Heterogeneity and the Public Sector Wage Policy

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Conference in honor of Christopher A. Pissarides

June 2015
Stylized facts about public sector employment and wages

- **Major components of labour market and gov. budget**
  [OECD: public employment is 18% of total employment, public sector wage bill is more than 50% of government consumption expenditures]

- **The public sector predominantly hires skilled workers**
  [UK: 36 percent of college graduates, 16 percent of workers with lower qualifications].

- **On average, the public sector pays higher wages.**
Other stylized facts

Heterogeneity:

- **Wage compression across education groups:**
  More educated workers have lower premium, less educated workers have higher premium.  

- **Wage compression within education groups:**
  Bottom quantiles have higher premium, top quantiles have lower or even negative premium  
Objective

Build a quantitative macro model that incorporates these stylized facts and use it to evaluate a reform of public sector wages that strengthens the link with private sector, across workers.

Why this reform? Implicit wage policy in a frictionless labour market.

- Frictionless labour market $\rightarrow$ no role for public sector wages.
- Labour market frictions $\rightarrow$ the market tolerates different wages.
  - High public sector wages induce queues for public sector jobs.
  - Low public sector wages leads to recruitment and retaining problems.
Why look at heterogeneity?

- Most literature considers homogeneous workers
  - Wage heterogeneity [Bradley, Postel-Vinay, Turon (2015)]
  - Heterogeneous skills [Domeij and Ljungqvist (2006)]

- Different public sector wage premiums imply different distortions.

- Current Euro Area crisis
  (*one-size-fits-all* policy might not be suitable).
Government wage bill and employment, 2008

\[
\frac{\text{Government wage bill}}{\text{Private wage bill}} \quad \text{and} \quad \frac{\text{Government employment}}{\text{Private employment}}
\]

<table>
<thead>
<tr>
<th>Country</th>
<th>Government wage bill (% of private sector wage bill)</th>
<th>Government employment (% of private sector employment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portugal</td>
<td>.1</td>
<td>.2</td>
</tr>
<tr>
<td>Cyprus</td>
<td>.2</td>
<td>.3</td>
</tr>
<tr>
<td>Greece</td>
<td>.3</td>
<td>.4</td>
</tr>
<tr>
<td>Ireland</td>
<td>.4</td>
<td>.5</td>
</tr>
<tr>
<td>Italy</td>
<td>.5</td>
<td>.6</td>
</tr>
<tr>
<td>Spain</td>
<td>.6</td>
<td>.7</td>
</tr>
</tbody>
</table>

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Heterogeneity and the Public Wage Policy
Build an extension of the model of Gomes (2015)

- Search and matching frictions and worker heterogeneity (education and ability)
- Given a wage schedule, the government decides how many workers of each type to hire.
- Calibrate the model to the United Kingdom using LFS microdata.

Main results

- Aligning the distribution of public sector wages with the private sector reduces steady-state unemployment rate by 1.9 percentage points, particularly of the low-ability unskilled.
  - Reduces the distortions in the labour market.
  - Gives the incentive for governments to hire more unskilled workers.
  - Gives the ability for governments to hire more skilled workers.
- The reform can reduce inequality.
Model
Setting

Population 1

Skilled \( \bar{h} \) [\( z^h \)]

Unskilled \( \bar{\mu} \) [\( z^\mu \)]

Assumption 1: segmented markets

Microfoundations

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Labour market for each type

**Assumption 2**: directed search

- Value of working in the two sectors \( (w_{t+1}^{p,i}, w_{t+1}^{g,i}, \lambda^{p,i}, \lambda^{g,i}) \)
- Probability of finding a job \( (v_{t+1}^{p,i}, v_{t+1}^{g,i}) \)
- Idiosyncratic preference for the public sector \( (\gamma_t^i \sim \Gamma) \)
Household
- Accumulate capital ($K_t$)
- Choose consumption ($c_t$)
- Search of unemployed members ($s_{ti}$)

Intermediate producers
- Post vacancies $v_{ti}^P$ [free entry in 4 submarkets]
- Matched firms rent capital [complement to skills]
- Nash bargaining for wages

Final good producer
- Buys 4 inputs in competitive markets
- Produces final good $Y_t = F(x_t)$

Government
- Exogenous wage schedule
- Produces services with workers $\bar{g} = g(I^g_t)$
- Chooses vacancies to minimize costs
- Pay unemployment benefit $\chi_b$
- Buy intermediate goods $\bar{g}^{int}$
- Collect taxes (income and lump-sum)

\[
Y_t = c_t + \bar{g}^{int} + K_{t+1} - (1 - \delta)K_t + \sum_i \sum_j \omega^i v^{j, i} \kappa^{j, i} \\
GDP_t = Y_t + \sum_i \omega^i l^g_i w^g_i
\]
Decentralised Equilibrium

