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Olivier Bargain  
Blaise Melly

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**Olivier Bargain**  
*University College Dublin  
and IZA*

**Blaise Melly**  
*MIT*

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IZA

P.O. Box 7240  
53072 Bonn  
Germany

Phone: +49-228-3894-0  
Fax: +49-228-3894-180  
E-mail: [iza@iza.org](mailto:iza@iza.org)

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## ABSTRACT

### Public Sector Pay Gap in France: New Evidence Using Panel Data<sup>\*</sup>

We estimate the public wage gap in France for the period 1990-2002, both at the mean and at different quantiles of the wage distribution, for men and women separately. We account for unobserved heterogeneity by using fixed effects estimations on panel data and, departing from usual practice, allow the public wage markup to vary over time. We also provide one of the very first applications of fixed effects quantile regressions. Contrary to common belief, results convey that monetary returns are not fundamentally different in the public sector. Firstly, public wage 'premia' (for women) or 'penalties' (for men) are essentially the result of selection. After controlling for unobserved heterogeneity, only small pay differences between sectors remain over time, reflecting fluctuations due to specific public policies and to the procyclicality of private sector wages. The long-term difference is essentially zero. Secondly, the relative compression of the wage distribution by the public sector is also partly due to unobserved characteristics. The most natural explanation for these results is that the civil sector manages to attract better workers in the lower part of the distribution, in part because of non-monetary gains (including job protection), but fails to retain the most productive ones at the top.

JEL Classification: C13, C14, C21, J31, J45

Keywords: wage gap, public sector, selection, fixed effects, quantile regression

Corresponding author:

Olivier Bargain  
Departments of Economics  
University College Dublin  
Belfield, Dublin 4  
Ireland  
E-mail: [olivier.bargain@ucd.ie](mailto:olivier.bargain@ucd.ie)

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# 1 Introduction

The size of the public sector poses a daunting challenge for policy makers in France. Public sector employment represents around a quarter of the total labour force (5.2 million employees in 2006) and has progressed more rapidly (+24%) than total employment (+13%) over the past 25 years, a reverse trend compared to most OECD countries. In the same period of time, the weight of the public debt has increased massively (from 20% to above 60% of GDP). The size of the public wage bill is naturally seen as one of the main culprits, generating tensions and risks for social cohesion.<sup>1</sup> A reduction of public employment, as announced by recent governments, would require an increase in the efficiency of public services, if the quality and provision of public goods are to be secured. In this context, economists need to better understand how the public sector influences behaviours on the overall labour market, how pay settlements operate in both public and private sectors and, ultimately, how to maintain the attractiveness of civil sector careers without creating distortions.

Surprisingly, little is known about the pay differential between public and private sectors in France.<sup>2</sup> This paper aims to fill (some of) the gap by providing an extensive analysis of the public wage gap, i.e. the wage differential obtained when controlling for workers' observed characteristics. For this purpose, we make comprehensive use of the French Labour Force Surveys for the 1990-2002 period. We first measure the public pay gap at the mean (using OLS) and at various points of the conditional distribution (using quantile regression).<sup>3</sup> While most studies assume a constant wage gap, we repeat the exercise for the different years to assess the evolution over time. Results reflect to some extent the cyclical nature of wage setting in the private sector and the effect of specific policies on public sector remunerations.

Yet, results based on OLS and quantile regressions are essentially descriptive and must be taken with caution when it comes to causal interpretations. Indeed, the role of workers' unobserved characteristics on both wages and selection in either sector cannot be ignored. Accounting for endogenous selection may change results regarding the public wage gap, and policy conclusions thereof. It may also give some indications about the nature and the quality of workers in each sector and at different points of the distribution. The selection issue has been strongly emphasized in the literature based on mean regression analysis and addressed using instrumental variable methods.<sup>4</sup> However, results vary a lot between countries due to some sensitivity to model specification or to institutional differences in the public sector recruitment process, in wage bargaining and wage structures.<sup>5</sup>

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<sup>1</sup>The share of public expenditure is well above 50% of GDP in France – a situation met only in Nordic countries among OECD countries. The labour costs of total public employment represent 13.7% of GDP (208 billion euro). The wage bill for the state alone represents 44% of the total budget (120 billion euro).

<sup>2</sup>Fougère and Pouget (2003) focus on the determinants of the sector choice while Fournier (2001) provides a descriptive comparison of wages in both sectors. Lucifora and Meurs (2006) decompose the wage gap in price and endowment effects using quantile regression for France, Italy and the United Kingdom.

<sup>3</sup>Quantile regressions have been used to study the public wage gap in many countries, starting with Poterba and Rueben (1995) for the US. Evidence is available for instance for Canada (Mueller 1998), the UK (Disney and Gosling 1998) and Germany (Melly, 2005). Most studies find that the public sector compresses the wage distribution and pays a 'premium' to those at the bottom of the wage distribution for men and to most women except those at the top of the distribution.

<sup>4</sup>Switching regression models have been traditionally used: a selection equation corrects the wage equations for each sector and the between-sector difference in expected wages impacts in turn on the propensity to enter the public sector. For example, Moulton (1990) analyses public-private earnings differential for the United States, Van Ophem (1993) and Hartog and Oosterbeek (1993) for the Netherlands, and Dustmann and van Soest (1998) for Germany.

<sup>5</sup>It is not clear which instrument should be used to identify public sector participation. These analyses also fail to account of the possible differences in the public wage gap at different points of the distribution. This is solved by introducing endogenous selection into quantile regression, as performed by Melly (2006) on German data using the IV-QR estimators

In this paper, we follow an alternative identification strategy relying on time variation in individual wages and public sector histories. The idea is simply to use ‘fixed effects’ panel regressions of the average wage gap, as allowed by the (unbalanced) panel dimension of the Labour Force Survey.<sup>6</sup> We originally extend the approach to estimations at different points of the wage distribution. This extension is one of the very first applications of the fixed effects quantile regression estimator suggested by Koenker (2004).<sup>7</sup>

The main results are as follows. Public sector premia or penalties typically found in the literature are much smaller when correcting for selection. This result applies to three dimensions: over time, between groups (gender) and within groups (across quantiles of the wage distribution). Over time, the average wage gap oscillates around zero with small cyclical variations, consistent with business cycles and specific policies in favour of public sector wages in the 1990s. In the long run, the wage gap tends toward zero. On average, men appear to select negatively in the public sector while women select positively. Differences between men and women disappear after correction since in both cases, the wage gap is close to zero. Across quantiles, the usual result that the public sector compresses the wage distribution partly disappears when controlling for selection. Smaller inequalities in the public sector are due to positive selection in this sector at the bottom of the distribution and negative selection at the top.

Two policy-related conclusions are drawn from these results. Contrary to common belief, we find that public sector workers are not systematically rewarded differently from their private sector counterparts. This result is in line with theory, as recalled by Disney (2007), and obtained in the French case even though movements across sectors are not completely free. That the state does not behave in a fundamentally different way from the private sector and does not generate as much distortions as expected can be seen as an encouraging finding. Conversely, however, it may signify that the French private sector is itself heavily constrained by labour market regulation. Secondly, the most likely explanation to the selection-driven compression is that the public sector attracts higher-quality workers at the bottom of the distribution thanks to an efficient recruitment policy but fails to retain the best agents at the top of the distribution, which may be detrimental to efficient management in public administrations.

