Taxes and Technological Determinants of Wage Inequalities: France 1976-2010

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Workshop “Incidence and labour market effects of SSCs”

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Motivation

Increase in wage inequalities in developed countries

Figure 1: International comparisons of P90/P10 log gross wage ratio: 1975-2011.

Source: OECD statistics.
Motivation
with the exception of France

**Figure 2:** International comparisons of P90/P10 log gross wage ratio: France included.

*Source: OECD statistics.*
Debated explanations

• **Demand-side explanations**
  • Skill-biased technological change (**SBTC**)
    • Katz and Murphy (1992): supply/demand model
    • Card and Lemieux (2001): experience groups nested within skill groups
Debated explanations

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  - Job polarization
    - Autor, Katz and Kearny (2006), AKK
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  - Globalization
    - Feenstra and Hanson (2002); Autor, Dorn and Hanson (2013)
  - Job polarization
    - Autor, Katz and Kearny (2006), **AKK**

- **Institutional factors**
  - Unions: Fortin and Lemieux (1997)
  - Education policies
Debated explanations
French case challenges the usual consensus

- **Emerging consensus**
  - Strong support for a demand shift towards skilled workers
    - in many countries, notably in the U.S. (AKK, 2006; Autor, 2015), the U.K. (Lindley and Machin, 2011) and Germany (Dustmann et al. 2009).
  - Limited impact of U.S. minimum wage or unions (AKK, 2006; Autor, Manning and Smith, 2016)
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  - Limited impact of U.S. minimum wage or unions (AKK, 2006; Autor, Manning and Smith, 2016)

- **French case is puzzling**
  - Even though exposed to SBTC and trade competition
  - High minimum wage may play a role but cannot explain the reduction in upper-tail inequalities
This paper

1. Compute labour cost, posted wages, and net wages measures of inequalities

- Labour cost inequalities increased in France by about 15% between 1976 and 2010
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   - Labour cost inequalities increased in France by about 15% between 1976 and 2010

2. Revisit demand-side explanations using labour cost instead of gross wages
   - That’s how it needs to be done
   - Would not change the picture in the U.S.
This paper

1. Compute labour cost, posted wages, and net wages measures of inequalities
   - Labour cost inequalities increased in France by about 15% between 1976 and 2010

2. Revisit demand-side explanations using labour cost instead of gross wages
   - That’s how it needs to be done
   - Would not change the picture in the U.S.

3. Discuss the impact of tax/SSCs on inequalities
   - Seem to have been neglected in the demand shifts vs institution debate
   - Might be an institutional tool counteracting SBTC
   - Depends on the incidence of employer SSCs
Outline

1. Data
2. SSC changes, labour cost/gross/net wage inequalities
3. Can taxation reduce net wage inequalities?
4. Preliminary conclusion
I-Data

- Déclarations Annuelles de Données Sociales (DADS), 1976-2010.
  - Administrative data based on social security records
  - Sample: 1/24 before 1993, 1/12 after 1993
  - Wage variable: annual net earnings
  - National censuses
  - Sample: 4/365
  - Educational attainment, demographic information
I-Wage concepts

- **Net wage**: $= \text{Posted wage} - \text{employee SSCs}$
  - Directly observed in DADS data (annual earnings).
- **Gross wage**: $\text{Posted wage} = \text{net wage} + \text{employee SSCs}$
  - Computed using the tax simulator of IPP, **TAXIPP**.
- **Labour cost**: total cost of the employee for the firm, $= \text{gross wage} + \text{Employer SSCs}$
  - Computed using the tax simulator of IPP, **TAXIPP**.
- **Net-of-tax wage**: net wage minus individual income tax share
  - Computed using *Enquête Revenus Fiscaux et Sociaux*
**I-SSC changes over time**

**Figure 3:** Total Social security contributions as a fraction of labour costs in the different deciles

*Sources: DADS data 1976-2010. The figure provides the ratio of the average total social security contributions (employer and employee part) to the average labour cost in each decile of the labour cost distribution.*
I-Wage inequalities: 3 measures

Figure 4: P90-P10 ratio, full-time male workers, 1976-2010

Sources: DADS data 1976-2010. The figure depicts the P90-P10 log wage gaps for net, gross and labour cost wages of male workers of the private sector working full-time full-year.
I-Wage inequalities: 3 measures

Figure 5: P90-P10 ratio, full-time male workers, 1976-2010

Sources: DADS data 1976-2010. The figure depicts the P90-P10 log wage gaps for net, gross and labour cost wages of male workers of the private sector working full-time full-year.
I-Wage inequalities: 2 more measures

