

Public-private sector wage differentials around the world: Methods and evidence*

by

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1. Introduction

My intention, in this (rather unambitiously titled) paper, is to present a brief overview of work on the rationale and evidence for the existence of pay premia or penalties associated with working in the public sector. Many studies have found evidence of such premia or penalties (and mostly the former, especially for women) using econometric methods that are not dissimilar to those utilised in measurement of the wage differential associated with trade union status. But whereas economic theory gives a simple rationale for the existence of a union wage differential (i.e. market power), it is harder to find a simple story that can explain why workers in the public sector should earn more (or less) than their counterparts in the private sector.

If the rationale for a public sector ‘pay effect’ is that public sector workers are somehow ‘different’ from workers in the private sector – whether as a result of differences in their own productive characteristics or in the nature of the jobs that they undertake – it should be straightforward to net out these differences through additional control variables. In this case, we are left to look for something intrinsic to working in the public sector that ‘explains’ these observed differences. Consideration of these ‘intrinsic differences’ forms the basis of the next section of the paper. Alternatively, of course, there is the possibility that regression estimates that purport

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to find a public sector pay effect are misleading for a variety of ‘technical’ reasons (data limitations, sampling bias, omitted variables, measurement error, selection issues etc. etc.). I examine some of these issues in the third section.

Before doing, so, however, it is useful to illustrate some of the issues that might arise by examining pay profiles in the public and private sector. Figure 1 utilises the UK’s Labour Force Survey to calculate lifetime discounted age-earnings profiles for public and private sector workers, differentiating by gender and by educational attainment (broadly: ‘CSL’ = leaving school at minimum school leaving age; ‘A’ level’ = leaving school at age 18; ‘degree’ = tertiary education).¹

Cumulating the data for men in Figure 1A, the *total* lifetime remuneration in absolute terms of a man working throughout his life in the public sector relative to the private sector is about 2.5% higher for the lowest educational group, 4% higher for the middle educational group and 5% *lower* for the highest educational group. Of course, these ‘life cycle’ differences in remuneration can be further adjusted to allow for differential coverage by, and generosity of, employer-provided pensions in the two sectors (see Disney, Emmerson and Tetlow, 2007).

Noticeable features of Figure 1A are: little difference in the age-earnings profiles across the public and private sector for men in the lowest educational group, less evidence of declining wages for older public sector workers in the middle educational group relative to the private sector, and a marked greater ‘hump’ (curvature) to private sector workers lifetime pay in the highest educational group – for example at age 40, private sector degree-educated workers are on average earning over 17% more than their public sector counterparts even though the lifetime differential is only 5%. Postel-Vinay and Turon (2007) providing a rationale for believing that cross-section differences in pay may be smoothed out over the life-cycle. Finally, note differences in the smoothness of the age-earnings profile by sector and education group, although this may partly be driven by differences in sample size.

¹ These profiles are constructed by pooling the Labour Force Survey from 1994-2006, netting out the average annual growth of earnings, and running quantile (median) regressions of reported weekly earnings on various polynomials in age interacted with gender and education separately for public and private sector workers. The profiles are not therefore ‘true’ longitudinal profiles, although they can be so regarded if we discount future earnings at the average economy-wide rate of earnings growth. The specifications depicted in Figure 1 utilise a measure of the weekly wage averaged at each age point over a 5 year age ‘window’ to induce some smoothing of the profile. For further details, see Disney, Emmerson and Tetlow (2007).

Figure 1B illustrates the profiles for women. These are very different from those of men. It is important to note that the data are weekly not hourly earnings. So the profiles are in part driven by changes in hours of work over the life cycle as well as variation in hours and pay across sectors. Overall, women in the public sector throughout their working life have cumulatively higher total earnings than in the private sector: respectively 12% for the lowest educational group, 19% for the middle and 35% for degree level – this likely arises from a combination of both differences in hours *and* pay. Whilst there seems to be a positive differential at most ages to the public sector, the impact is strongest among workers after age 40 and especially among the most educated workers. One simple reason for this difference is that women disproportionately continue in career jobs in the public sector (such as public administration, education and health) whereas private sector women with qualifications are more prone to cut their hours during and after the birth of children. In fact, given the public sector pay reforms of the last decade in the UK (including widespread use of job evaluation and attempts to limit direct and indirect discrimination in the public sector) the underlying curvatures of age-earnings profiles facing women who remain in full-time work through most or all of their working life are more likely to be described by the profiles for men in Figure 1A.