Definition

Given a sequence of policies of public wages $\{w^g_{i,t}, \forall i\} _{t=0} ^{\infty}$, unemployment benefits $\chi^b$, government services $\bar{g}$, intermediate purchases $\bar{g}^{int}$ and income tax $\bar{\tau}$ and a set of initial conditions $\{K_0, l_0^p, l_0^g, \forall i\}$; a decentralised equilibrium is a sequence of prices $\{r_t, w^p_{t,i}, p^x_{t,i}, \forall i\} _{t=0} ^{\infty}$ and allocations $\{K_{t+1}, C_t, k_t^i, v^p_{t,i}, v^g_{t,i}, s_t^i, \forall i\} _{t=0} ^{\infty}$ such that:

1- Representative household satisfies the Euler Equation.
2- Unemployed members of type $i$ choose which sector to search.
3- Matched intermediate goods’ firms choose optimal capital for each type.
4- Free entry of intermediates goods’ firms.
5- Private sector wages are the outcome of Nash bargaining.
6- Wholesale representative firm maximizes profits.
7- Government minimizes the cost of producing services.
8- Lump-sum taxes balance the budget.
9- Intermediate goods, final good and capital markets clear.
Calibration
Calibration

Country: United Kingdom

Frequency: quarterly


\[
F(x_t) = \left( \Psi((x_t^h)^{\varrho} + (x_t^{\mu})^{\varrho})^{\frac{s}{\varrho}} + (1 - \Psi)((x_t^{\mu})^{\varrho} + (x_t^{\mu})^{\varrho})^{\frac{s}{\varrho}} \right)^{\frac{1}{s}}
\]

\[
g(l_{t+1}^g) = \left( \Phi((\omega^h z_{t+1}^g)^{\varrho} + (\omega^{h} z_{t+1}^g)^{\varrho})^{\frac{s}{\varrho}} + (1 - \Phi)((\omega^{\mu} z_{t+1}^g)^{\varrho} + (\omega^{\mu} z_{t+1}^g)^{\varrho})^{\frac{s}{\varrho}} \right)^{\frac{1}{s}}
\]
Share of educated workers

**Figure:** Share of college graduates in labour force

\[ \bar{\omega} h = \omega h = 0.16 \text{ and } \bar{\omega} \mu = \omega \mu = 0.34 \]  

[Robustness]
Government production and services

Steady-state level of government services ($\bar{g}$)
Importance of skill in production ($\Phi$)

**Figure:** Public employment by skill

<table>
<thead>
<tr>
<th>Year</th>
<th>College graduates</th>
<th>Without college</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996q1</td>
<td>Mean: 37.3%</td>
<td></td>
</tr>
<tr>
<td>2000q1</td>
<td></td>
<td>Mean: 16.7%</td>
</tr>
<tr>
<td>2004q1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008q1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Separation rates

Figure: Separation rates

(a) College degree

\[ \lambda^{p,h} = 0.012, \lambda^{p,\mu} = 0.017, \lambda^{g,h} = 0.004, \lambda^{p,\mu} = 0.006. \]

(b) Without college
Method: quantile regressions of log net wages

Table: Estimation of public sector wage premium

<table>
<thead>
<tr>
<th>Education</th>
<th>Percentile</th>
<th>R-squared</th>
<th>Estimated Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>College educated</td>
<td>75</td>
<td>0.375</td>
<td>0.016</td>
</tr>
<tr>
<td>Obs: 84236</td>
<td>25</td>
<td>0.456</td>
<td>0.039</td>
</tr>
<tr>
<td>Without college degree</td>
<td>75</td>
<td>0.488</td>
<td>0.037</td>
</tr>
<tr>
<td>Obs: 209740</td>
<td>25</td>
<td>0.595</td>
<td>0.071</td>
</tr>
</tbody>
</table>

Note: quantile regression of log net wages on several control variables and a dummy for public sector. Controls include: sex, industry and occupation dummies, status in previous quarter, tenure, age and its square, marital status, time and region dummies, average hours worked and its square. The sample from 1996 to 2006.

\[
\begin{align*}
\frac{w_{g,h}}{w_{p,h}} &= 1.016, \quad \frac{w_{g,h}}{w_{p,h}} = 1.039, \quad \frac{w_{g,\bar{h}}}{w_{p,\bar{h}}} = 1.037 \text{ and } \frac{w_{g,\bar{h}}}{w_{p,\bar{h}}} = 1.071
\end{align*}
\]