Figure 6: P90-P10 ratio, full-time male workers, 1976-2010

Note: The two additional series are in terms of net of tax wage and of net wage plus contributive employer and employee SSC.
Figure 7: P90-P50 ratio, full-time male workers, 1976-2010

I-Lower-tail wage inequalities

Figure 8: P50-P10 ratio, full-time male workers, 1976-2010

### Table 1: Changes in P90/P10 by country, 1980-2010.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>2.81</td>
<td>2.88</td>
<td>3.56</td>
<td>3.96</td>
<td>0.33</td>
</tr>
<tr>
<td>U.S.</td>
<td>3.83</td>
<td>4.34</td>
<td>4.49</td>
<td>5.01</td>
<td>0.20</td>
</tr>
<tr>
<td>Sweden</td>
<td>1.96</td>
<td>1.99</td>
<td>2.35</td>
<td>2.23</td>
<td>0.20</td>
</tr>
<tr>
<td>U.K.</td>
<td>2.99</td>
<td>3.43</td>
<td>3.46</td>
<td>3.58</td>
<td>0.16</td>
</tr>
<tr>
<td>Australia</td>
<td>2.83</td>
<td>2.81</td>
<td>3.01</td>
<td>3.33</td>
<td>0.16</td>
</tr>
<tr>
<td><strong>France labour cost</strong></td>
<td>3.00</td>
<td>3.14</td>
<td>3.32</td>
<td>3.46</td>
<td>0.13</td>
</tr>
<tr>
<td>Finland</td>
<td>2.47</td>
<td>2.49</td>
<td>2.41</td>
<td>2.52</td>
<td>0.02</td>
</tr>
<tr>
<td>Japon</td>
<td>3.00</td>
<td>3.16</td>
<td>2.97</td>
<td>2.96</td>
<td>-0.01</td>
</tr>
<tr>
<td><strong>France net wage</strong></td>
<td>3.28</td>
<td>3.30</td>
<td>3.04</td>
<td>2.99</td>
<td>-0.08</td>
</tr>
</tbody>
</table>

*Notes:* net, gross and labor cost wages from the DADS data 1980-2010 for France, gross wage from the OECD for the other countries.
II-Revisiting SBTC
A simple Supply and Demand model

Aim: explaining relative wage as a function of relative supply and relative factor demand shifts

CES production function of output $Q$ with two factors:

- College equivalent workers: $c$
- High school equivalent workers: $h$

$$Q_t = \left[ \alpha_t (a_t N_{ct})^\rho + (1 - \alpha_t)(b_t N_{ht})^\rho \right]^{1/\rho}$$

Where:

- $N_{ct}$ ($N_{ht}$) is the quantity supplied of type $c$ ($h$) at $t$
- $\alpha_t$: time-varying technology parameter
- $a_t$ and $b_t$: technical change parameters
II-Labour cost wage equation

Under the hypothesis that workers are paid at their marginal product:

$$\ln\left(\frac{W_{ct}}{W_{ht}}\right) = \ln\left(\frac{\alpha_t}{1 - \alpha_t}\right) + \rho \ln\left(\frac{a_t}{b_t}\right) - \frac{1}{\sigma} \ln\left(\frac{N_{ct}}{N_{ht}}\right)$$

Where:

- $W_{ct}$ ($W_{ht}$) = labour cost of college (high school) equivalent workers
- $\sigma = \frac{1}{1 - \rho}$: aggregate elasticity of substitution between college and highschool equivalent
- $D_t$: relative demand shifts favouring college equivalents
  - Usual practice: capture the unobserved demand shift with a time trend
II-From theory to empirics (1)

**Education groups:**

1. No diploma, elementary school, junior high school, vocational basic
2. High school graduates (general and vocational advanced)
3. Some college
4. University graduates
II-From theory to empirics (1)

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**Construction of relative supply series:**

- Unskilled equivalents: $1 + 2 + 0.5 \times 3$
- Skilled equivalents: $4 + 0.5 \times 3$
II-From theory to empirics (1)

**Education groups:**

1. No diploma, elementary school, junior high school, vocational basic
2. High school graduates (general and vocational advanced)
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4. University graduates

**Construction of relative supply series:**

- Unskilled equivalents: $1 + 2 + 0.5 \times 3$
- Skilled equivalents: $4 + 0.5 \times 3$

