

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

Antoine Bozio<sup>1</sup>, Thomas Breda<sup>1</sup> and **Malka Guillot**<sup>1,2</sup>

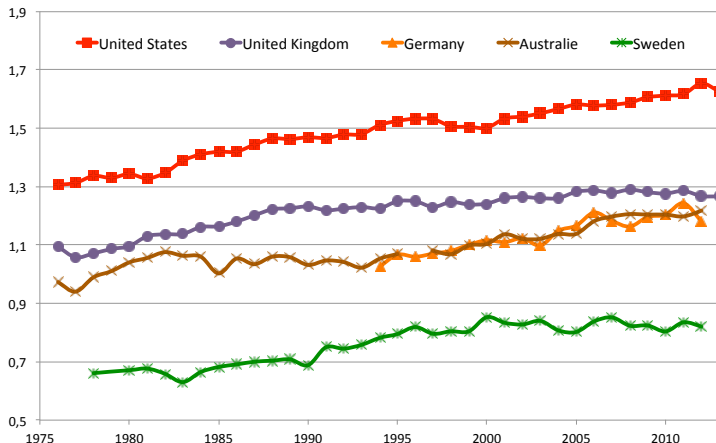
<sup>1</sup>Paris School of Economics (PSE) and Institut des politiques publiques (IPP)

<sup>2</sup>Centre de Recherche en Économie et Statistiques (CREST)

EEA, August 2016

## Increase in wage inequalities in developed countries

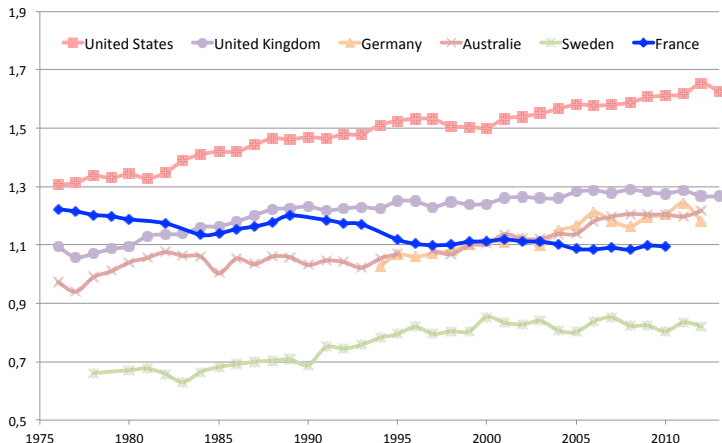
Figure 1: International comparisons of P90/P10 log gross wage ratio: 1975-2011.



# Motivation

## with the exception of France

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



- **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

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- Job polarization
  - Autor, Levy, Murnane (2003), Autor, Katz and Kearny (**AKK** 2006)
  - Goos and Manning (2007), Autor (2015)

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- **Institutional factors**

- Minimum wage: Lee (1999), Card and Lemieux (2001)
- Unions: Fortin and Lemieux (1997)
- Education policies

## 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)



# Debated explanations

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- **French case is puzzling**

- Wage compression and limited evidence of demand shifts (Card et al. 1999, Goux and Maurin 2000, Koubi et al. 2005, Verdugo 2014)
- Some evidence by Charnoz et al. 2014
- Even though exposed to SBTC and trade competition
- High minimum wage may play a role but cannot explain the reduction in upper-tail inequalities

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  - That's how it needs to be done
  - Would not change the picture in the U.S.

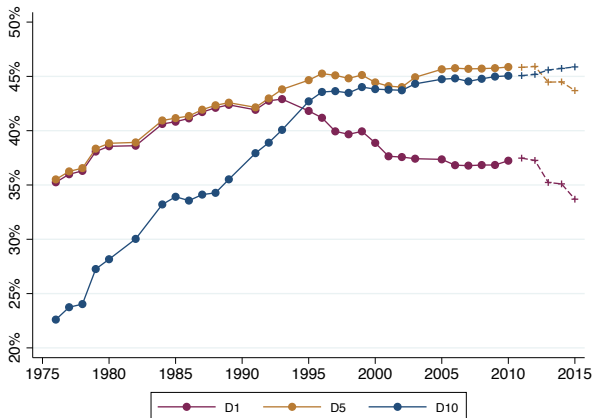
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  - That's how it needs to be done
  - Would not change the picture in the U.S.
- ③ Discuss the impact of tax/SSCs on inequalities
  - Seem to have been neglected in the demand shifts vs institution debate
  - Might be an institutional tool counteracting SBTC
  - Depends on the incidence of employer SSCs

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

- 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
- EDP (1968, 1975, 1982, 1990, 1999 and 2004 to 2010)
  - National censuses
  - Sample : 4/365
  - Educational attainment, demographic information