[Robustness]
Labour market frictions

Cost of posting vacancies and matching efficiency

Table: Cost per hire and vacancy duration by sector and worker type

<table>
<thead>
<tr>
<th>Type of worker</th>
<th>Cost per hire (£)</th>
<th>Vacancy duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Managers - Directors</td>
<td>13396</td>
<td>18963</td>
</tr>
<tr>
<td>Managers and professionals</td>
<td>8049</td>
<td>12392</td>
</tr>
<tr>
<td>Administrative, Secretarial and Technical Services (costumer, personal and sales)</td>
<td>3680</td>
<td>5628</td>
</tr>
<tr>
<td>Manual, craft workers</td>
<td>4564</td>
<td>1398</td>
</tr>
<tr>
<td></td>
<td>2498</td>
<td>2978</td>
</tr>
</tbody>
</table>


Matching elasticities: estimated by Gomes (2014), using JOLTS data.

\[
\begin{align*}
\kappa_{p,h}^{p} & = 1.35, \quad \kappa_{g,h}^{g} = 0.90, \quad \kappa_{p,\mu}^{p} = 0.14, \quad \kappa_{g,\mu}^{g} = 0.13 \\
\zeta_{g,h}^{g} & = 0.73, \quad \zeta_{p,h}^{p} = 0.56, \quad \zeta_{g,\mu}^{g} = 0.99 \text{ and } \zeta_{p,\mu}^{p} = 0.98 \\
\eta^{p} & = 0.4 \text{ and } \eta^{g} = 0.15
\end{align*}
\]
Flow value of unemployment

- Unemployment benefits ($\chi^b = 0.21$) $\rightarrow$ replacement rate of the low ability unskilled worker is 60 percent of the net wage [Salomaki and Munzi (1999)].
- Home production ($\chi^u = 0.37$) $\rightarrow$ unemployment rate of unskill workers.
- Bargaining power of workers ($b = 0.35$) $\rightarrow$ the overall unemployment rate.

**Figure:** Unemployment rate

Note: the flow value of unemployment is 40, 56-58 and 77 percent of the net wage.
College premium

The parameter of the private production function $\Psi$ targets a college premium of 40 percent.

Regress log net wages on a dummy for college education, on average hours and its square

- Estimated coefficient: 0.394
- R-squared=0.64
- Observations=312070
Wage dispersion

\[ z^h = z^\bar{\mu} = 1: \text{Normalization.} \]
\[ z^\mu, z^h \rightarrow \text{measure of wage dispersion.} \]

Table: Estimation of inter-quantile wage residual

<table>
<thead>
<tr>
<th>Education</th>
<th>R-squared</th>
<th>Obs.</th>
<th>25-75 percentile residual difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total (100%)</td>
</tr>
<tr>
<td>College educated</td>
<td>0.600</td>
<td>44133</td>
<td>0.461</td>
</tr>
<tr>
<td>Without college degree</td>
<td>0.595</td>
<td>209740</td>
<td>0.416</td>
</tr>
</tbody>
</table>

Note: regression of the log of net wages on several control variables: sex, industry and occupation dummies, status in previous quarter, tenure, age and its square, marital status, time and region dummies, average hours worked and its square. The sample from 1996 to 2006. The fourth column reports the 25-75 percentile difference of wage residuals.

Is all wage dispersion due to unobserved heterogeneity?

• Benchmark: 80% of difference is due to unobserved heterogeneity.

Robustness : 100% and 20%
Remaining parameters

Technology parameters

- Elasticity of output w.r.t capital ($\alpha = 0.34$) → labour share of 61.8%.

- Elasticity of substitution
  - 1 between skilled and unskilled input. [Robustness]
  - 2 between high and low ability. [Robustness]

Standard parameters

- Discount factor ($\beta = 0.99$).
- Risk aversion ($\sigma = 2$).
- Depreciation rate ($\delta = 0.02$).
- Income tax ($\bar{\tau} = 0.2$).
- Purchase of intermediate inputs ($\bar{g}^{int} = 0.034$) → gov. consumption is 20 % of GDP
Distribution of public sector preferences

Benchmark: Γ has a uniform distribution $[\nu_1, \nu_2]$

Google Trends: Indexes of keyword searches

- Index of “Jobs”
- Compound index for the public sector.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Relative importance in index</th>
</tr>
</thead>
<tbody>
<tr>
<td>nhs jobs</td>
<td>46%</td>
</tr>
<tr>
<td>council jobs</td>
<td>32%</td>
</tr>
<tr>
<td>jobs in nhs</td>
<td>5%</td>
</tr>
<tr>
<td>gov jobs</td>
<td>4%</td>
</tr>
<tr>
<td>public jobs</td>
<td>4%</td>
</tr>
<tr>
<td>direct gov jobs</td>
<td>2%</td>
</tr>
<tr>
<td>government jobs</td>
<td>2%</td>
</tr>
<tr>
<td>army jobs</td>
<td>2%</td>
</tr>
<tr>
<td>local government jobs</td>
<td>1%</td>
</tr>
<tr>
<td>raf jobs</td>
<td>1%</td>
</tr>
</tbody>
</table>
Distribution of public sector preferences

