correcting for sector sorting bias. A similar instrument for sector sorting (i.e. union perception) was used by Heitmueller (2006) when estimating the public sector pay gap in Scotland in 2000. In addition, estimates in Heitmueller (2006) were corrected for workers'participation choice. Heitmueller (2006) found that the selection effect was driven by the sector choice rather than the participation choice. The gap for male workers was found to be due to differences in productive characteristics and sector sorting. In particular, the gap, due to differences in returns, was zero after accounting for differences in characteristics but turned into private sector premium after accounting for selectivity which was opposite to results obtained for the whole United Kingdom in 1986 by Bender (2003).

Finally, in Spain, DiPaolo (2011) estimated that private sector workers who were more likely to be selected in the public sector performed in 2006 worse in terms of monthly earnings than a random private sector worker.

Another strand of studies avoided identification issues by tracking the same individuals over a given period of time. For example, Disney and Gosling (2003) applied 'fixed effects' methods on British Household Panel data for the period during 1990s. They found that the 5% public premium estimated by OLS for male workers became zero using the fixed effect method (for women the premium declined from 17% to 9%). In addition, a negative differential for male university graduates, previously found in the cross sections (namely in Disney and Gosling, 1998), appeared to have arisen from sector sorting. Using the same method but for the United States, from 1987 until 1993, Lee (2004) also suggested that the OLS estimate is substantially biased (upward for men and downward but insignificant for women).

A recent group of studies imposed exogeneity in quantile regression models to examine whether the public sector pay compression was due to unobserved characteristics. Again different identification strategies were applied in the presence of non-random sector sorting across the pay distribution.

For example, Melly (2006) applied a quantile regression instrumental variable method by using variables related to the parents' occupational status. These were based on German Socio-Economic Panel data for 2003. Melly (2006) found that at the median a 11.5% public sector penalty translated into a 3.3% premium after correcting for endogeneity but that the public sector pay compression remained or was even accentuated. Hence, Melly (2006) concluded that in Germany different distributions of wages were not caused by different distributions of unobserved ability.

Using the same method, Depalo and Giordano (2011) confirmed that public premium for male workers in Italy in 2004 had a decreasing pattern across earnings distribution. The premium was found to be substantially higher when possible sector sorting was considered. In contrast, Bargain and Melly (2008) found that in France the public sector wage compression was mainly due to unobserved characteristics. In particular, this study used the same data as in Lucifora and Meurs (2004) for France but found that the long term sectoral differences were essentially zero for both male and female employees after applying fixed effects panel data estimations on quantile regressions over the period from 1990 until 2002.

6. Conclusion

This paper has surveyed both theoretical and empirical studies on public–private sector pay differentials in the EE transitioning and developed countries during the last 20 years. In comparisons between estimates, obtained in transitioning and developed countries, the paper offers broad explanation for differences in pay between public and private sector workers. Non-exhaustive answers related to compositional differences, worker selection and incentives, objectives and constraints and market power (either of workers or employers) are the most quoted reasons for public–private sector earnings differentials in developed economies. In economies transitioning from a communist to a market system, a competition for workers seems to be a major argument. Other reasons could take into account the risk premiums for the first movers to emerging sectors, efficiency wages for harder effort in new jobs, compensating differentials for fewer non-wage benefits and reduced job security.

The issues raised in explanation of empirical methods showed that public–private sector pay differentials are not easy to estimate. In particular, common problems facing researchers in this area include data limitations, measurement error, sampling bias, selection issues and omitted variables.

Although the magnitude of the public sector pay effects proved sensitive to the empirical method, time period, country and sample selected, the main results suggested by empirical literature could be outlined as following, firstly, public sector workers in the EE countries during economic transition fared on average worse than their private sector counterparts in contrast to developed economies. This penalty appeared to dissipate with progress of transition. Secondly, there were gender differences in the differential between developed and the EE economies. In particular, while in developed economies female workers obtained a greater average premium than men, in the majority of the EE countries there were no large gender differences in the differential. Thirdly, public sector pay compression was a common feature to both developed and the EE economies. Moreover, the public sector pay compression increased with higher educational qualification in both developed and the EE economies. Finally, the public sector pay inequality reducing effect relative to the private sector was greater in the EE than in developed economies. However, studies of the EE economies provided some evidence that the relative public sector pay distribution changed over time towards the one usually observed in developed economies. In this context, the paper emphasizes the convergence of the EE post-communist countries towards those developed economies. This could be observed not only through withdrawal of public sector pay penalties but also through changes in the relative pay distribution as a result of restructuring during the process of economic transition.