In reality, of course, actual individual pay trajectories over the lifetime do not follow these smoothed paths and vary across workers as a result of differential career paths such as promotion, year-on-year ‘shocks’ (the business cycle in the private sector, and public sector pay policies and budget constraints) and individual tastes and unobserved abilities. It proves very hard to net many of these factors out in studies that rely on cross-sections of workers. Moreover, people switch between the public and private sectors and this mobility may indeed be a further means of identifying a public sector pay ‘effect’ (under some rather stringent assumptions, discussed later). Before considering these issues, however, it is useful to think briefly as to *why* pay should differ between the sectors in any systematic matter.

2. What is ‘special’ about working in the public sector?

Standard neo-classical models predict that pay differences in competitive markets across individuals arise from differences in measured and unmeasured ability – the former typically measured by experience and qualifications whilst the latter can

be netted out by appropriate techniques. Driving a wedge between pay and productivity may be various factors such as market power (whether of workers, or producers/employers) and more systematic social inequalities such as discrimination. In the short run, the relative scarcities or surplus of particular skills may drive occupational differentials, although with competitive access to training, long-run occupational differences in pay should be driven by non-pecuniary advantages rather than relative supply, with relative demand affecting the employment mix. All this is standard textbook labour economics. Why should public sector workers be systematically differently rewarded in such a world? I consider some explanations.

2.1. Occupational composition of the public sector

One possibility is that the workers in the public sector do systematically different jobs from those in the private sector, and this is why rates of pay differ. Some jobs are often seen as intrinsically ‘public sector jobs’: public administration, nursing, teaching or security (police, armed forces, intelligence services etc.). Yet there is nothing intrinsically ‘public sector’ about many of these jobs – a simple comparison of the occupational composition of the public sector in the UK compared to, say, 25 years ago, will illustrate this point. The public sector in the 1980s contained significant numbers of manual workers – both in local and central government – and employees of public utilities and other nationalised industries. Almost all these jobs have since been privatised, contracted-out or subject to competitive tendering – indeed this transformation forms an interesting ‘natural experiment’ in studying wage determination which is, unfortunately, not ‘clean’ enough to yield precise estimates of the public-private sector pay differential.² At the same time, the share of public sector employment in some white collar professions (e.g. managers, auditors) has expanded rapidly in that period. The public sector in Britain has become more non-manual in composition, and increasingly dominated by workers with higher professional qualifications (Disney, Goodmand, Gosling and Trinder, 1999).

Even in specific sectors, the market context of different jobs varies. For example, in the National Health Service, some jobs are located in private sector-dominated occupations (such as managerial positions) whereas some (such as

² On which, see Disney and Gosling (2003) but also, *inter alia*, Card (1986) and Haskel and Szymanski (1993).

specialist nursing and radiography) are public-sector dominated jobs. Other occupations, such as nursing care assistants or physiotherapy, are more evenly divided between the public and private sector. A simple generalisation as to what is a ‘public sector job’, even in a public sector-dominated activity – the provision of primary and hospital-based health care – is not straightforward.

Further back in history, jobs which we might regard as wholly ‘public sector’ have not been exclusively so in the past. Tax collection was often contracted-out to private agents who could retain a share of the revenues that they raised. Armies and militia were often raised as mercenaries or by conscription. The development of a ‘public sector’ seems often to have been brought about by historic events or geographical circumstances. One of the earliest examples of a systematic attempt to develop a large-scale publicly-managed sector in England was the expansion of publicly-managed naval storehouses and dockyards in the first part of the sixteenth century – by the mid-1560s, public dockyards constituted the largest single employer of workers on regular salaries in England (Rodger, 1997). The political and strategic importance of England’s navy was to be apparent soon after (with the arrival of the Spanish Armada); other countries for which a navy was not the primary line of defence had different contractual arrangements for naval forces (whereas in contrast the English army continued to rely on conscription from militias and payment of mercenary troops for a considerable period thereafter).

2.2. Use of incentives

A pertinent distinction between the public and private sectors lies in the differential use of incentive-based pay in the two sectors. This in part arises from the difficulty of measuring ‘output’ or ‘productivity’ in the public sector. Typically public sector outputs are not marketed and have been measured until recently in accounting terms by input values since ‘prices’ cannot be attached to production. Contrast this with the private sector where, in the economics textbook if nowhere else, the term ‘marginal revenue product’ has some meaning.