The paper is organized as follows. Section 2 presents the data. Section 3 briefly describes the institutional setting and the factors that influence selection and wage settlement in both sectors. Section 4 summarizes the econometric approach, then reports and discusses the results about the evolution of the public pay gap over time and across quantiles, stressing the impact of endogenous selection. Section 5 draws some policy implications and Section 6 concludes.

## 2 Data

In this study, we make use of the French Labour Force Survey (‘Enquêtes Emploi’) collected by the French National Institute of Statistics (INSEE). Conducted every March on around 60,000 persons, this survey is a 1/300 representative sample of the French workforce, containing information about education levels, occupations, wages, region, industry and employment status.

We focus on hourly wages calculated using weekly hours of work during a ‘normal’ week. As is often the case, information on work duration is self-reported and subject to measurement errors, especially for

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suggested by Chernozhukov and Hansen (2005) and Abadie et al (2002). The latter estimator is also used to correct quantile regression estimates of the public wage gap in France in Bargain and Melly (2007).

<sup>6</sup>See also Disney and Gosling (2007) on British data.

<sup>7</sup>An application of this estimator to the evaluation of private school vouchers can be found in Lamarche (2006).

professions with flexible working time (e.g. researchers). Also, work duration may not necessarily reflect productive efforts: this is a usual limitation for the comparison between sectors. Wages are net of social contributions and include all bonuses and premium paid to employees in both sectors, as well as the family supplement (*Supplément familial de traitement*) versed to workers in the public sector in complement to usual family benefits. Yet, monetary measures of specific in-kind advantages, more frequent in the private sector, may be underestimated. In addition, differences in pension schemes cannot be rendered in this analysis.<sup>8</sup> Other implicit advantages, and in particular the fact that tenured civil servant have lifetime job protection, are almost impossible to quantify and affect workers in an idiosyncratic way according to their unobserved characteristics (e.g. risk aversion, productivity, etc.).<sup>9</sup> Nevertheless, these other attributes of public sector jobs, and the (expected) net gains from belonging to the civil sector, as viewed by each individual thereof, are hopefully captured in the treatment of sector selection as suggested in the sequel.

We restrict the analysis to working individuals aged 20-60 who are not in education and neither farmers nor self-employed workers. For these two groups, the nature of their income makes it difficult to compare with salary workers and incomes are subject to important measurement errors. Facing the usual trade-off between representativeness of the sample at the population level and the comparability across sector, we opt in favour of the latter and make further selections for the sake of comparability. We restrict the sample to those holding a full time contract and exclude trainees and temporary contracts. We also take out those working in public-owned companies since these firms have been partly privatised over the last 20 years.<sup>10</sup> Finally, we exclude blue-collars workers because they are strongly over-represented in the private sector (40%) compared to the civil sector (9%), and would make the two distributions much less comparable both in terms of occupation types and earnings. This last exclusion explains why the share of public sector workers in the total selection (around 34%) is larger than usual figures (around 23%). Because of the above selection, we believe we can use interchangeably the terms public sector workers and civil servants in the sequel.

The selected data is described in Table 1 for the initial and final years of the period under investigation. On average, wages are higher in the public (private) sector for women (men). The usual argument that the state is a less discriminatory employer is partly challenged when controlling for observed and unobserved characteristics, as found and discussed in the rest of the paper. Women are more represented in the public sector and there is certainly an important selection effect, either due to in-kind benefits discussed above or to gender-specific advantages (more family friendly policies in the public sector). This also is reflected in the larger average number of children among civil servants. In addition, statistics show that workers in the public sectors have more experience on average; they have more frequently achieved a general college or upper university degree while employees in the private sector have opted more often for vocational education (at the secondary level) or technical degree (after high school). Administrations are well represented over the whole territory while most of the headquarters of large firms are concentrated in the Paris region, which explains the reported difference in location. This potentially explains some differences in wages due to the fact that public sector remuneration is geographically uniform while private sector

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<sup>8</sup>Retirement age for public sector depends on the type of job (50, 55 or 60) and is generally lower than in the private sector (standard age is 65). It has been reformed in the recent years.

<sup>9</sup>Bellante and Link (1981) show that civil servants are more risk-averse than private sector employees in the US; similar results are obtained by Bonin et al. (2007) for Germany: a higher willingness to take risks makes an individual more likely to work in occupations with higher earnings variability.

<sup>10</sup>Note that several authors, including Disney and Gosling (2003), exploit privatisations as natural experiments to account for unobserved heterogeneity when estimating the public wage gap.

wages are on average higher in Paris. Finally, Table 1 reports general types of profession. In France, socio-professional categories are traditionally summarised in four groups: managers (including professors and ‘higher intellectual professions’), intermediate professions, white-collar workers and blue-collar workers. With the exclusion of the last group, as previously indicated, the distribution of occupations is reasonably comparable between the two selected samples.

The Labour Force Survey is a rotating panel: each household remains in the survey for three consecutive years with one third of households being replaced each year. We use this feature to construct an unbalanced longitudinal panel sample, making use of the waves from 1990 to 2002. Importantly for our fixed effects estimations, we find that in the total 12-year pooled sample, 5% of the workers move from the public to the private sector while 3% moves in the other direction. Considering the large sample size, these cross-sector movements allow us to identify the selection effect.

Table 1: Descriptive Statistics (Selected Samples)

Period	Public		Private	
	1990	2002	1990	2002
Real hourly wage - women (1)	8.3	9.7	7.9	8.8
Real hourly wage - men (1)	10.0	11.3	10.9	11.7
Weekly work hours	39.2	37.6	40.6	38.4
Age	40.2	43.0	37.8	39.6
Experience (# years) (2)	21.6	23.2	19.4	19.8
Female	0.59	0.62	0.54	0.54
In couple	0.19	0.23	0.24	0.25
# children	1.24	1.09	1.05	1.00
Paris region	0.21	0.19	0.28	0.26
Education:				
Secondary education	0.21	0.17	0.18	0.14
Vocational training	0.39	0.31	0.44	0.32
High school	0.20	0.23	0.19	0.21
University first degree (tech.)	0.03	0.07	0.09	0.16
University first degree	0.05	0.04	0.01	0.02
University upper degrees	0.11	0.18	0.08	0.16
Occupation:				
Managers (3)	0.13	0.17	0.16	0.21
Intermediate professions (4)	0.33	0.33	0.38	0.37
White-collar workers (5)	0.54	0.50	0.46	0.42
No of observations	8,236	9,048	13,001	16,899
Proportion of initial sample of employees	53%	57%	45%	47%

(1) Salaries include all bonuses and premium averaged over the year; they are expressed in 2002 euro.

(2) Computed as current age minus age at end of studies

(3) Includes administrative, commercial or technical executives, professors and ‘higher intellectual professions’

(4) Includes intermediary positions in commercial, technical and administrative sectors, health services, teachers, technicians.