**Construction of relative wage series:**

- Unskilled workers: 2
- Skilled workers: 4
II-From theory to empirics (2)

Data restrictions

- Supply of skilled and unskilled workers:
  - Employed men
  - Aged 26 to 65
  - 0 to 39 years of potential experience
  - Adjusted for changes in group quality (experience)

- Wages of skilled and unskilled workers:
  - Employed men
  - Aged 26 to 65
  - 0 to 39 years of potential experience
  - Private sector
  - Full-time and full-year workers
  - Adjusted for changes in group composition (experience)
II-From theory to empirics (2)

Data restrictions

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  - Private sector
  - Full-time and full-year workers
  - Adjusted for changes in group composition (experience)
II-A steady increase in relative supply

Figure 9: Relative labour supply and net wage premium: 1976 - 2008
II-A small increase in relative labour cost

Figure 10: Relative labour supply and labour cost wage premium: 1976 - 2008

## Table 2: Estimated effect of the relative supply and the time trend on the College/High School log labour cost gap

<table>
<thead>
<tr>
<th>Year removed</th>
<th>Relative supply</th>
<th>Corresponding Elasticity of substitution</th>
<th>Time trend (divided by 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.06</td>
<td>-16.7</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.41)</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>0.05</td>
<td>-20.0</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.42)</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>0.06</td>
<td>-16.7</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.41)</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>0.11</td>
<td>-9.1</td>
<td>-0.15</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.42)</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>0.07</td>
<td>-14.3</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.41)</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>0.04</td>
<td>-25.0</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.42)</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>-0.06</td>
<td>16.7</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.43)</td>
<td></td>
</tr>
</tbody>
</table>

*Notes: Standard errors in parentheses. All variables are in 2010 euros. Each row show estimates when the year indicated in the first column has been removed from the sample.*
### Regression models
**U.S. versus France**

**Table 3: College/High School log wage gap**

<table>
<thead>
<tr>
<th></th>
<th>Estimates for the U.S. from AKK 1965-2005</th>
<th>Estimates for France Log Labour cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) (2) (3)</td>
<td>(4) (5) (6)</td>
</tr>
<tr>
<td>Relative supply</td>
<td>-0.411 (-0.046)</td>
<td>-0.411 (calib.)</td>
</tr>
<tr>
<td>(CLG vs HS)</td>
<td>-0.599 (0.112)</td>
<td>-0.599 (calib.)</td>
</tr>
<tr>
<td>Log real min. wage</td>
<td>0.117 (0.047)</td>
<td>0.114 (0.107)</td>
</tr>
<tr>
<td>Unemp. Rate (males)</td>
<td>0.001 (0.004)</td>
<td>-0.002 (0.197)</td>
</tr>
<tr>
<td>Time</td>
<td>0.018 (0.001)</td>
<td>0.017 (0.000)</td>
</tr>
<tr>
<td></td>
<td>0.028 (0.006)</td>
<td>0.028 (0.000)</td>
</tr>
<tr>
<td></td>
<td>0.017 (0.002)</td>
<td>0.017 (0.000)</td>
</tr>
<tr>
<td>Time2/100</td>
<td>-0.011 (0.006)</td>
<td>-0.014 (0.004)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.043 (0.037)</td>
<td>-0.587 (0.000)</td>
</tr>
<tr>
<td></td>
<td>0.143 (0.108)</td>
<td>-1.015 (0.000)</td>
</tr>
<tr>
<td></td>
<td>0.266 (0.112)</td>
<td>-1.66 (0.018)</td>
</tr>
<tr>
<td>Observations</td>
<td>43</td>
<td>31</td>
</tr>
<tr>
<td>R2</td>
<td>0.934</td>
<td>0.987</td>
</tr>
<tr>
<td></td>
<td>0.940</td>
<td>0.993</td>
</tr>
<tr>
<td></td>
<td>0.944</td>
<td>0.987</td>
</tr>
</tbody>
</table>

**Notes:** Standard errors in parentheses. All variables are in 2010 euros. Minimum wage is labour cost terms in columns (4) to (6).
Regression models
France net versus labour cost