Even in the absence of plausible means of tying pay to measurable output, there are however other techniques, familiar to personnel economics, for motivating workers to work harder such as deferring pay (through backloading remuneration

across the lifecycle or by employer-provided pensions).³ Deferred pay, whether by minimising shirking and thereby reducing the relative value of an outside option, or through explicit incentive procedures such as promotion, is an alternative strategy for employers to ‘spot market’ equilibrium pay-setting in which pay is broadly linked at each point in the lifetime to productivity and which should generate the standard ‘inverted U’ age-earnings profile. Figure 1A, for graduate men, provided some evidence that deferred pay is a more prevalent strategy in the public sector than the private sector. Differences in pay between the public and private sectors at any given age will therefore reflect different pay-setting strategies as well as differences in underlying worker productivity.

Nevertheless, deferred pay may be a somewhat blunt instrument for raising individual productivity. Recent attempts to ‘incentivise’ public sector pay by making pay progression (not just through promotion) conditional on performance have been a response to this difficulty: see numerous recent papers from the Centre for Market and Public Organisation. However, arguably throughout history such a solution to the problems of public sector management has been sought: for example Allen (2002) has (perhaps somewhat fancifully) argued that the British navy was successful against that of the French in the Napoleonic wars because of the greater use by the former of piece rates (prize money), harsh penalties for shirking (capital punishment) and incentive-based promotions.⁴

2.3. Market power

An intrinsic difference between the public sector and large parts of the private sector is that the public sector is a unitary employer (this despite frequent attempts to ‘decentralise’ public sector management, and the important distinction between federal and centralised governments). Much of public sector pay bargaining – whether ‘face to face’ or conducted by specialised agencies such as ‘Review Bodies’ – is conducted at the national level. This scope for national bargaining in turn generates a ‘countervailing power’ to the public employer insofar as public sector workers are typically more heavily unionised than private sector workers. The existence of unions is typically given as one rationale for a measured public sector

³ Standard references include Lazear (1979, 1981). See also Ippolito (1997).

⁴ Somewhat fancifully, because better quality of cannon, and better rates of fire of cannon, seem to have been the primary factors for British success: see Rodger (2004).

pay premium but of course unionisation is in part a response to the potential monopsonistic power of the public employer and the effect on pay of bilateral market power can go either way.

Much of the evidence adduced for what Manning (2003) terms the ‘static’ theory of monopsony has emanated from United States’ evidence on local school boards, health agencies etc. which have market power in the local labour market relative to the local supply of teachers, nurses etc. (for a survey, see Boal and Ransom, 1997). Unsurprisingly perhaps, economists differ on whether this is strong evidence for monopsony power (for a sceptical view, see Hirsch and Schumacher, 1995). The older literature, written from an industrial relations viewpoint, tends to suggest that certain groups, notably female-dominated public sector professions, are more likely to face adverse effects arising from monopsonistic power, whereas strongly unionised and often male-dominated public sector groups earn a positive differential (see, for example, Fogel and Lewin, 1974 on local bargaining in a large US metropolitan area). This finding in turn raises further questions.

Attempts to ‘incentivise’ pay and to decentralise bargaining to reflect local labour market conditions are seen as a relatively recent response to the problem of market power in public sector pay bargaining. Disney and Gosling (2003) provide tentative evidence that among low paid public sector manual (and traditionally unionised) workers in the UK, any evidence of a positive wage premium has been eliminated by the introduction of compulsory competitive tendering and contracting-out in a range of services such as refuse collection and ancillary service provision from the mid-1980s onwards. On the other hand, moves to decentralise power to employers (for example in the NHS where trusts have been given a degree of autonomous status and, in the case of Foundation Trusts, the freedom to vary considerably pay and employment conditions) there is, so far, little evidence of independent pay-setting or decentralised bargaining. The whole tension between public centralised bargaining leading to better quality management but restrictive practices and labour inefficiency *versus* decentralisation and contracting-out leading to cheaper delivery and lower quality service provision again has its antecedents in history.⁵

⁵ Following our earlier historical theme, the history of British naval dockyards and warship construction, which were alternately centrally managed interspersed with periods of contracting-out,

2.4. Worker selection

A key issue in examining pay determination is worker preferences. In a narrow sense, we might be interested in why a worker chooses to work in a particular job or sector. Background characteristics, notably occupational and sectoral choices of parents, are often used as a method of identifying sectoral choices made by workers (see, in this context, for example, Dustmann and van Soest, 1998) so that pay premia or penalties to working in a particular sector can be conditioned on the (potentially self-selected) characteristics of the workers.