**Figure:** Google indexes

(a) Original indexes

(b) Search in public sector

**Benchmark:** $\bar{s} = 0.14$ and $\nu_2 - \nu_1 = 2 \times \bar{w}$

**Robustness:**
Results
S.S. Effects of skilled public sector wages

Unemployment Rate

Public sector employment

Public employment: share of high ability

Private sector wages (relative to baseline)

Share of unemployed searching in public sector

Government spending (% GDP)

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S.S. Effects of unskilled public wages

Unemployment Rate

Public sector employment

Public employment: share of high ability

Private sector wages (relative to baseline)

Share of unemployed searching in public sector

Government spending (% GDP)

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Heterogeneity and the Public Wage Policy
Welfare effects

Figure: Welfare effects of public sector wages adjustments

Welfare change from baseline

(a) Lump-sum taxes

(b) Distortionary taxes
### Steady-state effects of the reform

<table>
<thead>
<tr>
<th>Variables</th>
<th>Lump-Sum Taxes</th>
<th>Distortionary Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public-private wage premium Baseline</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>0.060</td>
<td>0.041</td>
</tr>
<tr>
<td>Skilled</td>
<td>0.030</td>
<td>0.024</td>
</tr>
<tr>
<td>High-ability</td>
<td>0.021</td>
<td>0.018</td>
</tr>
<tr>
<td>Low-ability</td>
<td>0.040</td>
<td>0.031</td>
</tr>
<tr>
<td>Unskilled</td>
<td>0.074</td>
<td>0.048</td>
</tr>
<tr>
<td>High-ability</td>
<td>0.015</td>
<td>0.008</td>
</tr>
<tr>
<td>Low-ability</td>
<td>0.133</td>
<td>0.088</td>
</tr>
<tr>
<td>Consumption</td>
<td>-</td>
<td>+1.94%</td>
</tr>
<tr>
<td>Welfare Gains</td>
<td>-</td>
<td>1.47%</td>
</tr>
</tbody>
</table>

*Note: model simulations under the baseline calibration. ** given in percent of GDP.*
## Steady-state effects of the reform

<table>
<thead>
<tr>
<th>Variables</th>
<th>Lump-Sum Taxes</th>
<th>Distortionary Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

### Public-private wage premium

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>Lump-Sum Taxes</th>
<th>Distortionary Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public employment</td>
<td>0.233</td>
<td>0.236</td>
<td>0.236</td>
</tr>
<tr>
<td>Skilled</td>
<td>0.373</td>
<td>0.368</td>
<td>0.368</td>
</tr>
<tr>
<td>High-ability</td>
<td>0.391</td>
<td>0.394</td>
<td>0.394</td>
</tr>
<tr>
<td>Low-ability</td>
<td>0.355</td>
<td>0.342</td>
<td>0.342</td>
</tr>
<tr>
<td>Unskilled</td>
<td>0.167</td>
<td>0.174</td>
<td>0.174</td>
</tr>
<tr>
<td>High-ability</td>
<td>0.174</td>
<td>0.174</td>
<td>0.173</td>
</tr>
<tr>
<td>Low-ability</td>
<td>0.160</td>
<td>0.174</td>
<td>0.175</td>
</tr>
</tbody>
</table>

### Government*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>Lump-Sum Taxes</th>
<th>Distortionary Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage bill</td>
<td>0.165</td>
<td>0.158</td>
<td>0.158</td>
</tr>
<tr>
<td>+ recruitment costs</td>
<td>0.165</td>
<td>0.159</td>
<td>0.158</td>
</tr>
<tr>
<td>+ unemployment benefits</td>
<td>0.179</td>
<td>0.168</td>
<td>0.166</td>
</tr>
<tr>
<td>Income taxes</td>
<td>0.2</td>
<td>0.2</td>
<td>0.186</td>
</tr>
</tbody>
</table>

### Implied public [private] sector wage change

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>Lump-Sum Taxes</th>
<th>Distortionary Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled (high-ability)</td>
<td>-</td>
<td>0.5% [1.1%]</td>
<td>1.7% [3.4%]</td>
</tr>
<tr>
<td>Skilled (low-ability)</td>
<td>-</td>
<td>-5.1% [-1.4%]</td>
<td>-3.1% [0.7%]</td>
</tr>
<tr>
<td>Unskilled (high-ability)</td>
<td>-</td>
<td>-3.1% [0.4%]</td>
<td>-1.5% [2.2%]</td>
</tr>
<tr>
<td>Unskilled (low-ability)</td>
<td>-</td>
<td>-8.1% [-1.6%]</td>
<td>-8.1% [-1.5%]</td>
</tr>
</tbody>
</table>

Note: model simulations under the baseline calibration.

* given in percent of GDP.