- **Net wage** = Posted wage – employee SSCs
  - Directly observed in DADS data (annual earnings).
- **Gross wage** = Posted wage = net wage + employee SSCs
  - Computed using the tax simulator of IPP, **TAXIPP**.
- **Labour cost**: total cost of the employee for the firm,  
= gross wage + employer SSCs
  - Computed using the tax simulator of IPP, **TAXIPP**.
- **Net-of-tax wage**: net wage – individual income tax share
  - Computed using *Enquête Revenus Fiscaux et Sociaux*

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

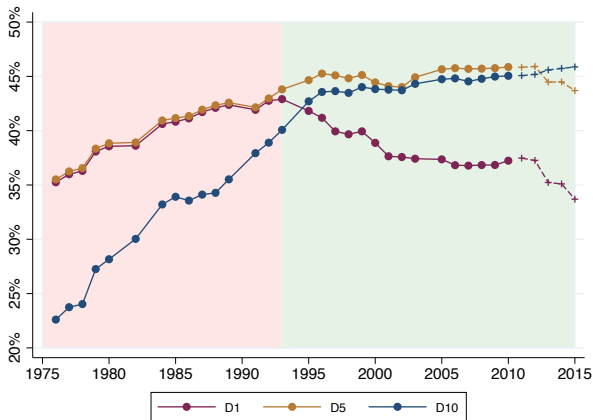


Sources: DADS data 1976-2010. The figure provides the ratio of the average total social security contributions (employer and employee part) to the average labour cost in each decile of the labour cost distribution.



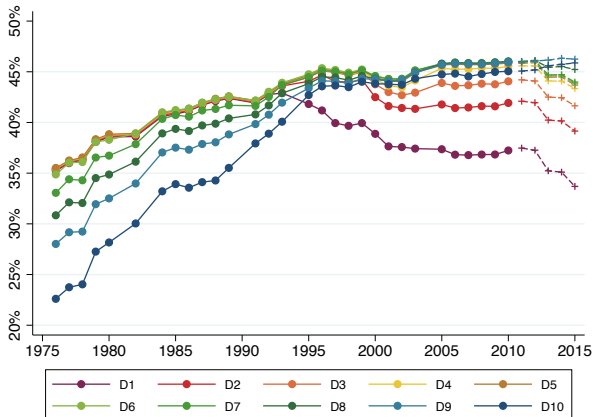
# I-SSC changes over time

Figure 4: Total Social security contributions as a fraction of labour costs in the different deciles



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Figure 5: Total Social security contributions as a fraction of labour costs in the different deciles



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Figure 6: P90-P10 ratio, full-time full-year 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.

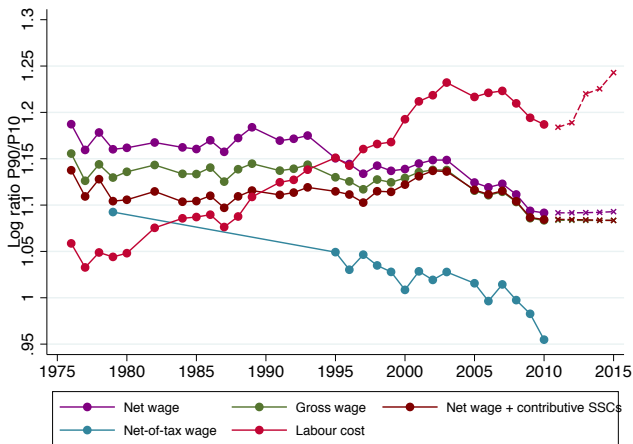
Figure 7: P90-P10 ratio, full-time full-year male workers, 1976-2010



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# I-Wage inequalities: 2 more measures

Figure 8: P90-P10 ratio, full-time full-year 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.

▶ With unemployed

Figure 9: P90-P50 ratio, full-time full-year male workers, 1976-2010



SOURCE: DADS data 1976-2010.