In a broader and more intangible sense, however, it is often argued (not least by public sector unions) that employees in the public sector are motivated by particular notions of ‘public service’ or duty which motivate them in addition to pay considerations. If people are motivated by such considerations, rather than simply by remuneration levels, we might expect an impact on the pay of particular groups (such as nurses, teachers etc) where personal preferences might be paramount. Such an idea has some parallel with what Alan Manning (2003) terms ‘dynamic monopsony’ – the observation that employers retain market power insofar as observed wage dispersion for broadly identical workers illustrates that workers do not necessarily immediately quit when their own wage is inferior to an outside option – presumably either because they like their existing job or have very limited information on outside wages.

Extend this argument to a particular occupation, or sector, and we are closer to what Heyes (2005) terms the ‘economics of vocation’: some workers receive a non-pecuniary benefit from providing a higher quality of service in their job so that their total pecuniary plus non-pecuniary remuneration exceeds the wage and they remain in the job even in the face of a higher outside pecuniary option. Unlike pure incentive ‘stories’ (such as ‘efficiency wages’), higher wages (whether or not coupled with greater monitoring) in such circumstances do not necessarily generate greater average productivity. In Heyes’ analysis, higher wages attract workers who are *not* motivated by vocational considerations, so that average productivity may fall. This is a worker composition effect. In Frey (1993) in contrast, ‘intrinsic motivation’ of individual workers declines where there is increased monitoring coupled with greater emphasis

illustrates the trade-off between high quality and high labour cost on the one hand (publicly managed) and productive efficiency, lower cost and lower quality on the other (when dockyard services and construction were contracted-out): see Baugh (1965) and Morriss (1983).

on pecuniary rewards as this combination ‘crowds out’ the intrinsic motivation of particular workers. This is a change in behaviour of an existing workforce. Either way, the ‘economics of vocation’ or ‘intrinsic motivation’ suggest that attempts to ‘incentivise’ public sector pay may turn out to have perverse results and the public sector might produce better results in terms of productivity with lower pay levels but less emphasis on ‘performance targets’ etc.⁶

2.5. *Formal versus informal sector; transition economies*

Most of these arguments are specific to an analysis of pay determination in developed economies, although they may also have pertinence in other labour markets. A salient feature of labour markets in developing and transition economies is the co-existence of a relatively small ‘formal sector’ of employment in salaried jobs and a (often much larger) sector of informal and own-employment. The supply of jobs in the formal sector is less than the demand for such jobs, and workers effectively queue for positions in that sector.

Typically jobs in the public sector reside in the formal sector. Although in the past (for example, the colonial era) requisition of labour, often at low daily rates, for public duties such as road and railway construction, fighting wars etc., was prevalent, the modern public sector usually offers high status and high remuneration jobs that are prized by workers. Studies of jobs in such settings *should* suggest that there is a significant premium to working in the public sector (see Bales and Rama, 2001; Nielsen and Rosholm, 2001, Stelcner, van der Gaag and Vijverberg, 1989; Terrell, 1993; Van den Gaag and Vijverberg, 1988) although evidence is mixed. In transition economies, where a public sector with regulated pay and an unregulated private sector co-exist, the public pay effect may be negative, although ultimately this situation may be politically unsustainable.⁷ Even though some such studies use quite sophisticated statistical techniques in order to uncover such premia, an essential difficulty in many studies of this kind is that the household or labour force survey data that are used to

⁶ Anecdotal evidence, but certainly confirmed by visits to individual public sector employers by public pay Review Body members in Britain, suggest that excessive targeting, reorganisations, performance criteria, ‘excess paperwork’ and other by-products of the desire to ‘incentivise’ the public sector often draw more adverse criticism from workers than a perceived problem of low pay relative to comparable private sector jobs. Public sector workers do however find the implications of the arguments adduced by Frey as intrinsically more appealing than that of Heyes, although both draw on the identical idea of incomplete contracts.