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Heterogeneity and the Public Wage Policy
Robustness

- Elasticity of substitution between abilities [both sectors, only public sector] 
  \((\rho = 0.8, \rho = 0.3)\)

- Elasticity of substitution between skills [both sectors, only public sector] 
  \((\varsigma = -0.4, \varsigma = 0.4)\)

- Search in public sector 
  \((s = 0.07, s = 0.21)\)

- Dispersion in preferences for public sector 
  \((\nu_2 - \nu_1 = 3 \times \bar{w}, \nu_2 - \nu_1 = 0.2 \times \bar{w})\)

- Share of skilled in economy 
  \((\omega^h = \omega^h = 0.125, \omega^h = \omega^h = 0.20)\)

- Heterogeneity in ability 
  \((\bar{w}^p,\bar{h} / \bar{w}^p,\bar{h} = 1.09, \bar{w}^p,\bar{\mu} / \bar{w}^p,\bar{\mu} = 1.08, \bar{w}^p,\bar{h} / \bar{w}^p,\bar{h} = 1.46, \bar{w}^p,\bar{\mu} / \bar{w}^p,\bar{\mu} = 1.42)\)

- Lower baseline premium 
  \((\bar{w}^g,\bar{h} / \bar{w}^p,\bar{h} = 0.986, \bar{w}^g,\bar{h} / \bar{w}^p,\bar{h} = 1.009, \bar{w}^g,\bar{\mu} / \bar{w}^p,\bar{\mu} = 1.007, \bar{w}^g,\bar{\mu} / \bar{w}^p,\bar{\mu} = 1.041)\)

- No dispersion in premium 
  \((\bar{w}^g,\bar{h} / \bar{w}^p,\bar{h} = 1.03, \bar{w}^g,\bar{h} / \bar{w}^p,\bar{h} = 1.03, \bar{w}^g,\bar{\mu} / \bar{w}^p,\bar{\mu} = 1.03, \bar{w}^g,\bar{\mu} / \bar{w}^p,\bar{\mu} = 1.03)\)
## Robustness

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Lump-sum taxes</th>
<th></th>
<th>Distortionary taxes</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unemployment rate</td>
<td>Consumption</td>
<td>Welfare</td>
<td>Unemployment rate</td>
<td>Consumption</td>
</tr>
<tr>
<td>Elasticity of substitution between abilities [both sectors]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\zeta = 0.4$</td>
<td>-2.0pp</td>
<td>1.9%</td>
<td>1.4%</td>
<td>-2.8pp</td>
<td>3.8%</td>
</tr>
<tr>
<td>$\zeta = -0.4$</td>
<td>-1.8pp</td>
<td>1.9%</td>
<td>1.5%</td>
<td>-2.6pp</td>
<td>3.7%</td>
</tr>
<tr>
<td>Elasticity of substitution between abilities [only public sector]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\zeta^g = 0.4$</td>
<td>-2.0pp</td>
<td>1.9%</td>
<td>1.4%</td>
<td>-2.8pp</td>
<td>3.7%</td>
</tr>
<tr>
<td>$\zeta^g = -0.4$</td>
<td>-1.8pp</td>
<td>1.9%</td>
<td>1.5%</td>
<td>-2.6pp</td>
<td>3.8%</td>
</tr>
<tr>
<td>Elasticity of substitution between skills [both sectors]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\varrho = 0.8$</td>
<td>-2.3pp</td>
<td>2.3%</td>
<td>1.8%</td>
<td>-3.2pp</td>
<td>4.5%</td>
</tr>
<tr>
<td>$\varrho = 0.3$</td>
<td>-1.7pp</td>
<td>1.8%</td>
<td>1.3%</td>
<td>-2.4pp</td>
<td>3.5%</td>
</tr>
<tr>
<td>Elasticity of substitution between skills [only public sector]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\varrho^g = 0.8$</td>
<td>-1.9pp</td>
<td>1.9%</td>
<td>1.5%</td>
<td>-2.7pp</td>
<td>3.7%</td>
</tr>
<tr>
<td>$\varrho^g = 0.3$</td>
<td>-1.9pp</td>
<td>1.9%</td>
<td>1.5%</td>
<td>-2.7pp</td>
<td>3.8%</td>
</tr>
<tr>
<td>Search in the public sector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{s} = 0.07$</td>
<td>-1.3pp</td>
<td>1.3%</td>
<td>1.0%</td>
<td>-2.0pp</td>
<td>3.0%</td>
</tr>
<tr>
<td>$\bar{s} = 0.21$</td>
<td>-2.1pp</td>
<td>2.1%</td>
<td>1.6%</td>
<td>-2.9pp</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

Note: model simulations under alternative calibrations. For each scenario the model was recalibrated according to Section 3. The table reports the steady-state change of implementing a zero public sector wage premium for all workers relative to baseline of: unemployment rate (percentage points), consumption (percent) and welfare (percent of consumption equivalent variation).
Robustness