Figure 11: Supply and demand framework

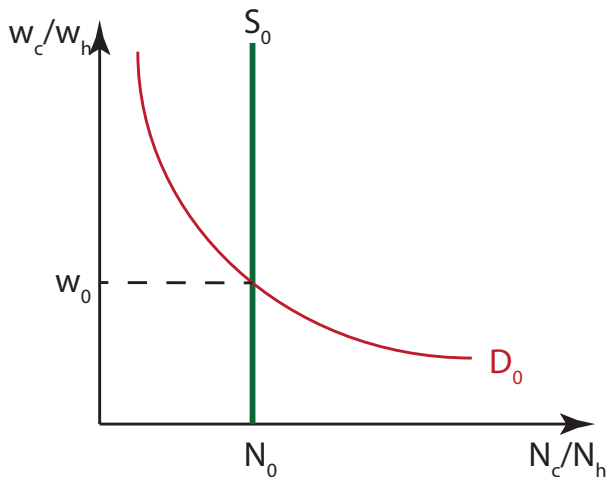




Figure 12: Supply and demand framework

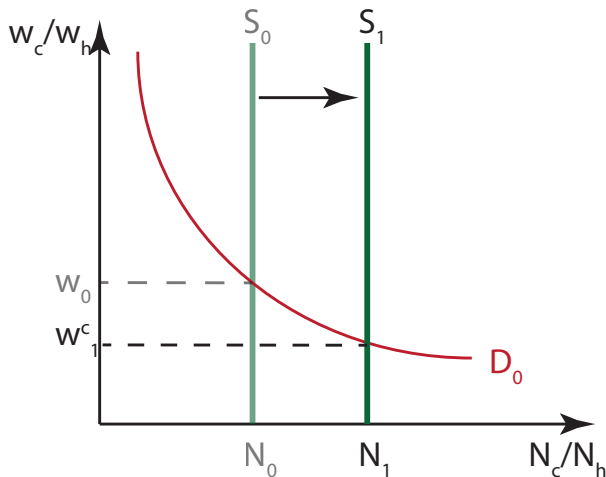


Figure 13: Supply and demand framework

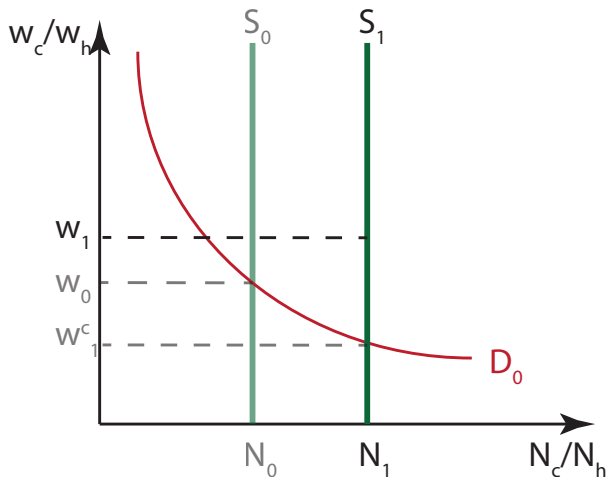
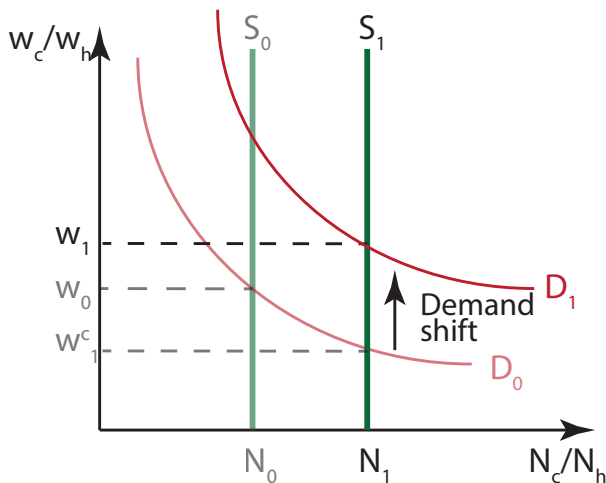


Figure 14: Supply and demand framework



## 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:  $h$

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

Where:

- $D_{ct}$  ( $D_{ht}$ ) is the quantities used 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:

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

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

$$\ln \left( \frac{w_{ct}}{w_{ht}} \right) = \beta_0 + \beta_1 t + \beta_2 \ln \left( \frac{S_{ct}}{S_{ht}} \right) + \epsilon_t$$

Assumptions:

- 1 Market clearing  $\Rightarrow S_{it} = D_{it}, i = c, h$
- 2 Exogenous supply  $\Rightarrow$  **net wages** do not matter
- 3 Demand shift approximated by a time trend

▶ With taxes

# 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

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### Construction of relative supply series:

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



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### 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)

# II-From theory to empirics (2)

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  - 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-A steady increase in relative supply