⁷ Studies of public pay in such markets include Adamchik and Bedi (2000), Falais (2000), Jovanovic and Lokshin (2003), Lokshin and Jovanovic (2003), and Reilly, Krstic and Litchfield (2007).

investigate pay structure are disproportionately collected from households that are predominantly formal sector or salaried (tax-paying) earners; the studies that suggests a public sector ‘penalty’ may simply be an artefact of the sampling procedure.

2.6. Overall: what underpins public-private pay differentials?

The range of factors considered here make any conclusions as to the likely magnitude, or even direction, of a public-private sector pay differential hard to establish. In summary of the previous points:

- The changing occupational composition of the public sector workforce suggests that aggregate analyses of the public sector over time should control for this changing occupational composition of the public sector in estimating public sector pay effects (see, for example, Figure 3.2 in Disney, Goodman, Gosling and Trinder, 1998) or focus on individual occupations within the public sector.
- The issue of differential incentives and output measures imply that not just there may be different pay levels but also different pay *structures* between the two sectors – in particular that pay at a point in time or a specific age may not fully reflect lifetime differences – especially if deferred remuneration is included in the calculation.
- Market structure is a key issue. The methodology for the statistical measurement of the premium to belonging to a trade union or being covered by a collective agreement has often motivated econometric studies of public sector pay effects, and indeed trades unions are often an important actor in public sector pay determination. But whereas the model of market power that underpins the trade union ‘pay effect’ is relatively straightforward to model, the potential monopsonistic power of public sector employers complicates the issue in this setting.
- Ideas of ‘vocation’ or ‘public service’ are very hard to model empirically but are pertinent to standard economic models of incentives in the labour market. They may explain why recruitment to the public sector is relatively insensitive to fluctuations in the public-private sector pay

differential, although of course such fluctuations are ultimately likely to impact on labour quality (as in Nickell and Quintini, 2002).

- In many labour markets, public sector jobs form an important component of the ‘formal sector’, where a ‘queuing’ model rather than a simple market clearing model may be most appropriate underlying description of the labour market. In transition economies, residual regulation of public sector pay also has implications for public-private pay inequality.

3. Econometric methodology

3.1. The general methodology

Modelling the public sector ‘premium’ or ‘penalty’ (and indeed estimation of other, comparable, variables such as the size of the trade union ‘markup’) has relied on a limited range of tried and tested specifications.⁸ These can be illustrated by writing down a very general model, as in Disney and Gosling (2003):

$$w_{it}^P = \gamma_i \delta_t^P + x_{it} \alpha_t^P + \beta_t + \varepsilon_{it}^P \quad (1)$$

$$w_{it}^{NP} = \gamma_i \delta_t^{NP} + x_{it} \alpha_t^{NP} + \varepsilon_{it}^{NP}$$

In the model of pay in equation (1), P and NP denote ‘public’ and ‘non-public’ sectors respectively. w_{it}^j therefore refers to the wage received by individual i at time t if (s)he works in sector j , γ_i is a set of unobserved time-invariant wage-determining individual characteristics (such as ‘ability’, or job-matched productivity) with time and sector-specific ‘prices’ δ_t^j , and x_{it} are a set of observed wage determining characteristics (such as education and experience), again with time and sector-specific prices α_t^j . The ε s are idiosyncratic shocks to wages constructed to be uncorrelated with x , or with whichever sector is worked in. β_t , the parameter of most pertinence in this context, is the time-varying average difference in pay across the two sectors after controlling for the x s and γ s.

As it stands, this model is very general and requires some restrictions for estimation of the parameters of interest (essentially the β s and α s). Moreover data availability may limit our ability to estimate particular parameters.

⁸ For general surveys, see also Bender (1998) and Gregory and Borland (1999).

3.2. Time series models

In time series estimates of the public sector ‘premium’ or ‘penalty’, data on individual workers are unavailable and estimates are obtained off average values (perhaps using proxies for changing composition of the workforce) at a point in time. Since individual worker affiliation is not observed, any average public sector pay ‘effect’ must be ‘identified’ off a weighted average of series on public and private sector wages with the weight given by the (time varying) proportion ρ of workers in the public sector – whether the implied coefficient on ρ tells us anything about the coefficient of interest, β in equation (1), has been extensively discussed in the closely related context of time series estimates of the union non-union wage differential (e.g. Lewis, 1986).