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Lump-sum taxes</th>
<th></th>
<th>Distortionary taxes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unemployment</td>
<td>Consumption</td>
<td>Welfare</td>
<td>Unemployment</td>
</tr>
<tr>
<td></td>
<td>rate</td>
<td></td>
<td></td>
<td>rate</td>
</tr>
<tr>
<td><strong>Dispersion in preferences for public sector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\nu_2 - \nu_1 = 3 \times \bar{w}$</td>
<td>-2.0pp</td>
<td>2.0%</td>
<td>1.5%</td>
<td>-2.8pp</td>
</tr>
<tr>
<td>$\nu_2 - \nu_1 = 0.2 \times \bar{w}$</td>
<td>-1.4pp</td>
<td>1.5%</td>
<td>1.1%</td>
<td>-2.2pp</td>
</tr>
<tr>
<td><strong>Share of skilled workers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\omega^h = \omega^h = 0.125$</td>
<td>-2.3pp</td>
<td>2.2%</td>
<td>1.6%</td>
<td>-3.3pp</td>
</tr>
<tr>
<td>$\omega^h = \omega^h = 0.20$</td>
<td>-1.6pp</td>
<td>1.7%</td>
<td>1.3%</td>
<td>-2.2pp</td>
</tr>
<tr>
<td><strong>Heterogeneity in ability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{w}<em>{p,i} / \bar{w}</em>{p,i} = 1.09 - 1.08$</td>
<td>-2.2pp</td>
<td>2.6%</td>
<td>2.0%</td>
<td>-3.2pp</td>
</tr>
<tr>
<td>$\bar{w}<em>{p,i} / \bar{w}</em>{p,i} = 1.46 - 1.42$</td>
<td>-1.9pp</td>
<td>1.8%</td>
<td>1.4%</td>
<td>-2.6pp</td>
</tr>
<tr>
<td><strong>Lower average premium</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline=3%</td>
<td>-0.7pp</td>
<td>0.8%</td>
<td>0.6%</td>
<td>-1.0pp</td>
</tr>
<tr>
<td>No dispersion in premium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium=3%</td>
<td>-1.3pp</td>
<td>1.3%</td>
<td>0.9%</td>
<td>-1.9pp</td>
</tr>
</tbody>
</table>

Note: model simulations under alternative calibrations. For each scenario the model was recalibrated according to Section 3. The table reports the steady-state change of implementing a zero public sector wage premium for all workers relative to baseline of: unemployment rate (percentage points), consumption (percent) and welfare (percent of consumption equivalent variation).
How about inequality?

*Why is the public sector wage distribution so distorted?*

*Why is it hard to defend cutting the lowest public sector wages?*

**Key insight:**

- The government has a redistributive role, but not all instruments have to be redistributive (Mirlees report).

- If the government wants to fight inequality, it should use the income tax system, or potentially, other regulatory policy (minimum wage).

- Using public sector wages does not solve the problem, and creates inefficiencies in the labour market.

\[
\Omega_i^t = I_t^{p,i} W_t^{p,i} + I_t^{g,i} W_t^{g,i} + u_t^i U_t^i, \quad \forall i. \tag{1}
\]
## Effects of reform on inequality

<table>
<thead>
<tr>
<th>Public-private wage premium</th>
<th>Baseline</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taxation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital tax rate</td>
<td>0.200</td>
<td>0.186</td>
<td>0.200</td>
<td>0.200</td>
</tr>
<tr>
<td>Income tax rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skilled (high-ability)</td>
<td>0.200</td>
<td>0.186</td>
<td>0.177</td>
<td>0.200</td>
</tr>
<tr>
<td>Skilled (low-ability)</td>
<td>0.200</td>
<td>0.186</td>
<td>0.177</td>
<td>0.200</td>
</tr>
<tr>
<td>Unskilled (high-ability)</td>
<td>0.200</td>
<td>0.186</td>
<td>0.177</td>
<td>0.200</td>
</tr>
<tr>
<td>Unskilled (low-ability)</td>
<td>0.200</td>
<td>0.186</td>
<td>0.177</td>
<td>0.074</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>0.060</td>
<td>0.033</td>
<td>0.032</td>
<td>0.018</td>
</tr>
<tr>
<td>Consumption</td>
<td>3.854</td>
<td>+3.8%</td>
<td>+2.9%</td>
<td>+4.4%</td>
</tr>
<tr>
<td>Welfare Gains</td>
<td>-</td>
<td>3.1%</td>
<td>2.2%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Labour market value of type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skilled (high-ability)</td>
<td>642</td>
<td>+5.1%</td>
<td>+4.6%</td>
<td>+3.1%</td>
</tr>
<tr>
<td>Skilled (low-ability)</td>
<td>457</td>
<td>+0.5%</td>
<td>+0.0%</td>
<td>-1.1%</td>
</tr>
<tr>
<td>Unskilled (high-ability)</td>
<td>410</td>
<td>+3.5%</td>
<td>+3.2%</td>
<td>+1.0%</td>
</tr>
<tr>
<td>Unskilled (low-ability)</td>
<td>303</td>
<td>+1.5%</td>
<td>+1.0%</td>
<td>+10.3%</td>
</tr>
</tbody>
</table>
Conclusion