**Table 4: College/High School log wage gap**

<table>
<thead>
<tr>
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<th>Labour cost gap in France</th>
<th>Net wage gap in France</th>
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<tbody>
<tr>
<td></td>
<td>(1) (2) (3)</td>
<td>(4) (5) (6)</td>
</tr>
<tr>
<td>Relative supply</td>
<td>-0.411 -0.599 -0.403</td>
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<td>(CLG vs HS)</td>
<td><em>calib.</em> <em>calib.</em> <em>calib.</em></td>
<td><em>calib.</em> <em>calib.</em> <em>calib.</em></td>
</tr>
<tr>
<td>Log real min. wage</td>
<td>0.114 (0.107)</td>
<td>0.319 (0.063)</td>
</tr>
<tr>
<td>Unemp. Rate (males)</td>
<td>-0.002 -0.197</td>
<td>-0.002 (0.114)</td>
</tr>
<tr>
<td>Time</td>
<td>0.017 0.028 0.017</td>
<td>0.014 0.025 0.014</td>
</tr>
<tr>
<td></td>
<td>(0.000) (0.000) (0.000)</td>
<td>(0.000) (0.000) (0.000)</td>
</tr>
<tr>
<td>Time2/100</td>
<td>-0.000 (0.004)</td>
<td>-0.012 (0.003)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.587 -1.015 -1.66</td>
<td>-0.534 -0.960 -1.747</td>
</tr>
<tr>
<td></td>
<td>(0.000) (0.000) (0.018)</td>
<td>(0.000) (0.000) (0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>31 31 31</td>
<td>31 31 31</td>
</tr>
<tr>
<td>R2</td>
<td>0.987 0.993 0.987</td>
<td>0.987 0.993 0.988</td>
</tr>
</tbody>
</table>

*Notes:* Standard errors in parentheses. All variables are in 2010 euros. Minimum wage is net terms in columns (4) to (6) and in labour cost in columns (7) to (9).
Figure 11: Ratio of minimum to median gross wage, OECD countries, 1975-2013

Source: OECD.
II-Minimum wage and inequalities

Figure 12: Ratio of minimum to median wage, France: net versus labour cost

III-Can taxation reduce inequalities?

- Depends on incidence of SSCs
  - SSCs reforms may have reduced net wage inequalities if long-run incidence falls on employees
  - What are counterfactual wage inequalities in the absence of SSC changes?
III-Can taxation reduce inequalities?

• Depends on incidence of SSCs
  • SSCs reforms may have reduced net wage inequalities if long-run incidence falls on employees
  • What are counterfactual wage inequalities in the absence of SSC changes?

• Two polar cases
  • Assume no behavioural responses
  • Assume either full incidence on employees, or full incidence on employers
III-Can taxation reduce inequalities?

Figure 13: Wage inequalities in the absence of tax changes: two polar cases

Source: DADS data 1976-2010. The figure offers two scenarios of incidence, on workers or on employers, absent any behavioral responses, for male workers of the private sector working full-time full-year.
III-Can taxation reduce inequalities?

- **SBTC as evidence of incidence?**
  - SBTC should have hit all developed countries
  - Even in France, we use computers
  - Then, it suggests that SSCs have been incident on employees in the long-run

But high minimum wage in France? Can play a role in the bottom half of the wage distribution. But cannot explain upper half decrease in net wage inequalities.
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Figure 14: P90-P50 ratio, full-time male workers, 1976-2010

III-Behavioral responses

• Taxes could generate inefficiencies...
  1 lower incentive to accumulate skills (if incidence on workers)
  2 specialisation in lower-skill technology, less innovation (if incidence on firms)
III-Behavioral responses

- Taxes could generate inefficiencies...
  1. lower incentive to accumulate skills (if incidence on workers)
  2. specialisation in lower-skill technology, less innovation (if incidence on firms)
- ... which are hard to detect in the data
  1. no breaks in the accumulation of skills that could be linked to tax changes
  2. increase rather than decrease in the demand for skilled workers
- but hard to distinguish SBTC demand shifts from tax-driven demand shifts
Figure 15: Unemployment rate by educational attainment, 1978-2010: Workers with less than five years of experience

Figure 16: Unemployment rate by educational attainment, 1978-2010: Workers with five to ten years of experience

Figure 17: Unemployment rate by educational attainment, 1978-2010: Workers with more than ten years of experience

Conclusion and perspectives

- **Labour cost inequalities in France**
  - Using labour cost changes the assessment on French data
  - France is no exception after all
  - Reinforces demand-side explanations for increased wage inequalities
  - Perspective might change for other countries too

- **Incidence of SSCs**
  - SBTC provides macro-level evidence for long-run incidence of SSCs on employees

- **Further research**
  - Integrate taxation in supply/demand framework?
  - Compare French policies (high MW/SSCs reductions) with tax credit policies and lower MW countries (e.g. EITC in the U.S., WFTC in the U.K.)
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