A more promising avenue in time series analysis is to utilise data for, say, particular sub-groups of public workers in order to examine the *time variation* in relative wages between this group and other workers (preferably in occupations which require similar qualifications).⁹ Not only cross-sections but even some standard panel data-based methods (e.g. fixed effects) do not generate time-varying $\bar{\beta}s$, so this approach is of some interest since, although time series methods cannot estimate an average public sector ‘effect’ as such, they can tell us whether events such as macroeconomic shocks or public pay policies lead to variations in wage relativities over time – evidence much favoured in pay negotiations. Unfortunately, without data on the composition of these groups, caution must be exercised in inferences from such findings. Changing pay relativities, as already noted, have implications for the quality (composition) of public sector workers (as in Nickell and Quintini, 2002). In addition, changing composition driven by employment growth may have major effects. To take a very specific local example, the Health Departments in the UK have argued that recent periods of rapid employment growth in the NHS are associated with the hiring of workers at the lower end of pay bands. Over time, these changes in composition of the workforce would affect both the *level* of pay (lower than trend) and the *growth* of pay (faster than trend).¹⁰

⁹ See, for example, Elliott and Duffus (1996) in the UK context.

¹⁰ The same point has been made more generally in the context of changing composition and hours of workers over the business cycle, and how this affects measured earnings growth (Blundell, Reed and Stoker, 2003).

3.3. Cross section-based estimates

In a regression of public-private sector pay using cross-sectional differences, a number of restrictions on (1) are generally implemented. In a reduced form log-linear specification it is often assumed, for example, that the α s are constant across the two sectors – an assumption which is unlikely to hold as illustrated for age by the differing profiles between sectors in Figure 1. Whilst this problem can be solved by adding suitable interactions or by undertaking appropriate decompositions, there are other, more fundamental, problems with these methods. When the regression is estimated by OLS, since the γ s are not observed, the restriction is imposed on (1) that:

$$E(\gamma|P, x) = E(\gamma|NP, x) \quad (2)$$

This restriction is implausible for the following reason. For someone to work in the public sector, two conditions must hold:

$$P_i^* = g(w_i^P - w_i^{NP}, Z_i) \quad \text{wants a public sector job} \quad (3a)$$

$$P_i^{**} = \eta(w_i^P - \bar{w}_i, V_i) \quad \text{is offered a public sector job} \quad (3b)$$

where Z denotes a set of variables influencing whether someone would choose to work in the public sector, V denotes a set of variables that determines the public sector labour demand curve (such as public spending limits) and \bar{w} denotes the productivity of each worker in the public sector of that type (marginal productivity condition). Since:

$$g'(w_i^P - w_i^{NP}) > 0, \quad \eta'(w_i^P - \bar{w}_i) < 0 \quad (4)$$

equation (2) is unlikely to hold (see, for example, the discussion in Blank, 1985; Borjas 2002). A large literature has therefore attempted to ‘correct’ the estimates of β from OLS estimates by some form of Instrumental Variable (IV) procedure that requires the researcher to find observed elements of V and W that are uncorrelated with wages but that are a significant determinant of public sector status. Suitable instruments are rarely available and interpretation is made harder by the ‘double hurdle’ nature of the model.

Studies for a variety of countries which control for selection include those that identify off functional form, especially on the education variables, such as Belman

and Heywood (1989) for the US, van der Gaag and Vijverberg (1989) for Peru, and van Ophem (1993) for the Netherlands, or off background family characteristics, as in Terrell (1993) for Haiti, Borland, Hirschberg and Lye (1996) for Australia, and Dustman and van Soest (1998) for Germany. From a reading of their paper, the identification strategy of Rees and Shah (1995) for the UK is not clear.

A popular extension to the cross-section method (which does not, however, focus on identification issues) is the use of quantile regression methods to examine whether public sector pay ‘premia’ or ‘penalties’ differ across the public and private sector earnings distributions (as in, for example: Disney and Gosling, 1998; Melly, 2002; Mueller, 1998; Nielsen and Rosholm, 2001; Poterba and Rueben, 1994). It is often noted that the public sector pay distribution is more compressed than the private sector pay distribution, and this should lead naturally to quantile regression methods finding different ‘penalties’ or ‘premia’ across the distribution.

