Using Social Norms to Estimate the Effect of Collective Bargaining on the Wage Structure

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Why is this interesting?

- Positive union wage premium not mirrored by productivity advantages of employees covered by a collective bargaining agreement may lead firms to reduce employment.
- Too low degree of wage flexibility reduces incentives to invest in human capital.
Collective wage bargaining at the industry level predominant system for wage determination in Germany.

Wages are determined by collective bargaining between unions and employers’ associations at the industry level. Agreements are only binding for firms belonging to such an employers’ association.

In 2001: 70% of workers are covered by a collective wage bargaining agreement (but recently sharp decline, Antonczyk/Fitzenberger/Sommerfeld, 2010).
Unconditional on average +9.6 log points, conditional (OLS) still +4.0 log points.

In addition, it has been found that collective bargaining compresses the wage structure (Burda et al., 2008; Dustmann and Schönberg, 2009).

Basically same findings for the U.S., although bargaining takes place at the firm level (in Germany this applies to only 7 percent of the workforce).

No study for Germany accounts for possible selection based on unobservables (of workers and employers) into collective bargaining and heterogeneous treatment effects when looking at either the level or the dispersion of wages.
In this study, I estimate the causal effect of collective wage bargaining

- on the average wage (using Marginal Treatment Effects).
- on the dispersion of wages (using pairwise matching procedure).

Main results:

- Causal effect of collective bargaining on level of wages is very close to zero.
- Positive selection on observables and unobservables.
- Collective bargaining has diminishing effect on wage inequality.
- Overall: impact on the level is small, but unions seem to be successful in compressing the wage structure.
Data

- Linked employer-employee data set, administrative character.
- Random sample of all German firms with at least ten employees, focus on private sector.
- Information on bargaining regime.
- Use full-time employed males in West Germany, aged 25-55.
- 210,000 employees, 16,000 firms.
- Logarithmized gross hourly wage.
## Data Description: Individual Level

### Table: Descriptive statistics

<table>
<thead>
<tr>
<th>Individual level</th>
<th>Collective wage bargaining</th>
<th>Individual wage bargaining</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Stdd.</td>
</tr>
<tr>
<td>Wage</td>
<td>17.82</td>
<td>7.15</td>
</tr>
<tr>
<td>Log wage</td>
<td>2.81</td>
<td>.35</td>
</tr>
<tr>
<td>Age</td>
<td>39.87</td>
<td>8.03</td>
</tr>
<tr>
<td>Tenure</td>
<td>10.93</td>
<td>9.33</td>
</tr>
<tr>
<td>Low education</td>
<td>.15</td>
<td>.36</td>
</tr>
<tr>
<td>Medium education</td>
<td>.68</td>
<td>.46</td>
</tr>
<tr>
<td>High education</td>
<td>.10</td>
<td>.30</td>
</tr>
<tr>
<td>Education n/a</td>
<td>.05</td>
<td>.22</td>
</tr>
<tr>
<td>No. of observations</td>
<td>132,833</td>
<td>77,638</td>
</tr>
</tbody>
</table>

All statistics are weighted by the inverse sampling probability.
Data Description: Firm Level

**Table: Descriptive statistics**

<table>
<thead>
<tr>
<th>Firm level</th>
<th>Share collective bargaining</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>10 - 99 employees</td>
<td>.46</td>
</tr>
<tr>
<td>100 - 199 employees</td>
<td>.63</td>
</tr>
<tr>
<td>200 - 999 employees</td>
<td>.72</td>
</tr>
<tr>
<td>1000 - 1999 employees</td>
<td>.76</td>
</tr>
<tr>
<td>&gt; 1999 employees</td>
<td>.87</td>
</tr>
</tbody>
</table>

No. of observations 210,471

All statistics are weighted by the inverse sampling probability.

Other variables on the firm level: Region (Bundesland), Sector (22 industries), Share male employees, Mainly publicly owned.
Econometric Approach, Heckman and Vytlacil (2005)

Wages are functions of observable characteristics $X$ and an unobservable component $U$.

\[ Y_1 = \mu_1(X) + U_1 \quad \text{(Wage if treated)} \]
\[ Y_0 = \mu_0(X) + U_0 \quad \text{(Wage if not treated)} \]

- Treatment effect: $\Delta = Y_1 - Y_0$ not observable. $U_1$ and $U_0$ ($U_1 \neq U_0$) are known by the individual but not by the data-analyst.

- If idiosyncratic gains ($U_1 - U_0$) are correlated with the treatment choice, standard 2SLS identifies Local Average Treatment Effect (LATE).

Marginal Treatment Effect (MTE)

- Average Treatment Effect evaluated for the subpopulation which is indifferent between either receiving treatment or not.