Acknowledgements

I am deeply grateful to Richard Disney for valuable comments. Thanks go to the University of Nottingham and to the Governments of the United Kingdom and the Republic of Serbia for funding my PhD studies at the Nottingham School of Economics. Helpful suggestions were received from David Blackaby, Richard Upward and two *anonymous reviewers*.

Notes

1. Substantial public sector pay premium in developing countries is confirmed empirically by a number of studies (see for example Glinskaya and Lokshin, 2007 for India; Christofides and Pashardes, 2002 for Cyprus; Nielsen and Rosholm, 2001 for Zambia; Terrel, 1993 for Haiti; Stelcner *et al.*, 1989 for Peru; Van der Gaag and Vijverberg, 1988 for Ivory Coast; Lindauer and Sabot, 1983 for Tanzania).
2. In this paper we use the term ‘transitioning economies’ in a narrow context covering the former communist states in Europe. According to the World Bank the economic transition has been finished in countries that joined the European Union, i.e. in 2004 for the first-wave accession countries: Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, and Slovenia and

in 2007 for the second-wave accession countries: Romania and Bulgaria. Other former communist states in Europe are still considered to be in the process of economic transition: Albania, Belarus, Ex-Yugoslav Republics (excluding Slovenia), Moldova, Russian Federation and Ukraine. The wider context of this term may refer to countries outside of Europe, emerging from a socialist-type command economy towards a market-based economy, post-colonial countries, heavily regulated countries or post-dictatorship countries and are not considered in this paper.

3. For example, Newell and Socha (2007) claimed that sharp increases in hourly wage inequality in Poland after 1998 were similar in magnitude to the much-studied increase in British wage inequality during the 1980s (for example Machin, 1996 and Gosling *et al.,* 2000).
4. A number of recent empirical applications are strongly suggestive of monopsonistic or oligopsonistic wage-setting behaviour by employers, especially in the public sector (see for example Falch, 2010; Ransom and Sims, 2010 and Staiger *et al.*, 2010).
5. Boeri and Terrell (2002) explained that unions were largely unprepared to enter tough negotiations over wages and staff cuts at the outset of transition and incapable of reform. Consequently, union membership and coverage declined during economic. Particularly, from 1989 until 1996, the share of workers covered by collective wage agreements declined from about 90% to only 30% in the Czech Republic and Hungary whereas in Lithuania the share of union membership in the labour force declined from about 85% to 13% (Boeri and Terrell, 2002). Moreover, Socha and Weisberg (2002) pointed that in Poland unions did not exploit their power to push wages up because they were committed to economic reforms and joined forces in policy-making decisions at the national level.
6. Indeed, the evidence that the private sector hired almost exclusively from the public sector rather than drawing from the pool of unemployed (which has been perceived as a sign of lower ability) is broadly documented by the empirical literature on transitioning economies (Boeri, 1998; Večerník, 1993).
7. For example, Telegdy (2006) explained that the low level of public sector wages in Hungary had not been only a problem for fairness but also for potential negative effects on the quality of public sector employment due to migration of highly qualified workers abroad.
8. A number of macro studies examined the public–private sector wages causality and co-movements without measuring differences in wages between the two sectors. For example, Jacobson and Ohlsson (1994) and Lindquist and Vilhelmsson (2006) found private sector wage leadership in Sweden whereas Friberg (2007) did not. For 18 OECD countries Lamo *et al.* (2012) showed that the private sector seemed to affect more public sector then vice versa although there was some evidence of public sector feedback effect on the private sector and Lamo *et al.* (2013) found strong positive correlation between public and private sector wages over the business cycle.
9. For example Blackaby *et al*., 1999 apply decomposition method outlined in Juhn *et al*., 1993 while Mueller, 1998; Lucifora and Meurs, 2006 and Melly, 2005 apply decomposition method outlined in Machado and Mata, 2005.