Caution should be exercised, however, before inferring from these measured pay differences that, for example, more educated workers in the public sector ‘do worse’ than those in the private sector while less educated workers ‘do better’. Whilst it is probably true that the private sector allows higher rewards to the most productive workers (not least because individual productivity – such as achievement of sales targets is easier to measure in that sector – see the discussion in Section 2.2 above), it may also be the case that higher qualified public sector workers are simply of lower quality/ability in the public sector.¹¹ At the lower end of the distribution, it is probably true that public sector trades unions have been more successful in raising wages for lower paid workers than in the private sector, whilst legislative measures to limit exploitation, low wages and discrimination are also easier to enforce in the public than the private sector. As described previously, there is some tentative evidence in Disney and Gosling (2003) to suggest that the process of contracting-out and compulsory competitive tendering of public sector occupation (many of them manual) has eroded this difference in wages of manual workers between sectors in recent years in the UK.

¹¹ See the discussion of Nickell and Quintini (2002), above.

3.4. Panel data-based estimates

Panel data – that is, tracking the same individuals over a period of time, are a more attractive means of identifying public sector pay ‘effects’, since such data permit a richer set of hypotheses and potential estimation strategies. There are, however, several pitfalls inherent in the restrictions that may be implemented to utilise panel-data based methods.

A common specification with panel data restricts the equations in (1) to collapse to:

$$w_{it} = \gamma_i + x_{it}\alpha^P P_{it} + x_{it}\alpha^{NP}(1 - P_{it}) + \beta P_{it} + v_{it} \quad (5)$$

where P is a discrete variable taking the value 1 if the individual works in the public sector and where $v_{it} = \varepsilon_{it}^P P + \varepsilon_{it}^{NP}(1 - P)$. Equation (5) implies that the effect of unobservables on the wage does not vary over time or vary between the public and private sectors, and that β is time-invariant, although it nets out the effect of unobservables without recourse to an explicit IV procedure and whatever exclusion restrictions are thereby implied. Perhaps because of data limitations, relatively few studies of the public sector markup of this type exist.¹² However, studies which explicitly compare coefficients derived from cross-sections and panel data methods (as in Disney and Gosling, 1998) often suggest quite sharp differences in estimated coefficients.

Such a disparity in findings has been extensively discussed in the closely related area of attempts to measure the trade union markup (Card, 1996; Jakubson, 1991). A well-established argument, as in Freeman (1984) and Swaffield (2000), is that estimates of β using a standard differences or mean deviations method will be biased downwards by measurement error, especially when sectoral changes are self-reported.¹³ The possibility of measurement error in such circumstances is particularly high when, as in the recent UK experience, contracting-out of public services often leaves employees of private companies working in public sector establishments. However, Disney and Gosling (2003) note that the bias may go either way when job

¹² See, for example, Disney and Gosling (1998), Pedersen *et al* (1990) for Scandinavia, and Bales and Rama (2001) for Vietnam.

¹³ From(5): $E(w_{it} - w_{it-1} | x_{it}, x_{it-1}) = x_{it}\alpha^P P_{it} - x_{it-1}\alpha^P P_{it-1} + x_{it}\alpha^{NP}(1 - P_{it}) - x_{it-1}\alpha^{NP}(1 - P_{it-1}) + \beta P_{it} - \beta P_{it-1}$
If we also assume that the x s are stable and that $\alpha^P = \alpha^{NP}$, then we get $E(w_{it} - w_{it-1} | x_i) = \beta(P_{it} - P_{it-1})$

changes are endogenous. They suggest an IV procedure in the context of a longitudinal estimator which potentially handles both measurement error and the endogeneity of job moves, exploiting the introduction of contracting-out and compulsory competitive tendering (CCT) in the 1980s and 1990s to utilise changes in the *sectoral* composition of the workforce as instruments. Nevertheless, their parameter estimates of the β s for various sub-groups (delineated by gender and educational group) are not particularly robust and, moreover, the estimator only generates an average value of β for each sub-group over the whole time period.