I propose a reform of public sector wage:

- Aligning the distribution of public sector wages with the private sector reduces steady-state unemployment rate by 1.9 percentage points, particularly of the low-ability unskilled.
  - Reduces the distortions in the labour market.
  - Gives the incentive for governments to hire more unskilled workers.
  - Gives the ability for governments to hire more skilled workers.

- With such substantial gains, why don’t governments implement it?
  - Worry about inequality.
  - Political economy issues.
Additional results
Adverse selection with labour market friction

- Guerrieri, Shimer and Wright (2010), use hours worked as the self-selection mechanism (disutility of work).

- Michelacci and Suarez (2006), use the wage setting (wage posting attracts the low type and wage bargaining attract the high type)

- Fernandez-Blanco and Gomes (2013) use capital as the self-selection mechanism.
Households

Consumption is pooled between the members of the household (Merz, 1995). Preferences are:

\[ E_0 \sum_{t=0}^{\infty} \beta^t \left[ \frac{c_t^{1-\sigma}}{1-\sigma} + \chi^u u_t \right], \]

Budget constraint:

\[ c_t + K_{t+1} = (1-\delta)K_t + (1-\tau_t) \left( r_t K_t + \sum_j \sum_i \omega^i w_{t,ij} l_{t,ij} \right) + \sum_i \omega^i \chi^g u_t + \Pi_t, \]

Optimality conditions:

\[ u_c(c_t) = \beta E_t[u_c(c_{t+1})(1-\delta + r_{t+1}(1-\tau_{t+1})]], \quad (2) \]

\[ \chi_t^u = \frac{\chi^u}{u_c(c_t)} \quad (3) \]

Pedro Gomes, UC3M  Heterogeneity and the Public Wage Policy
Households members: value functions

\[ W_{t}^{j,i} = (1 - \tau_{t}) W_{t}^{j,i} + E_{t} \beta_{t,t+1} [(1 - \lambda_{j,i}) W_{t+1}^{j,i} + \lambda_{j,i} U_{t+1}^{i}], \quad \forall i,j, \quad (4) \]

\[ U_{t}^{j,i} = \chi_{t}^{u} + \chi_{t}^{b} + E_{t} \beta_{t,t+1} [f_{t}^{j,i} W_{t+1}^{j,i} + (1 - f_{t}^{j,i}) U_{t+1}^{i}], \quad \forall i,j, \quad (5) \]

Unemployed choose which sector to search

\[ U_{t}^{p,i} = U_{t}^{g,i} + \gamma_{t}^{i}, \quad \forall i. \quad (6) \]

\( \gamma_{t}^{i} \): random variable with cumulative distribution \( \Gamma \) (idiosyncratic preference for the public sector).

**Shortcut**: without it search is too responsive.
Households members

$\gamma^i_*, t$: the cut-off point of the distribution given by:

$$\gamma^i_*, t = f^p, i_t E_t \beta_{t,t+1} [W^p, i_{t+1} - U^i_{t+1}] - f^g, i_t E_t \beta_{t,t+1} [W^g, i_{t+1} - U^i_{t+1}], \ \forall i. \ (7)$$

The fraction on unemployed searching in the public sector $s^i_t$ is:

$$s^i_t \equiv \frac{u^g, i_t}{u^i_t} = 1 - \Gamma(\gamma^i_*, t), \ \forall i, \quad (8)$$

The ex-ante value of unemployment:

$$U^i_{t+1} = s^i_{t+1} U^g, i_{t+1} + (1 - s^i_{t+1}) U^p, i_{t+1}, \ \forall i, \quad (9)$$
Intermediate good producers

- Large continuum of firms.

- Produce one of four types of intermediate goods $x_t^i$ that is sold at price $p_t^{x,i}$.

- Pay a cost $\kappa^{p,i}$ to open vacancies $v_t^{p,i}$, in a given sub-market $i$.

- If the vacancy is filled, the firm is matched to a type-$i$ worker, chooses capital, and produces $f(a, z^i, k_t^i) = az^i(k_t^i)^\alpha$.

- $f(a, z^i, k_t^i)$ is increasing and concave in all its arguments with a positive cross partial derivative of capital and skill (there is an optimal capital for each worker).