(5) Commercial, technical and administrative employees and clerks

### 3 The Public Sector in France

To better understand the institutional setting, we discuss the selection of workers into the public sector in France. We also describe how wages are formally settled in both sectors. As developed in the following sections, however, these structural differences between sectors may not necessarily translate into substantial differences in pay levels.

In France, the main entry in the public sector is through a nationwide competitive examination process (known as ‘external exam’). Until 2005 it included some legal age limits – between 28 and 45 depending on the type of job – so that sector choice occurred at a relatively early stage in one’s career. Nonetheless, pathways to different positions in the civil sector also exist (‘internal exam’), as well as entry for professionals who previously had a career in the private sector. Leaving the public service is irreversible in the sense that one loses the benefit of passing the ‘external exam’. However, public-to-private sector crossover is allowed for a certain period of time.

Endogenous selection has been addressed by Fougère and Pouget (2003) in a switching regression model adapted to some of the French specificities. Because of age restriction for national examination, they select a sub-group of young workers and model selection into the public sector as a double hurdle. Firstly, workers must be willing to attend the competitive exams. The instrument used to identify self-selection is a question on whether the father was himself a civil servant, in line with sociological results on the importance of cultural transmission (Audier, 2000). Secondly, the probability of success is explained, among other things, by education. Minimum levels of education, or specific diploma, are required to be eligible to different positions through the ‘external exam’. Another important aspect is that tenured civil servants have life job protection while those who do not wish or manage to enter the public sector face a risk of unemployment. Fougère and Pouget identify the probability of unemployment by local situations on the labour market and use it to compute expected wages in the private sector, thereby affecting the expected differential in potential wages between sectors.

Wage settlements in the French private sector depend on collective negotiations and, contrary to the public sector, are sensitive to business cycles. In particular, the 1992-1996 period is characterized by economic slowdown and increased unemployment, which translate into lower negotiation power and stagnation in real wages for the private sector, as illustrated in Figure 1. Union membership is smaller in the private sector than in the public sector. For a majority of firms, wage bargaining relied on sector-based negotiations until the 1980s. Following the introduction of the Auroux Act in 1982, wages were negotiated at the firm level more than at industry level. Private sector trade unions have disparate objectives and strategies. It is nonetheless important to stress that the labour market is strongly regulated in France, as further discussed in the last section.

Wages in the public sector depend on a grid of four general pay scales, distinguishing between managerial positions of responsibility, clerical staff, specialised posts and non-specialised posts (labelled as categories A, B, C and D). Education levels essentially determine the type of public job and hence the corresponding scale and the starting wage level. Then, promotions in the public sector are automatic, with a rigid wage progression depending on age according to official salary scales.<sup>11</sup> In principle, wages are centrally negotiated through collective bargaining between social partners, as established in 1983. They should reflect at minimum changes in the cost of living but are not settled in reference to private sector pay, as this is the case for instance in the UK. In practice, the level of the multiplier applied to the pay indices on the single integrated pay structure is still decided unilaterally by governments (and the outcome of the bargaining process is not legally binding for the government, cf. Guillotin and Meurs, 1999). Public pay levels thus reflect mostly policy orientations, public budgetary conditions and, to a lesser extent, political business cycles. In particular, public sector wages have been ‘frozen’ in real terms during the period 1982-1988 characterized by fiscal rigor (not represented). To compensate for the loss in purchasing power and to catch up on private sector wages, public sector remuneration has been boosted

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<sup>11</sup>Nonetheless, rates of advancement vary within each pay scale and total salaries may vary overall thanks to different bonus schemes.



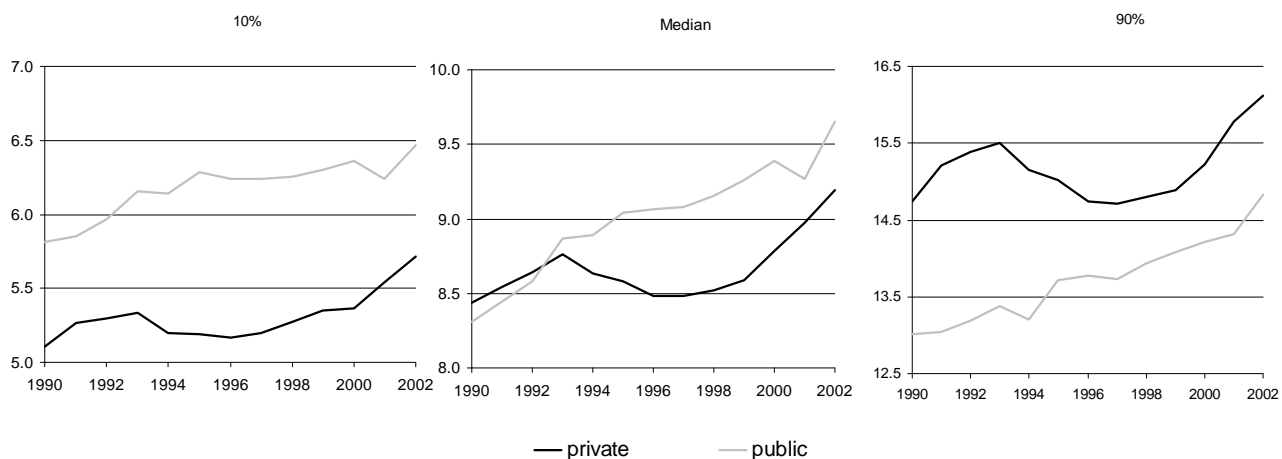


Figure 1: Progression of Hourly Wages (2002 constant euro) in Private and Public Sectors

by the ‘*réformes catégorielles*’ of Durafour, Jospin and Lang in periods 1988-1995 and 1997-2000. The effect of these reforms can be seen on the evolution of the median in Figure 1.<sup>12</sup>

For the 10%, 50% and 90% percentiles, Figure 2 plots the raw differentials between public and private sector wages that result from trends in both sectors. There is a clear positive gap in favour of the public (private) sector for women (men) throughout the period, with the exception of those at the top (bottom) of the wage distribution. Also, it appears that boosts in public wages in the early 1990s, combined with stagnant wages in the private sector, have indeed allowed public remuneration to increase compared to private wages (for both men and women). In the late 1990s and early 2000s, however, the positive effect of the economic upturn on private sector wages has dominated and the raw gap has thereby decreased. Overall, the counter-cyclicity of the wage differential seems to reflect primarily the sensitivity of private sector wage (and the lack of sensitivity of the public sector) to macro shocks. In what follows, we investigate to which extent these results – both differences between gender and shifts in the wage gap over time – are due to genuine price effects or to differences in workers’ observed and unobserved characteristics across sectors.

## 4 Estimations of the Public Wage Gap

### 4.1 Econometric Approach

Estimates of the public wage gap with exogenous selection are obtained using standard OLS and quantile regressions for each year data. To account for unobserved characteristics that possibly affect both wages and selection, we use fixed effects estimations of the public wage gap on the (unbalanced) panel data. Below, we first summarize this approach then provide an intuitive explanation for the identification of a time-varying wage premium. Lastly, we extend the fixed effects approach to quantile regression.