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Appendix

Table A1. Summary of the Selected Empirical Literature on Public–Private Sector Pay Gap in Developed Economies over the Last Two Decades.

Study	Data source	Years covered	Methodology	Results
OECD countries				
Lamo, Perez, Schuknecht (2012)	OECD Economic Outlook	1970–2006	Vector error correction	Decline in relative public to private sector wages in 1970s, moderate increase in 1980s and 1990s and strong increase in euro area from 2000s.
United Kingdom				
Rees and Shah (1995)	General Household Survey	1983, 1985, 1987	Double equation: decomposition at the mean	Unadjusted hourly pay gap: 10%, 9.8%, 11.4% for men and 26.3%, 22.3%, 25.9% for women in each year respectively. Men differ more in characteristics (endowments) and women in returns (coefficients). Adjusted gap for all workers: 11%, 13%, 12%; for men: −1.8%, −33%, −3.2%; for women: 38%, 28%, 31% in each year respectively.
Elliott and Duffus (1996)	New Earnings Surveys	1970–1992	Time series technique	Public hourly premium declined by 5–20% over the period for nonmanual and manual occupations but increased by 15% in education occupations.
Blackaby, Murphy, O'Leary (1999)	Quarterly Labour Force Survey	Autumn 1993 – Summer 1995	Double equation: decile decomposition	Hourly pay gap: 1.5% (3.3%) at the 10th percentile and −1.9% (0.1%) at the 90th percentile for men (women).
Disney and Gosling (1998)	General Household Survey (GSH) and British Household Panel Survey (BHPS)	1983 GSH and 1991–1995 BHPS	Single equation: quantile regression	Public weekly pay premiums/penalties differ across educational levels. Pay compression effect largest for graduates: men in 1983 25% at 10th and 0% at 90th percentile; in 1991–95 at 25th percentile and above significant public sector penalty; women in 1983 0% across distribution; in 1991–95 premiums at the lower end and penalty at the top end of earnings distribution.

Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
		1991–1995 BHPS	OLS	0% (13.7%); 9.1% (21.2%); 8.9% (26.4%); −9.4% (6.6%) for men (women) with no qualification; O level or below; at least one A level; degree or above.
		1991–1995 BHPS	Fixed effects	6% (17.7%); 4.6% (7.8%); −6.4% (17.3%); 13.2% (16.6%) for men (women) with no qualification; O level or below; at least one A level; degree or above.
Bender (2003)	Social Change and Economic Life Initiative	1986	Double equation:	Average hourly pay differential: 8.6% (23.6%) for men (women).
			MSE decomposition	Without adjustment: 4.9% (11.5%) at 10th; −0.3% (5.6%) at 50th and 8.9% (17.1%) at 90th percentile for men (women). Adjustment for differences in mean differences: 3.2% (0.1%) at 10th ; −2% (−5.8%) at 50th and 7.2% (5.7%) at 90th percentile for men (women).
			Selection technique: decomposition at the mean and deciles controlling for sector sorting	Instruments: worker attitudes towards unionization and whether father worked in the public sector when the respondent was age 14. Average hourly pay differential: 14.5% (41.2%) for men (women). Without adjustment: 13.4% (34.1%) at 10th; 7.3% (28.9%) at the 50th and 18.5% (32.8%) at 90th percentile for men (women). Adjustment for differences in mean differences: 2.2% (1.9%) at 10th; −4% (−3.3%) at 50th and 7.2% (0.6%) at 90th percentile for men (women).
Disney and Gosling (2003)	British Household Panel Survey	1991–1999	Single equation: OLS	Hourly pay differential: All workers: 5% men; 17.2% women. Graduates: −7% men; 2% women. No education: 0% men, 14.3% women.

Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
	New Earnings Survey		Fixed effects	All workers: 0% men; 9.2% women. Graduates: 16% men; 20% women. No education: 0% men, 10.7% women.
			Selection technique: Instrumental variable procedure	Instrument for measurement error: proportion of each occupation in the public sector. Instrument for endogenity of job moves: occupation in t-1 period. Measurement error and endogenous change biases are of the opposite direction. For men measurement error and endogeneity cancel out so first differences showed no statistically significant public sector effect. For women the measurement error is less crucial and therefore there is a premium.
Heitmueller (2006)	British Household Panel Survey for Scotland	2000	Selection technique: Endogenous switching regression model corrected for double sample selection: participation and sector choice and decomposition at the mean	Raw gross hourly pay gap: 10% for men and 24% for women. Selection effect driven by the sector choice rather than the participation choice. Men: the gap due to differences in productive characteristics and selectivity. After accounting for differences in characteristics returns to differences in return are zero but the gap turns into private sector premium after accounting for selectivity. Women: results sensitive against the weighting scheme. Instrument for participation: number of children Instrument for sector sorting: union perception

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Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
Postel-Vinay and Turon (2007)	British Household Panel Survey	1996–2003	A model of income and employment dynamics	The average public monthly total income premium in terms of present discounted sum of future incomes would be positive (although small) if individuals remain all their working life in either sector. The public premium in lifetime values is zero for highly employable individuals when job mobility is taken into account. Greater variance of private sector incomes due to the transitory component of income.
United States				
Moulton (1990)	Current Population Survey	1988 September to December	Double equation technique	Public hourly premium declines when detailed occupation variables are included: blue collar 8.6%, clerical 4.1%, administration 0%.
Katz and Krueger (1991)	Current Population Survey	May 1973, 1975 and full year 1979, 1983, 1988 (outgoing rotation groups)	Double equation technique by examining different subsamples (by sector, education, experience and gender)	Public hourly wages more compressed. Public premium highest for women and less educated.
Moore and Raisian (1991)	Panel Study of Income Dynamics (PSID) and Current Population Survey (CPS)	PSID: 1970–79; CPS May: 1979 and 1983	Single equation: OLS Fixed efects Double equation: decomposition at the mean	Government hourly wage differential: PSID: 0%, CPS: 3.7%. PSID: 2.14%. PSID: 3.99%, CPS: 2.63%.
Jacobsen (1992)	1% Census Sample	1980	Single equation: OLS	Federal government hourly premium for men: 9% (white), 12% (non white) and women 16% (white), 18% (non white).

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Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
Choudhury (1994)	Current Population Survey	March 1991	Selection technique: Heckman corrected wage equation for participation and sector choice	Public hourly premium: 19% men and 26% women. Sector selection important for public and employment selection for private sector.
Belman and Heywood (2004)	Current Population Survey	May 1993	Alternative measures of comparability	Absolute differential in wages: 13.2% (federal); 15.5% (state and local) The percentage of the workforce observed in 5% band: 25.4 (federal); 19.2 (state); 22.3 (local) Mean squared deviation (MSD) shows that the average differential (i.e. 8.6% federal, 0% state and -10.4% local) contributes only a small share of the deviation from comparability. Federal sector is closest to comparability while state sector which had an average white collar differential of essentially zero has MSD that exeeds that in the federal sector.
Lee (2004)	National Longitudinal Survey of Youth Cohort data with Geocode supplement	1987–1993	Single equation: OLS	Federal vs. private: 16.53% men and 6% women. State vs. private: −9% men and −4% women. Local vs. private: 0% men and −4% women.
			OLS and test score approach	OLS including the standardized residuals of Armed Services Vocational Aptitude Battery (ASVAB) test scores to control for potential omitted ability. Federal: upward bias in OLS for men and downward bias in OLS for women State: downward bias in OLS for men and downward bias in OLS for women Local: downward bias in OLS for men and upward bias in OLS for women
			Fixed effects	FE: Federal vs. private: 5.6% men and 6.7% women
			Selection technique:	Federal vs. private selectivity corrected wage differential: 1% men and 22% women