- Can be used to recover the Average Treatment Effect (ATE) as well as the Average Treatment Effect on the Treated (ATET).
Econometric Approach, Chen and Khan (2010)

For estimating the causal effect of collective wage bargaining on the dispersion of wages, some additional assumptions are necessary. Potential outcomes are determined by a location-scale-shift model:

\[
Y_1 = \mu_1(X) + \sigma_1(X)\epsilon_1
\]
\[
Y_0 = \mu_0(X) + \sigma_0(X)\epsilon_0.
\]

- Parameter of interest is \(\sigma_1/\sigma_0\).
- Identification of this scale ratio is not straightforward, as it would require to know both potential distribution of wages for each treatment status. Comparing the conditional variances of wages does not necessarily provide the correct answer, as in general

\[
\frac{\text{Var}[Y_1|X = x, D = 1]}{\text{Var}[Y_0|X = x, D = 0]} = \frac{\sigma_1^2\text{Var}[\epsilon_1|D = 1]}{\sigma_0^2\text{Var}[\epsilon_0|D = 0]} \neq \frac{\sigma_1^2(x)}{\sigma_0^2(x)}.
\]
Econometric Approach, Dispersion of Wages

Under certain symmetry conditions imposed on the error terms in the choice and the outcome equations: can use a pairwise matching estimator for calculating $\sigma_1(x)/\sigma_0(x)$.

Construction of symmetric pairs is the key for the implementation. Pairs of individuals $i$ (treated) and $j$ (non-treated) with covariates $x$ and $z$ such that:

$$p(x_i, z_i) + p(x_j, z_j) = 1$$

are constructed. Under symmetry assumptions, these pairs of individuals share the same selection bias.
Instrumental Variables I

First set of instruments: Shares of inhabitants with Catholic, Protestant and No/Other confession at the district level.

- 319 districts in West Germany
- Strong variation of these shares within and across German states

Exogenous?

- Religion is not likely to be a choice variable (as it might be the case in the U.S.)
Influence on the decision *collective wage bargaining*

- **Social norms:** Employers of a certain religion might decide to join an employers association, because in certain regions this has traditionally been the case: *Catholic social teaching*.

- **Protestants** value institutions and mutual social control more than Catholics do, and thus should be more likely to join a union (Arruña, 2010).
Second instrument: Approximated gross union density in 1961

- Use data from the largest union in Germany in 1961, the *IG Metall* (1.85 million members in 1961), joint with information of inhabitants in 1961 at the district level and importance of the different industries.

Influence on the decision *collective wage bargaining*

- High union density during the 1960s in certain areas has created a "culture" of unionism in these regions: leads to c.p. higher collective wage bargaining rates in 2001, even for industries which are not related to the *IG Metall*.

Exogenous?

- To minimize possible confounding effects with the instrument *gross union density*, certain industries from the analysis that are likely to be influenced by the *IG Metall* are excluded from the analysis.
## Results, Level of Wages

<table>
<thead>
<tr>
<th>Method</th>
<th>Average effect</th>
<th>Robust standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLS with no control variables</td>
<td>0.096***</td>
<td>0.002</td>
</tr>
<tr>
<td>OLS with control variables</td>
<td>0.040***</td>
<td>0.001</td>
</tr>
<tr>
<td>2SLS</td>
<td>0.023***</td>
<td>0.010</td>
</tr>
<tr>
<td>LATE</td>
<td>0.024</td>
<td>0.026</td>
</tr>
<tr>
<td>ATE</td>
<td>0.006</td>
<td>0.029</td>
</tr>
<tr>
<td>ATET</td>
<td>0.014</td>
<td>0.025</td>
</tr>
</tbody>
</table>

Note: Standard errors for LATE, ATE, and ATET rely upon 100 bootstrap replications. Standard errors for OLS and IV 2SLS are calculated using White-Huber formula. 

***: Significant at the 1% level, **: Significant at the 5% level, *: Significant at the 10% level.
Results, Dispersion of Wages

Table: Effect of collective wage bargaining on dispersion of wages

<table>
<thead>
<tr>
<th></th>
<th>Average effect</th>
<th>Robust standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconditional ratio of standard deviations</td>
<td>0.848***</td>
<td>0.008</td>
</tr>
<tr>
<td>Ratio of residual standard deviations</td>
<td>0.794***</td>
<td>0.011</td>
</tr>
<tr>
<td>Average scale ratio using pairwise-matching</td>
<td>0.738***</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Note: Standard errors rely upon 100 bootstrap replications.

***: Significant at the 1% level, **: Significant at the 5% level, *: Significant at the 10% level.
Summary Results

- ATE equals 0.6 log points, which lies below OLS estimate of 4.0 log points, and unconditional 9.6 log points union wage premium.
- Positive selection into treatment, based on observables as well as unobservables: individuals undergoing treatment have a higher productivity compared to individuals not being treated.
- Significant effect of collective wage bargaining on wage dispersion: collective bargaining lowers residual standard deviation by 26%.
- Workers whose observable and unobservable characteristics involving high wage dispersion select themselves into the collective bargaining regime.
Conclusions

- This paper uses a large linked employer-employee data set to estimate the effect of collective bargaining on the structure of wages, taking into account both observed and unobserved characteristics.

- Results show that unions have only a little causal impact on the level of wages. In contrast, they are successful in compressing the wage structure, suggesting that unions concentrate their efforts on diminishing wage inequality.

- Another explanation: level of wages is taken as given by firms which are not covered by collective wage bargaining regimes, in order to attract employees.
Thank you