<sup>12</sup>The trend for the mean, not represented, is very similar. For average values: (initially lower) wages in the public sector increase by 8% in real terms in the first half of the 1990s while wages in the private sector are almost stagnant (+1%). The progression for 1996-2002 is slightly faster in the private sector (+8%) than in the civil sector (+6%).

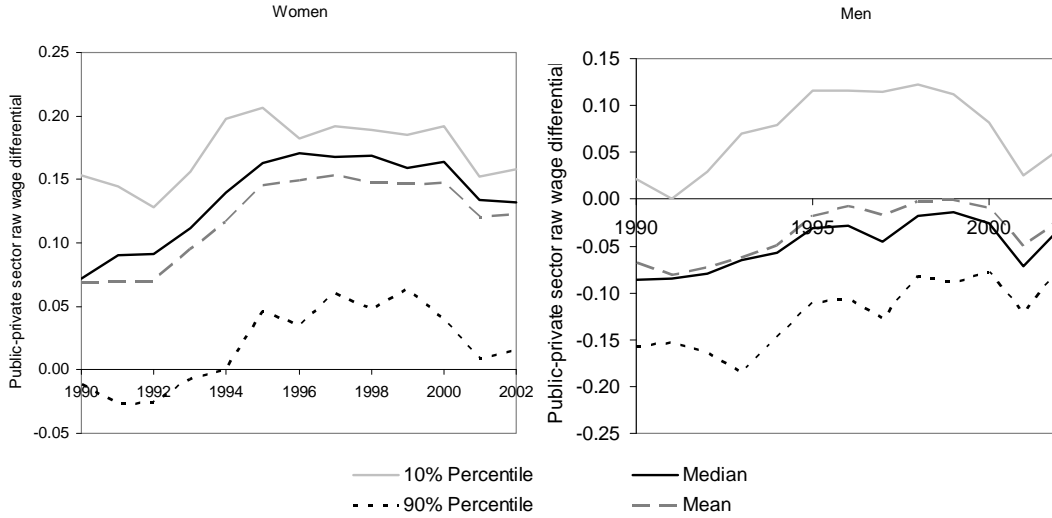


Figure 2: Raw Wage Differential

Consider the classical linear panel data model:

$$y_{i,t} = \alpha_i + x_{i,t}\beta + \varepsilon_{i,t}, \quad i = 1, \dots, N, \quad t = 1, \dots, T$$

where  $\alpha_i$  is time-invariant heterogeneity among workers (the individual fixed effect) and  $x_{i,t}$  is a vector of explanatory variables including a public sector dummy and a set of controls.<sup>13</sup> The  $\beta$  parameter corresponding to the public sector dummy is the public wage premium (positive or negative) that we report in the results of the next section. Let us write the model in matrix form as:

$$y = \alpha Z + X\beta + \varepsilon.$$

The fixed effects model makes no assumption about the dependence of  $\alpha_i$  and  $x_{i,t}$  such that the vector of the individual fixed effects must be (explicitly or implicitly) estimated. If we are willing to assume that  $E[\varepsilon | X, Z] = 0$ , then the traditional fixed effects estimator is given by the solution of the following optimisation problem:

$$\min_{\alpha, \beta} \sum_{i=1}^N \sum_{t=1}^T (y_{i,t} - \alpha_i - x_{i,t}\beta)^2.$$

Of course, this dummy variable regression approach results in so many explanatory variables (more than 50,000 regressors in our application) that it is not possible to estimate the model using standard softwares and computers. However, it can be shown that this optimisation problem has the following, computationally simple, solution:

$$\hat{\beta} = [X'(I - Z(Z'Z)^{-1}Z')X]^{-1} X'(I - Z(Z'Z)^{-1}Z')y.$$

<sup>13</sup>In all estimation techniques described here, we use the following controls: experience, experience square, dummies for education levels (see Table 1), number of children, presence of children of age 0-3, lone parent, French nationality obtained by naturalization. Regions cannot be used with fixed effects models since panel information is collected for those staying at the same location over the three years. The complete set of results from the estimations is available upon request to the authors.

This is the traditional fixed effects estimator implemented as a pooled OLS regression on time-demeaned data.

The fixed effects estimation of a time-varying wage gap is simply obtained by interacting the public sector dummy with year dummies. The intuition for the identification result is best illustrated with a simple two-period model where the only relevant variable is the public sector dummy  $S$ . We assume that

$$y_{i,t} = \alpha_i + \beta_t + S_{i,t}\delta_t + \varepsilon_{i,t} \quad \text{for } i = 1, \dots, N \text{ and } t = 1, 2$$

where  $E[\varepsilon_{i,t} | \alpha_i, S_{i,t}] = 0$  for  $i = 1, \dots, N$  and  $t = 1, 2$ . The parameters of interest are  $\delta_1$  and  $\delta_2$ . We also assume that, with a strictly positive probability, some individuals move from the public sector to the private sector between period 1 and period 2 and others move in the opposite direction during the same period. Asymptotically, we can observe:

$$\begin{aligned} E[y_{i,2} - y_{i,t} | S_{i,1} = 0, S_{i,2} = 0] &= \beta_2 - \beta_1 \\ E[y_{i,2} - y_{i,t} | S_{i,1} = 1, S_{i,2} = 1] &= \beta_2 - \beta_1 + \delta_2 - \delta_1 \\ E[y_{i,2} - y_{i,t} | S_{i,1} = 0, S_{i,2} = 1] &= \beta_2 - \beta_1 + \delta_2 \\ E[y_{i,2} - y_{i,t} | S_{i,1} = 1, S_{i,2} = 0] &= \beta_2 - \beta_1 - \delta_1. \end{aligned}$$

It follows that, if we subtract the last line from the first one, we obtain:

$$E[y_{i,2} - y_{i,t} | S_{i,1} = 0, S_{i,2} = 0] - E[y_{i,2} - y_{i,t} | S_{i,1} = 1, S_{i,2} = 0] = \delta_1$$

and if we subtract the first line from the third one, we get:

$$E[y_{i,2} - y_{i,t} | S_{i,1} = 0, S_{i,2} = 1] - E[y_{i,2} - y_{i,t} | S_{i,1} = 0, S_{i,2} = 0] = \delta_2.$$

Thus, the public sector premia are identified for both periods. An equivalent result can be obtained by using the second line (the population always in the public sector) as a reference instead of the first one (the population always in the private sector). Identification on the population of ‘movers’ is standard but we nonetheless discuss possible limitations in the conclusion.

Finally, we consider the analogous quantile regression model of the form:<sup>14</sup>

$$F_y^{-1}(\theta | X, Z) = \alpha Z + X\beta(\theta) \quad \text{for } \theta \in [0, 1].$$

Note that the  $\alpha$ ’s have a pure location shift effect on the conditional quantiles of the response. It is impossible to estimate distributional shift for each individual because we do not observe an individual in more than three waves. However, the effects of the covariates (especially of the public sector dummy) are permitted to depend on the quantile of interest. We can estimate this model for several quantiles simultaneously by solving:

$$\min_{\alpha, \beta} \sum_{q=1}^Q \sum_{i=1}^N \sum_{t=1}^T w_q \rho_{\theta_q}(y_i - \alpha_i - x_{i,t}\beta(\theta_q)) \quad (1)$$

where  $\rho_{\theta}(u) = u(\theta - 1(u < 0))$  denotes the quantile loss function. The weights control the influence of the  $Q$  quantiles on the estimation of the fixed effects. In the application we simply use Tukey’s trimean weights:  $w_q = 0.5 - |q - 0.5|$ .