As Jakubson (1991) points out, the fixed effects specification is unnecessarily restrictive when panel data are available. First, it is possible to test for asymmetries (for example, if workers move between two sectors, we can test whether the measured changes in pay associated with the transitions are symmetric). Second, and more generally, we can use alternative specifications to the fixed effects model to test whether the β s are time-invariant. Many of the policy issues that revolve around public sector pay concern the *trajectory* of public sector pay relative to private sector pay over time. For example, the 2007 report of the Nurses and Other Health Professionals Review Body (NOHPRB), which recommends pay increases for this remit group, states:

“We would observe that our role is to take a longer-term view about the appropriate pay relativities to deliver the level and standard of labour force that the NHS wants...[If] the NHS pay structure [is] falling behind the market...The result would be that at some point problems would need to be addressed through a ‘catch-up’ award, introducing unnecessary volatility into NHS pay.” (NOHPRB, 2007, para#7.74)

In such a policy context, as mentioned previously, it seems strange to utilise data with temporal dimensionality to establish a single, constant, public sector pay ‘effect’, particularly where there are reasons for thinking in the long run that this net effect may not be large (Postel-Vinay and Turon, 2007). Better, surely, to utilise methods, even if it involves repeated cross-sections (if one can justify the consequent strong assumptions as to the time-invariance of selection mechanisms) to examine the *time variation* of measured public sector ‘penalties’ and ‘premia’ even if the average absolute measure of the pay ‘effect’ may thereby be open to question. An alternative approach (which is currently being utilised by Amanda Gosling and myself) is to use more general panel data methods, as suggested by some of the econometric literature

on union pay effects to test whether there are systematic (and significant) differences in the time path of public and private sector wages, and to establish whether significant, time-varying, β s can be identified.

4. Conclusion

This paper has surveyed broad explanations for differences in pay between public and private sector workers, and the econometric methods used to measure these effects. There are other important issues in public sector pay determination, such as the effect of specific bargaining arrangements (for example, of the use of review bodies to make pay recommendations in some sectors of UK public employment), and the role of workplace characteristics, but I have not considered these here. This omission is partly for reasons of length (and the cross-country dimension to the survey here) but also because such issues tend to be considered *in the public sector context* rather more by industrial relations specialists than by economists and econometricians. This may well be a significant deficiency in the analysis of the topic by economists.

The standard tool in the analysis of public sector pay effects in most of the studies described here is a wage equation augmented by an indicator of public sector affiliation, with the β on the latter interpreted as ‘the’ public sector pay effect. The methodology behind such studies and, presumably, the expected inferences to be drawn from the estimates, are heavily influenced by the literature on union wage effects, which also has as its basic building block a wage equation augmented by an indicator of union status (whether union membership or affiliation).

But there are three reasons for thinking that simply hijacking this methodology to examine public sector pay ‘effects’ is flawed. First, while the rationale for finding union wage premia is simple – the existence of market power – any theoretical rationalisation for differences in public and private sector wages is far less transparent, as the discussion in Section 2 demonstrated. Second, most methods generate a measured β for ‘the public sector pay effect’ which is time invariant and often constant across large groups of heterogeneous public sector workers. This may be appropriate for measuring the average effect of unions (although there is also evidence of time-varying union premia) but seems less appropriate for policy questions concerning relative *trends* (or time variation) in public sector pay relative to

the private sector for which attempts to measure a time invariant β are not useful. Finally, while the public sector wage literature has picked up on some of the statistical issues that have motivated econometric studies of the union wage effect – notably endogeneity and self-selection – some of the other issues that have motivated union wage studies (such as the use of more sophisticated panel data methods, and seeking ‘treatments’ in labour markets that might generate testable hypotheses) are less well developed in the literature on public sector pay.

In conclusion, therefore, there seem to be a large and expanding number of studies internationally on the public sector wage effect (the bibliography here is not comprehensive). However, the deficiencies in the literature are also notable: a lack of careful theoretical models to underpin empirical estimates, a lack of analysis – at least in the economics literature – of the implications of different pay-setting arrangements in the public sector, relatively unsophisticated panel data models, and a lack of evidence based on ‘treatments’ – of which the wholesale attempts to privatise and contract-out public sector activities around the world would seem to be an obvious appropriate set of case studies.¹⁴ None of these analyses are easy to do but may prove to be the directions that future research will take.

¹⁴ In addition to the studies mentioned in footnote 2, I have only been able to find Monteiro (2004), and Grosfeld and Nivet (1999) that examine the consequences for pay of privatisations.

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Figure 1

Age-earnings profiles, public and private sector by educational group