- Surplus is shared: wages ($w_t^{p,i}$) are determined by Nash Bargaining.
Intermediate good producers

\[
V^i_t = -\kappa^p,i + E_t \beta_{t,t+1} [q^p,i J^i_{t+1} + (1 - q^p,i) V^i_{t+1}], \quad \forall i. \tag{10}
\]

\[
J^i_t = \max_{\{p^x,i, f^i(a_t, z^i, k^i_t) - w^p,i - r_t k^i_t + E_t \beta_{t,t+1} [(1 - \lambda^p,i) J^i_{t+1}]\}, \quad \forall i. \tag{11}
\]

Optimal capital:

\[
p^x,i f^i_k(a_t, z^i, k^{*i}_t) = r_t, \quad \forall i. \tag{12}
\]
Intermediate good producers

\[ V_t^i = -\kappa^{p,i} + E_t \beta_{t,t+1}[q_t^{p,i} J_{t+1}^i + (1 - q_t^{p,i}) V_{t+1}^i], \quad \forall i. \quad (13) \]

\[ J_t^i = p_t^{x,i} f^i(a_t, z^i, k_t^{*i}) - w_t^{p,i} - r_t k_t^{*i} + E_t \beta_{t,t+1}[(1 - \lambda^{p,i}) J_{t+1}^i], \quad \forall i. \quad (14) \]

Optimal capital:

\[ p_t^{x,i} f_k^i(a_t, z^i, k_t^{*i}) = r_t, \quad \forall i. \quad (15) \]
Intermediate good producers

Private sector vacancies satisfy the free entry condition: $V_t = 0$, $\forall i$.

Nash wage bargaining between workers and firms:

$$(W_t^{p,i} - U_t^i) = \frac{b(1 - \tau_t^l)}{1 - b\tau_t^l} (W_t^{p,i} - U_t^i + J_t^i), \quad \forall i.$$  

(16)
Wholesale firm

- Buys the 4 intermediate goods to produce a wholesale good

\[
\max_{x_t} [F(x_t) - \sum_i \tilde{p}^{x,i} x_t^i], \quad (17)
\]

\[
F'_{xi} = \tilde{p}^{x,i}, \quad \forall i. \quad (18)
\]

\[
F(x_t) = \left( \frac{1}{\varsigma} \right) \left[ \underbrace{\Psi((x_{ht}^{\bar{h}})^{\varrho} + (x_{ht}^{h})^{\varrho})}_{\text{Skilled}} + \underbrace{(1 - \Psi)((x_{ht}^{\bar{u}})^{\varrho} + (x_{ht}^{u})^{\varrho})}_{\text{Unskilled}} \right]^{\frac{1}{\varsigma}}
\]
• Needs to produce a minimum level of services $\bar{g}$.

• Wages $w^{g,i}$ are the exogenous policy variables.

• Chooses the vacancies of each type of worker at time $t$ to minimize the total cost of providing the government services.

\[
\min_{v^{g,i}_t} \sum_i \omega^i \kappa^i v^{g,i}_t + \beta_{t,t+1} \left[ \sum_i \omega^i w^{g,i}_{t+1} l^{g,i}_{t+1} \right]
\]

s.t.
\[
\bar{g} = g(l^{g}_{t+1})
\]
\[
l^{g,i}_{t+1} = (1 - \lambda^{j,i})l^{g,i}_t + q^{g,i}_t v^{g,i}_t, \quad \forall i.
\]

Two opposite effects of public wages

• Wage bill effect.

• Recruitment effect.
First-order conditions:

\[
\frac{\omega_i \kappa_i g_i}{q_{t}} + E_t \beta_{t,t+1} [\omega^i w_{t+1}^g] = \zeta_t E_t g_{i,t+1}, \ \forall i
\]  

(19)

**Spending**: wage bill, recruitment costs, unemployment benefits and exogenous purchases of goods.

**Revenue**: income taxes (distort the wage bargaining and capital accumulation) and lump-sum taxes (balance the budget).

\[
\tau_t \left( \sum_j \sum_i \omega^i l^j_i w^j_i + r_t K_t \right) + T_t = \sum_i \omega^i l^g_i w^g_i + \sum_i \omega^i v^g_i + \sum_i \chi^b \omega^i u_i + \bar{g}^{\text{int}},
\]

(20)
Market Clearing

Intermediate goods

\[ x_t^i = \omega^i l_t^{p,i} f^i(a_t, z^i, k_t^i), \quad \forall i, \]  

(21)

Final good

\[ Y_t = F(x_t) = c_t + \bar{g}^{int} + K_{t+1} - (1 - \delta)K_t + \sum_i \sum_j \omega^i v_t^{j,i} \kappa^{j,i}. \]  

(22)

Capital

\[ K_t = \sum_i \omega^i k_t^{p,i}. \]  

(23)