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<sup>14</sup>The following approach and the presentation of the fixed effects quantile regression estimator draw heavily Koenker (2004).

As noted above, the dimensions of this problem are extremely large ( $N > 50,000$  and  $T = 12$ ). For quantile regression, we must deal with the full problem because time-demeaning the data is not allowed and would change the estimand. Fortunately, the design matrix has a very sparse structure: the extremely large majority of the elements of the matrix are equal to 0. Koenker and Ng (2005) have written an algorithm for quantile regression exploiting the sparsity of the design matrix. We have used this algorithm to estimate the coefficients of interest in our application.<sup>15</sup>

## 4.2 Evolution of the Mean Public Wage Gap

Figure 3 first shows that using repeated OLS for each year (exogenous sector choice), men appear to be underpaid in the public sector while women are overpaid, a rather classic result in this literature. When compared to the raw wage differential between sectors, the trend is unchanged but the overall level of the public pay gap is slightly lower, both for men and women. This shows that salary workers in the public sector have slightly better characteristics than their counterparts in the private sector, contributing to increase (reduce) the apparent premium (penalty) for women (men). Also, the null hypothesis that the mean public premium is constant is strongly rejected. Figure 3 actually shows that the premium increases until the mid-1990s then stabilizes before declining by the end the decade. These trends are similar for men and women and relatively similar to those obtained for the raw differential.<sup>16</sup>

Yet, it is not sure that these premium and penalties, even after controlling for observed heterogeneity, are due to genuine price differences between sectors. We therefore control for endogenous selection using fixed effects estimations as previously described. Interestingly, the wage gap is considerably lower for women and higher for men in this case (cf. Figure 3). It turns out that on average, men select negatively into the public sector while women select positively. The average public wage gap obtained after correction is very similar for men and women at all years and close to zero. The remaining premia and penalties correspond to small oscillations around zero and reflect the specific public policies aimed at boosting public remunerations in the early 1990s and the pro-cyclicality of private wages. For men, the wage gap is significantly negative in 1992 and positive in 1994-1999; for women, it is significantly negative in 1991-1992 and positive in 1994-2000. When estimations are carried out on pooled data holding the premium constant over time, traditional fixed effects estimations also show that for both men and women, the premium is not significantly different from zero. In other words, the average premium over time is null.

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<sup>15</sup>We are interested in the results for  $\theta = 0.01, 0.02, \dots, 0.99$ . Because of computational difficulties (near singularity of the design matrix), we could not estimate (1) for these 99 quantiles simultaneously. We have therefore used the following strategy: (i) estimation of the vector  $\alpha$  by solving (1) for  $\theta_q = 0.25, 0.50, 0.75$ , (ii) estimation of the remaining quantiles based on the vector  $\hat{\alpha}$  obtained from step (i). As a robustness check, different quantiles were used in step (i) but no noticeable change could be observed. Codes written in R (and Stata for the preparation of the data) are available from the authors.

<sup>16</sup>As discussed in Disney (2007), pay differences may be due to different occupational structures between sectors and different evolutions of the occupation mix over the period. Yet, controlling for occupation types in the regressions does not seem to change the time trend plotted in Figure 3 (contrary to what is found by Disney and Gosling, 1998, in the case of the UK) nor the level of the average premium for women (contrary to Poterba and Rueben, 1994, for the US). This is likely due to initial sample selection – exclusion of blue collar, part-time and temporary workers – aimed at making the two groups comparable, as discussed above. For men, however, the overall trend is shifted upward (the penalty is reduced) when accounting for occupations. Notice however that potentially important problems endogeneity arise from the introduction of occupation types.

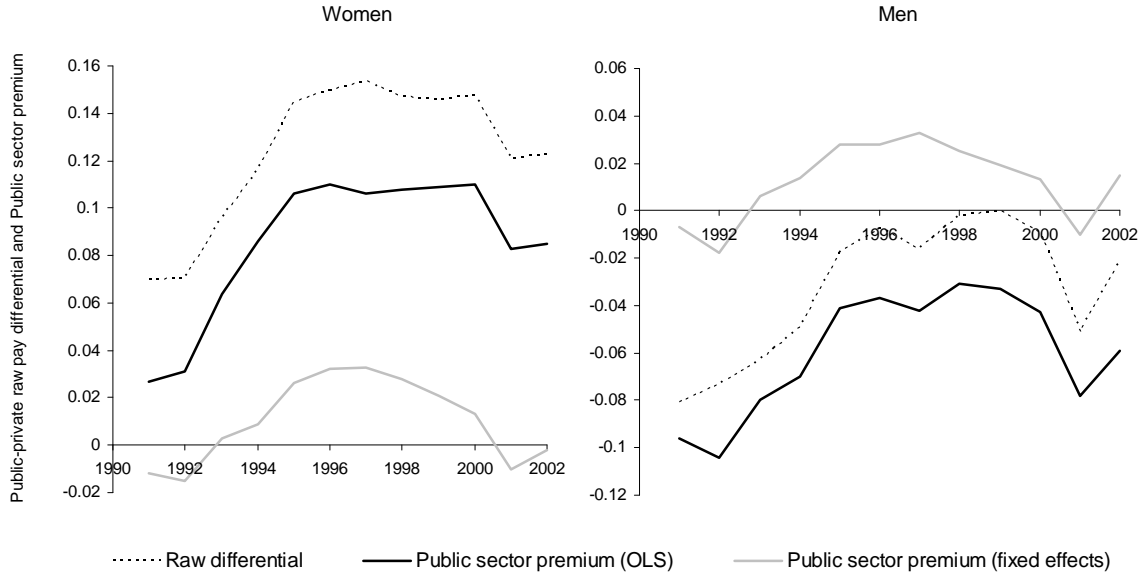


Figure 3: Evolution of the Average Public Sector Premium: OLS versus Fixed Effects

### 4.3 Evolution of the Quantiles of the Public Wage Gap

Figure 4 plots the public wage mark-up at different points of the wage distribution, as obtained using quantile regression on pooled data. It shows a premium for women (except at the top) and a penalty for men (except at the bottom). In both cases, the public pay gap decreases with the wage level. This relative compression of the wage distribution in the public sector is a rather usual result. It is often justified by the fact that governments are less competitively-driven than the private sector and more inclined to equity and fairness in wage settlements, which translates into higher earnings than market levels at the bottom and moderate remuneration to top civil servants.

This view is challenged by results of the fixed effects quantile regression on pooled data (holding the premium constant over time), as reported in Figure 4. The compression result partly disappears after correction.<sup>17</sup> For instance, the 10%-90% percentile difference is five times lower when we control for endogeneity (and only a small premium at the very bottom and a small penalty at the very top see to remain). This means that an important part of the observed compression is actually due to selection. Policy implications of this result are potentially very important and discussed in the sequel.