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Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
			Instrumental variable procedure	Instruments: test scores and the percentage of federal workers and private workers in the local labor market when the respondents was at the age of 14.
Australia				
Birch (2006)	Australian Bureau of Statistics' Household Sample File	2001	Single equation: OLS Quantile regression	Hourly pay gap for men:9.3% 20.9% at 10th, 8.5% at 50th and −5.4% at 90th percentile.
Cai and Liu (2011)	Household, Income and Labour Dynamics in Australia	2001–2006	Selection technique: quantile regression corrected for participation choice	Gap in pre-tax hourly wages: Men: −3.2% (mean); 5.3%, 0%, −13.2% at 10th, 50th and 90th percentiles respectively. Women: 3.9% (mean); 3.3%, 5.5%, 0% at 10th, 50th and 90th percentiles respectively. Instruments for participation: presence and total number of young children; aged 55 or over
			Double equation: decomposition at the mean and deciles	Gap due to differences in returns: Men: −4.9% (mean); 8.5%, 0%, −29.2% at 10th, 50th and 90th percentiles respectively. Women: 2.6% (mean); 4.55%, 6.6%, −4.8% at 10th, 50th and 90th percentiles respectively. Observed differences in individuals and job characteristics explain a substantial proportion of the sectoral gap

Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
Canada				
Mueller (1998)	Labour Market Activity Survey	1990	Single equation: quantile regression	Hourly pay gap: 2.1% (11.8%) −3.4% (2.4%) for men (women) at 10th and 90th percentiles respectively.
			Double equation: decile decomposition	Differences due to returns to characteristics: 9.8% (22.1%) −5% (−7%) for men (women) at 10th and 90th percentiles respectively.
Tiagi (2010)	Labour Force Survey	2008	Selection technique: endogenous switching regression	Men: 5.4%. Women: 20%. Public sector workers positively selected on observables. Instruments: family size and spouses' sector of employment.
New Zealand				
Gibson (2007)	International Social Survey Program Work Orientation	2005	Propensity score matching	Public sector annual pre-tax income gap: 17–21%.
France, Italy, United Kingdom				
Lucifora and Meurs (2006)	British Labour Force Survey, Bank of Italy's Survey of Household Income and Wealth and French Labour Force Survey.	1998	Single equation: Quantile regression	Public hourly pay premium for low skilled and penalty for high skilled. Differentials higher for female workers. All workers: France: 9.5%, 6.4%, 0% at 10th, 50th, 90th percentile. Italy: 11.4%, 6.1%, 0% at 10th, 50th, 90th percentile. United Kingdom: 13.7%, 7.3%, 0% at 10th, 50th, 90th percentile.

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Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
			Double equation: Decile decomposition	Differences in returns: Men: France: 8.6%, 2.4%, −5.5% at 10th, 50th, 90th percentile. Italy: 8.1%, 2.1%, −1.9% at 10th, 50th, 90th percentile. United Kingdom: 5.8%, 3.4%, −3.3% at 10th, 50th, 90th percentile. Women France: 10.7%, 8.4%, 3.4% at 10th, 50th, 90th percentile. Italy: 8%, 5.2%, 1.3% at 10th, 50th, 90th percentile. United Kingdom: 16.3%, 8.3%, 0% at 10th, 50th, 90th percentile.
France				
Bargain and Melly (2008)	French Labour Force Survey	1990–2002	Single equation: quantile regression	Pooled estimates for male (female) hourly pay gap: at median: −7.2% (9.4%); 90th -10th : −18.2% (−14.6%); 75th-25th: −9% (−8.6%)
			Fixed effects quantile regressions	at median: −0.2% (0.2%); 90th -10th : −3.4% (−2.5%); 75th-25th: −1.1% (−0.5%).
Germany				
Dustmann and Van Soest (1997)	German Socio-Economic Panel	1984–1993	Single equation: OLS	Pooled hourly pay gap: −6.5% men and 10.6% women. For men public penalty increases and for women public premium declines with higher level of education.
Dustmann and Van Soest (1998)	German Socio-Economic Panel	1984	Selection technique: endogenous switching regression	In the public sector, blue collar workers earn about 7% lower hourly pay than white collar workers. In the private sector, this difference amounts to 16%.

Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
				On average, the public sector workers have a comparative advantage in the public sector. Instruments taken from 1986 data set: the labour market status and occupation of the father when the child was aged 15, whether the mother participated in the labour market or not, the age of father and mother when the individual was born, and the education level of father and mother.
Melly (2005)	German Socio-Economic Panel	1984–2001	Double equation: decile decomposition	Most experienced and those with basic schooling gain the most from public sector status. Hourly pay gap stable over almost two decades. In 2001: Men: 5% at 10th and −17.4% at 90th percentile Women: 29.6% at 10th and −6.9% at 90th percentile
			Decomposition at the mean	Low education: −2.9%; Medium education: −5.4%; Higher education: −10.1%; University: −13.1%.
Melly (2006)	German Socio-Economic Panel	2003	Single equation: quantile regression	Public sector compresses the hourly pay for men (premium at the low end and penalty at the upper tail). At the median: −11.5%.
			Selection technique: IV in quantile regressions	Instruments: five variables related on parents' occupational status (whether a father is a civil servant, blue or white collor worker or self employed and a mother did not work when the respondent was 16 years old). At the median: 3.3% The public sector pay compression remains or is even accentuated.
Greece				
Papapetrou (2006)	European Community Household Panel Survey	1999	Double equation: decile decomposition	Public–private gap in annual wages at 10th; 50th; 90th percentile men/women (percentage of wage gap in parentheses men/women) due to: Endownment differences: 0.3/0.6 (59/65); 0.24/0.3 (63/65); 0.2/0.3 (100/75);

Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
				Public sector advantage: 0.16/0.3 (29/31); 0.08/0.08 (21/16); 0.007/0.03 (3/7); Private sector disadvantage: 0.06/0.04 (11/4); 0.06/0.1 (15/19); −0.008/0.06 (−4/18).
Italy				
Depalo and Giordano (2011)	Survey on Household Income and Wealth	1998–2008	Single equation: OLS Quantile regression	Public hourly pay premium for each year: Men: 10% at lower end, 6% at median, 0% at the higher end. 13–16% for women and 7–0% or less for men Women: 15% at lower end, 10% at median, 7.6–15% at the higher end.
		2004	Selection technique: 2SLS	Men: 50%. Men: 54% at 20th, 37% at 70th, 30% at 90th percentile.
			IV in quantile regressions	Instruments: the presence of sons, home ownership, the amount of money the individual claims for risk compensation, pro-social activity and parents' sector of occupation.
Netherlands				
Hartog and Oosterbeek (1993)	Unnamed microdata	1983	Selection technique: endogenous switching regression	Public hourly pay premium for lower and higher educational qualification: OLS (15% and 14%) and corrected for sector sorting (17% and 13%). Instruments: number of siblings/100, father's occupation, father's and mother's education. Workers select the better paying sector for them.

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Table A1. *Continued.*

Study	Data source	Years covered	Methodology	Results
Van Ophem (1993)	Dutch OSA Labour Market Survey	1986	Selection technique: endogenous switching regression	Public hourly pay premium: 11.4% (OLS) but penalty after controlling for sector sorting (−38% for high skilled). Sector choice equation includes: 6 education levels, age and age squared, gender and country of birth.
Portugal				
Machado and Mata (2001)	*Quadros de Pessoal* by the Portuguese Ministry of Employment	1982 and 1994	Single equation: quantile regression	Greater hourly pay compression in state owned firms. All workers: 1984: 17.6% at 10th and −6.8% at 90th percentile. 1994: 11.8% at 10th and −1.6% at 90th percentile.
Spain				
DiPaolo (2011)	Survey of Living Conditions and Habits of the Catalan Population	2006	Selection technique: Double simultaneous selection correction for sector sorting and Catalan language proficiency	The private sector workers who are more likely to be selected in the public sector perform worse in terms of monthly earnings than a random private sector worker. Instruments for sector sorting: father's occupation, whether the individual's spouse or partner is an employer, income from other sources (non-labour income), number of children.
Sweden				
Albrecht, Björklund, Vroman (2003)	Statistics Sweden LINDA data set for research purposes	1998	Single equation: OLS Quantile regression	Central government vs. private sector monthly pay gap for men (women): −9.5% (−2.9%) men (women); −0.9% (3.7%), −7.9% (−2.1%), −15.5% (−10.1%) at 10th, 50th and 90th percentile respectively.