Next, we allow the public wage gap to vary over time by estimating separate quantile regressions for each year (assuming exogenous selection) as well as fixed effects quantile regression on the whole panel (endogenous selection). These two sets of estimations are the analogue of results in the previous subsection for the (time-varying) average premium using OLS and fixed effects. The first result is a similar shift to that obtained for the mean – upward for men and downward for women – for all quantiles. That is, premia and penalties decrease at all points of the wage distribution. While the difference in pay gap

<sup>17</sup>Interestingly, this finding is confirmed by Bargain and Melly (2007) when using a different strategy to control for unobserved heterogeneity. Precisely, we apply the IV-QR technique suggested by Abadie et al. (2001) and use whether the father was himself a civil servant or not as the instrument. The latter captures the transmission of civil sector status documented by sociologists (Audier, 2000).

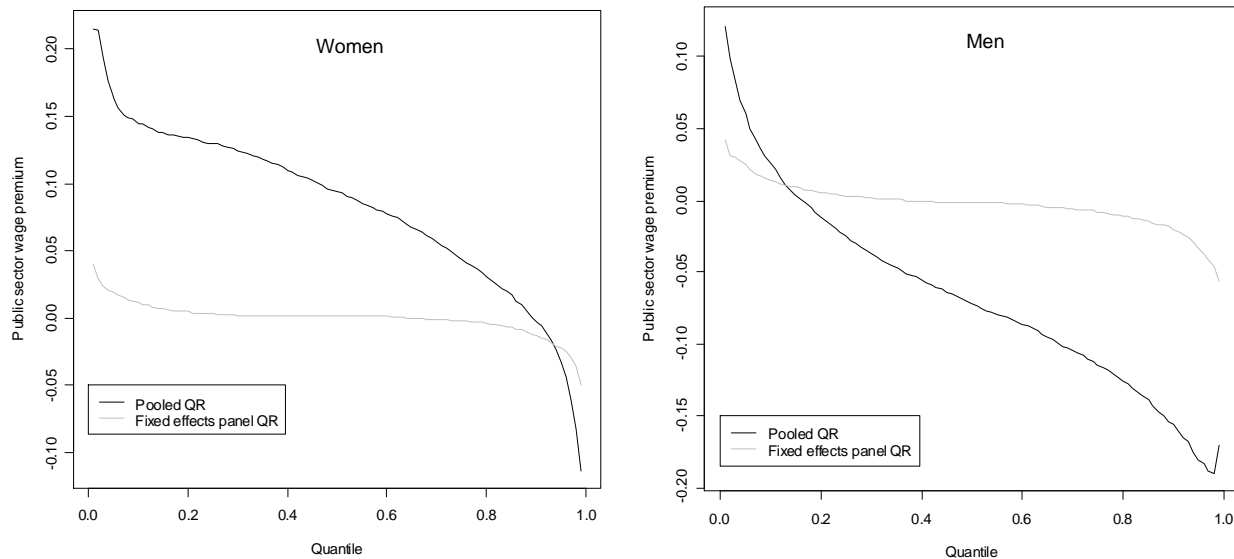


Figure 4: Public Sector Premium across Quantiles (quantile regressions on pooled data)

between the 10% and the 90% percentiles oscillated over time in a narrow range 0.08 – 0.12 (in terms of log hourly wage) for women and 0.12 – 0.16 for men, this difference is considerably reduced when using fixed effects (0.02 – 0.04 for women and 0.03 – 0.05 for men). That is, the compression effect partly disappears for all years in the data when controlling for selection.

The time-varying pay gap at 10%, 50% and 90% percentiles is represented in Figure 5 for all years. We can see the (small) remaining difference in the gap between top and bottom quantiles. The level of the median is very similar to that obtained for the mean and the trend is identical, with fluctuations around zero in a narrow interval (roughly between -0.02 and +0.03 in terms of log hourly wage). A similar trend is also observed for the extreme quantiles, conveying in particular that political decisions in favour of public sector wages in the early 1990s (or benefits from the economic upturn in the late 1990s) have reached all quantiles relatively evenly.

Table 2 summarizes all the previous results and provides standard errors, as obtained by bootstrapping all results 100 times. Note that we have bootstrapped the individuals so that standard errors are robust against clustering at the individual levels.

## 5 Interpretations and Policy Implications

In this last section, we provide a tentative interpretation of the results and some policy implications. The first general question is whether we should expect a ‘public sector wage effect’ or not. Disney and Gosling (1998) and Disney (2007) discuss several possible explanations for the observed differences in pay between sectors. In particular, the omission of characteristics that explain pay differences, as for instance a larger influence of trade unions in the public sector, is often invoked. While we do not test specifically for this possibility here, more representative unions in the public sector could indeed explain the wage premium for women. There is no obvious reason, however, why things should be different for men in

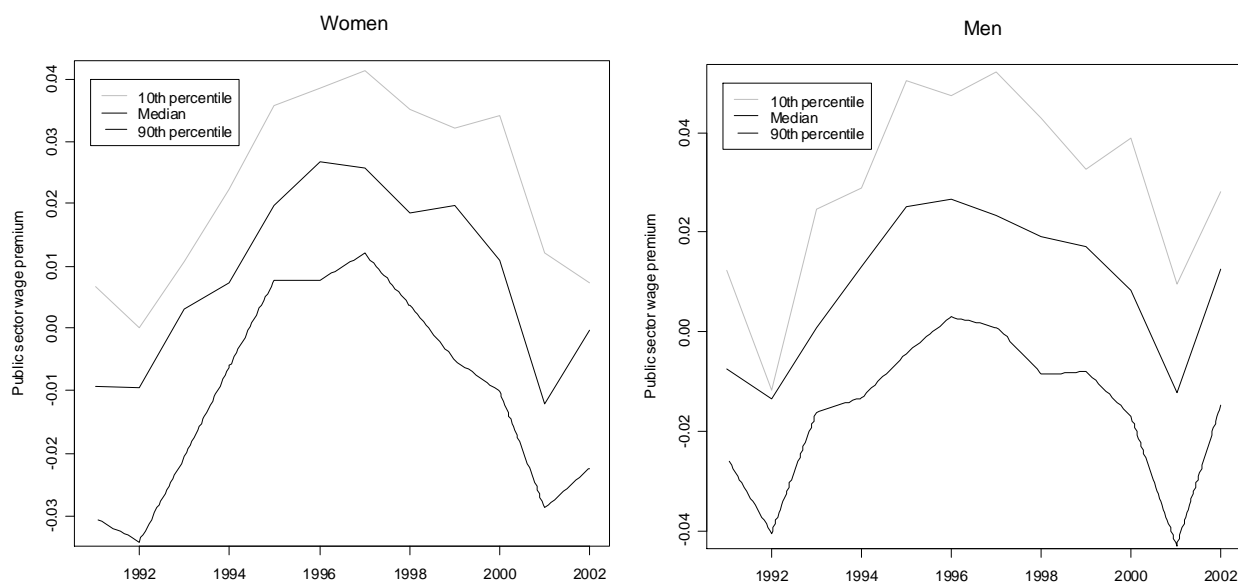


Figure 5: Evolution of the Public Wage Gap at different Quantiles (fixed effects quantile regression)

this regard. Another line of argument concerns the potential existence of compensating differentials, i.e. in-kind advantages and fringe benefits that would offset pay differences. As explained previously, however, this type of gain is to be found mostly in the public sector, where employees benefit from job protection and more advantageous pension plans. Therefore, the explanation may be valid for men, who face wage penalties in the public sector, but not for women. Other structural differences, due for instance to fundamentally different occupational compositions between sectors, have been netted out through additional control variables, as previously discussed.

While these interpretations militate for the existence of significant pay differences between sectors, the alternative explanation provided in this paper is that these apparent disparities essentially arise from differences in workers' unobserved characteristics. For both men and women, the difference between sectors is centred around zero when controlling for unobserved heterogeneity, contrary to a net premium for women and some penalties for men otherwise. Some differences remain but seem to be mainly cyclical, with for instance a small public sector premium in the mid-1990s, as discussed above. This residual gap is therefore the result of intrinsic differences in wage settlements (public sector wage policies versus sensitivity to macro shocks in the private sector). It may also reflect the fact that individuals are not totally free to move between sectors, as explained in the second section. However, in the long run, the gap tends to disappear for both men and women.<sup>18</sup>

That the civil sector is not responsible for large distortion on the labour market, contrary to what is usually thought, is a rather interesting or reassuring finding for policy makers. Yet, it may signify, on the contrary, that distortions on the private sector in France are just as large as in the civil sector. Indeed, private sector wages are directly or indirectly influenced by interventions like minimum wage,

<sup>18</sup>Focusing on men in the UK, Postel-Vinay and Turon (2007) show that the public wage premium tends to zero over the life-cycle and that wage compression in this sector also disappears when considering lifetime values.

work duration, unemployment benefits and strict job protection measures. In particular, the minimum wage necessarily limits the public-private differential for low-skill workers.<sup>19</sup>

The identification of unobserved heterogeneity on the population of ‘movers’ may lead to the interpretation that some genuine pay differentials exist between sectors and are precisely the reason for movement across sectors. We believe, on the contrary, that selection is a complex process that depends only partly on (supposedly) wage differences between sectors.<sup>20</sup> In turn, wage differentials are to some extent the result of the allocation of heterogenous workers in one or the other sector. An important point is the fundamental asymmetry that characterizes the French system: opting for a career in the private sector is entirely based on self-selection while entering the civil sector is the outcome of self-selection and success at the entry examination. Then a possible interpretation of the results is as follows. Those who form the lower end of the distribution in the public sector are those who selected positively in this sector (maybe due to higher risk aversion) but who have also succeeded in entry examination and are likely to have higher unobserved skills than workers at the same rank in the private sector wage distribution.<sup>21</sup> At the top of the wage distribution, agents with the highest wage potential (and possibly lower risk aversion) have self-selected in the private sector.

Policy implications can be drawn from these results. Positive selection in the public sector and the subsequent premium at the bottom of the wage distribution convey that the system of entry examination functions well and allows the recruitment of higher-skilled workers than in the private sector. Yet, negative selection at the top, i.e. the fact that the state does not retain the most skilled agents, is a problem. In the extreme case, skill shortage could appear at the top of the public sector hierarchy and be detrimental to the overall quality of public services.<sup>22</sup> This pleads in favour of performance-based mechanisms to secure efficient management in the administration.<sup>23</sup>

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<sup>19</sup>Lucifora and Meurs (2006) emphasize the fact that the public sector pay gap is smaller in countries where pay determination is more regulated (like France or Italy) compared to countries where market factors play a larger role (like Great Britain), and this particularly in the lower part of the wage distribution.

<sup>20</sup>Indeed, as argued in the third section, many non-monetary differences (e.g. job protection) can shape individual incentives to go in one or the other sector. Selection thus depends on this complex set of implicit costs and benefits, and from individual-specific perceptions of the differences between sectors (e.g. the attractiveness of a protected job in the civil sector depends on the individual unemployment risk, and hence the expected wage in the private sector, and on individual risk aversion, among other things).

<sup>21</sup>Several findings tend to confirm these views. Pouget (2005) shows that low educated workers obtain higher earnings in the public sector. Focusing on a cohort of young workers, Fougère and Pouget (2003) find that, all observable characteristics being equal, workers with the lowest wages in the private sector are also those who have the highest unemployment probabilities. Inversely, public sector entry examinations seem to select those who, among all candidates, would have higher wage potential in the private sector. Fougère and Pouget provide additional evidence on the excess supply of workers wishing to enter public sector employment in France. They also find that the recruitment process selects better candidates in years of high unemployment. As a matter of fact, Figure 5 shows that for years of economic downturn (early 1990s), the wage difference between quantiles is smaller, especially between the 10% percentile and the median.

<sup>22</sup>A substantial (20%) and increasing proportion of those graduating from the (elite) administration school, ENA, actually work in the private sector.

<sup>23</sup>Burgess and Ratto (2003) review international evidence and find that explicit incentives, and especially Performance Review Pay, are typically under-used in the public sector. Also, potential differences in financial incentives between public and private sector managers is often thought to be compensated by a non-pecuniary benefit for the public employees, e.g. meeting their altruistic goals, as document in the sociological or administrative literature. In Rainey and Steinbauer (1999), for instance, public service motivation is perceived as being a "general, altruistic motivation to serve the interests of a community of people, a state, a nation, or humankind...". This aspect has been very important in France, with a Napoleonic state tradition of non-monetary rewards in the public sector based on vocation and a culture of public service. Yet, relying on intrinsic motivation to achieve higher efficiency in the provision of public good does not seem to be sufficient anymore. However, attempts to incentivise public sector pay may have to be designed in ways that do not conflict with



A similar argument as above applies to explain the large positive premium for women. This premium is essentially due to selection, meaning that the public sector attracts more qualified women thanks to incentives that are not necessarily linked to pay differential between sectors (e.g. more pay discrimination in the private sector). More likely, jobs in the protected sector are more highly valued by women due to the fact that they face much higher risks of unemployment than men in the private sector. Additional factors may also come into play, like other in-kind advantages (more family friendly work arrangements in the public sector) and gender-specific characteristics (e.g. higher risk aversion, as documented by Bonin et al., 2007).<sup>24</sup>

## 6 Conclusion

We estimate the public wage gap in France over 1990-2002. We use (unbalanced) panel data to estimate fixed effects regression models for the mean and at different quantiles of the wage distribution. We thus capture the role of unobserved characteristics affecting both wage determination and sector selection.

The main results are as follows. Firstly, men select negatively in the public sector while women select positively. When correcting for endogenous selection, the average public wage gap is very similar for men and women, that is, very close to zero. In other words, the standard result that the public sector offers pay premia and does so especially for women is essentially the result of unobserved characteristics. In the short-run, residual premia (for women) and penalties (for men) reflect specific pay policies – aimed to boost public remunerations in the early 1990s after a period of fiscal rigor and wage stagnation – and the pro-cyclicality of private sector wages. The long-run pay differential is close to zero, a result shared with recent studies (Disney and Gosling, 2007, Postel-Vinay and Turon, 2007). Secondly, quantile regression estimates show that the relative compression of the wage distribution by the public sector is partly due to the selection effect. Important policy implications were drawn from these results.

Some limitations to the econometric approach used in this paper are discussed in the text. In addition, we make two final remarks. Firstly, there may be some limitations in using movements across sectors. As previously discussed, most of the shifts toward the public sector may have occurred in early years of career due to age limits on national entry examinations. To the extent that unobserved factors that influence selection (e.g. risk aversion) are fairly constant, relying on a relatively age-specific group may not be such an impediment. Movements in the other direction are less of a problem. Secondly, we have estimated models simply using a dummy variable for the public sector to capture potential ‘public sector wage effect’. Such models may be seen as misspecified. While it is well-known that, in case of misspecification, least square regression provides a minimum mean squared error linear approximation to the true functions, Angrist et al. (2006) provide a similar result for quantile regression. Our findings have therefore meaningful interpretation even if the true public sector wage premium depends on the covariates. Nonetheless, it would be interesting to examine the heterogeneity of the premium by interacting it to workers’ characteristics. In particular, this would bring more insights on whether controlling for selection reduces between-group wage compression (other than gender) in addition to within-group compression. We keep this for future research.

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vocations (see Disney, 2007).

<sup>24</sup>Differences between gender are found in other countries. For the UK, Nickel and Quintini (2002) find that the decrease in public sector wages is related to a decline in the ‘quality’ of the public sector workforce but that this effect concerns only men.

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Table 2: Estimates of the Public Sector Premium

	Men								Women							
	Mean		Median		90-10		75-25		Mean		Median		90-10		75-25	
	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.
Pooled regression	-0.069	0.002	-0.072	0.003	-0.182	0.005	-0.090	0.003	0.082	0.002	0.094	0.002	-0.146	0.004	-0.086	0.003
Fixed effects	0.001	0.004	-0.002	0.004	-0.034	0.002	-0.011	0.002	0.002	0.003	0.002	0.002	-0.025	0.002	-0.005	0.001
Separate regression assuming exogenous sector choice																
1991	-0.102	0.007	-0.105	0.008	-0.135	0.017	-0.064	0.010	0.036	0.005	0.043	0.006	-0.122	0.014	-0.054	0.009
1992	-0.093	0.007	-0.089	0.007	-0.167	0.015	-0.066	0.010	0.041	0.006	0.053	0.007	-0.102	0.012	-0.056	0.008
1993	-0.070	0.006	-0.070	0.007	-0.182	0.014	-0.066	0.010	0.075	0.005	0.087	0.006	-0.097	0.014	-0.056	0.008
1994	-0.059	0.006	-0.054	0.007	-0.164	0.016	-0.073	0.009	0.097	0.006	0.106	0.007	-0.124	0.010	-0.066	0.008
1995	-0.032	0.006	-0.034	0.007	-0.175	0.014	-0.083	0.008	0.120	0.006	0.134	0.007	-0.130	0.010	-0.064	0.007
1996	-0.030	0.006	-0.039	0.007	-0.174	0.015	-0.086	0.009	0.115	0.005	0.130	0.006	-0.105	0.012	-0.048	0.009
1997	-0.030	0.006	-0.033	0.007	-0.167	0.014	-0.086	0.009	0.118	0.005	0.130	0.006	-0.103	0.011	-0.062	0.008
1998	-0.029	0.007	-0.034	0.008	-0.175	0.014	-0.080	0.011	0.119	0.005	0.132	0.006	-0.108	0.010	-0.065	0.008
1999	-0.026	0.006	-0.033	0.007	-0.169	0.014	-0.086	0.009	0.112	0.005	0.125	0.006	-0.099	0.011	-0.057	0.008
2000	-0.041	0.006	-0.047	0.007	-0.146	0.016	-0.087	0.011	0.111	0.005	0.114	0.006	-0.112	0.011	-0.059	0.007
2001	-0.071	0.006	-0.076	0.007	-0.139	0.015	-0.071	0.011	0.091	0.005	0.087	0.007	-0.108	0.011	-0.056	0.007
2002	-0.048	0.006	-0.051	0.009	-0.126	0.017	-0.047	0.009	0.099	0.005	0.094	0.007	-0.116	0.014	-0.051	0.009
Fixed effects (allowing for endogenous sector choice)																
1991	-0.007	0.006	-0.007	0.004	-0.037	0.010	-0.021	0.006	-0.012	0.004	-0.009	0.003	-0.037	0.007	-0.013	0.004
1992	-0.018	0.006	-0.013	0.004	-0.029	0.010	-0.004	0.005	-0.015	0.004	-0.010	0.003	-0.034	0.007	-0.006	0.003
1993	0.006	0.005	0.001	0.004	-0.041	0.008	-0.008	0.004	0.003	0.004	0.003	0.003	-0.031	0.006	-0.002	0.003
1994	0.014	0.006	0.013	0.004	-0.042	0.007	-0.011	0.004	0.009	0.004	0.007	0.003	-0.028	0.006	-0.003	0.003
1995	0.028	0.006	0.025	0.004	-0.055	0.007	-0.012	0.004	0.026	0.003	0.020	0.003	-0.028	0.007	0.000	0.003
1996	0.028	0.006	0.027	0.005	-0.045	0.007	-0.017	0.005	0.032	0.004	0.027	0.003	-0.031	0.005	-0.003	0.002
1997	0.033	0.007	0.023	0.006	-0.051	0.008	-0.015	0.005	0.033	0.004	0.026	0.004	-0.029	0.005	-0.008	0.003
1998	0.025	0.007	0.019	0.006	-0.051	0.008	-0.016	0.005	0.028	0.005	0.018	0.004	-0.031	0.005	-0.007	0.002
1999	0.019	0.007	0.017	0.006	-0.041	0.008	-0.012	0.005	0.021	0.005	0.020	0.004	-0.037	0.006	-0.009	0.003
2000	0.013	0.007	0.008	0.006	-0.056	0.007	-0.028	0.005	0.013	0.006	0.011	0.004	-0.044	0.005	-0.026	0.003
2001	-0.010	0.008	-0.012	0.006	-0.053	0.008	-0.018	0.005	-0.010	0.006	-0.012	0.005	-0.041	0.005	-0.013	0.004
2002	0.015	0.010	0.013	0.007	-0.043	0.009	-0.006	0.008	-0.002	0.007	0.000	0.005	-0.030	0.007	-0.003	0.006

Notes: Results show the public sector premium (coefficient and standard error) at the mean and median, the difference between 90% and 10% percentiles and the difference between 75% and 25% percentiles. Variables controlled for in the regressions are: experience, experience square, dummies for education levels, number of children, presence of children of age 0-3, lone parent, French nationality obtained by naturalization. Standard errors are estimated by bootstrap on a large number of replications.