Figure 15: Relative labour supply and net wage premium: 1976 - 2008

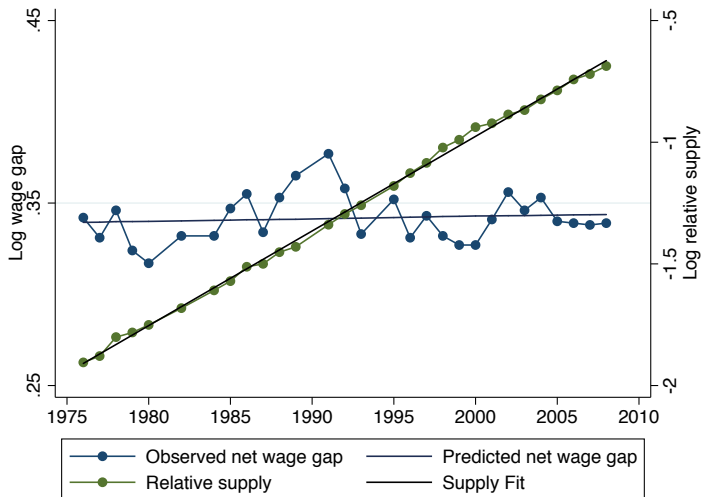
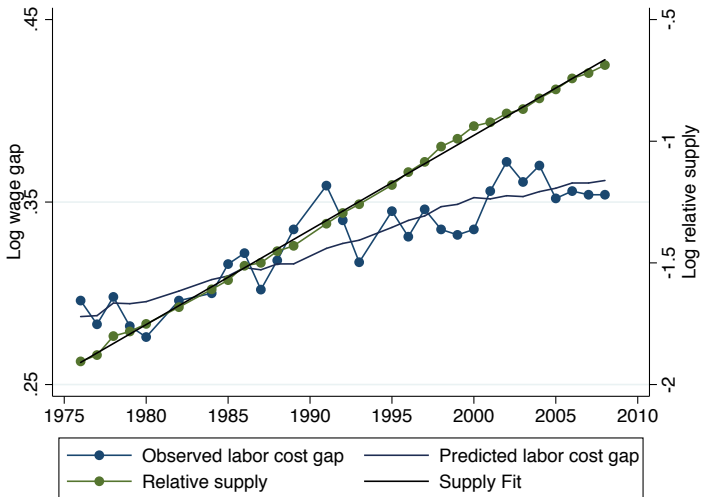


Figure 16: Relative labour supply and labour cost wage premium: 1976 - 2008



**Table 1:** Estimated effect of the relative supply and the time trend on the School log labour cost gap

Year removed	Relative supply	Corresponding Elasticity of substitution	Time trend (divided by 100)
None	0.06 (0.12)	-16.7	0.03 (0.41)
1976	0.05 (0.13)	-20.0	0.05 (0.42)
1983	0.06 (0,12)	-16.7	0.03 (0.41)
1989	0.11 (0.13)	-9.1	-0.15 (0.42)
1995	0.07 (0.13)	-14.3	-0.01 (0.41)
2001	0.04 (0.13)	-25.0	0.09 (0.42)
2010	-0.06 (0.13)	16.7	0.45 (0.43)

*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.

Table 2: College/High School log wage gap

	Estimates for the U.S. from AKK 1965-2005			Estimates for France <i>Log Labour cost</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
Relative supply (CLG vs HS)	-0.411 (0.046)	-0.599 (0.112)	-0.403 (0.067)	-0.411 <i>calib.</i>	-0.599 <i>calib.</i>	-0.403 <i>calib.</i>
Log real min. wage			0.117 (0.047)			0.114 (0.107)
Unemp. Rate (males)			0.001 (0.004)			-0.002 (0.197)
Time	0.018 (0.001)	0.028 (0.006)	0.017 (0.002)	0.017 (0.000)	0.028 (0.000)	0.017 (0.000)
Time2/100		-0.011 (0.006)			-0.014 (0.004)	
Constant	0.043 (0.037)	0.143 (0.108)	0.266 (0.112)	-0.587 (0.000)	-1.015 (0.000)	-1.66 (0.018)
Observations	43	43	43	31	31	31
R2	0.934	0.940	0.944	0.987	0.993	0.987

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

## France net versus labour cost

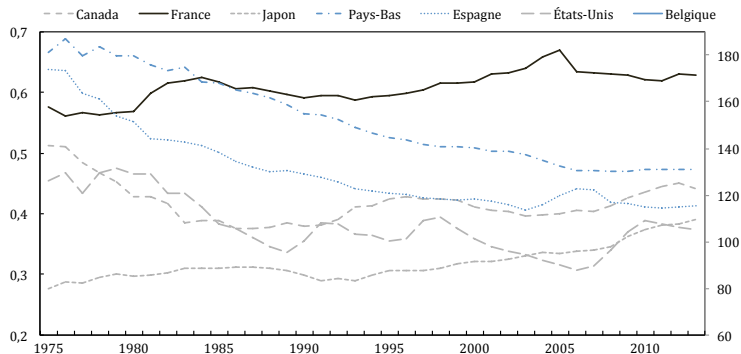
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	Labour cost gap in France			Net wage gap in France		
	(1)	(2)	(3)	(4)	(5)	(6)
Relative supply (CLG vs HS)	-0.411 <i>calib.</i>	-0.599 <i>calib.</i>	-0.403 <i>calib.</i>	-0.411 <i>calib.</i>	-0.599 <i>calib.</i>	-0.403 <i>calib.</i>
Log real min. wage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

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 (1) to (3).

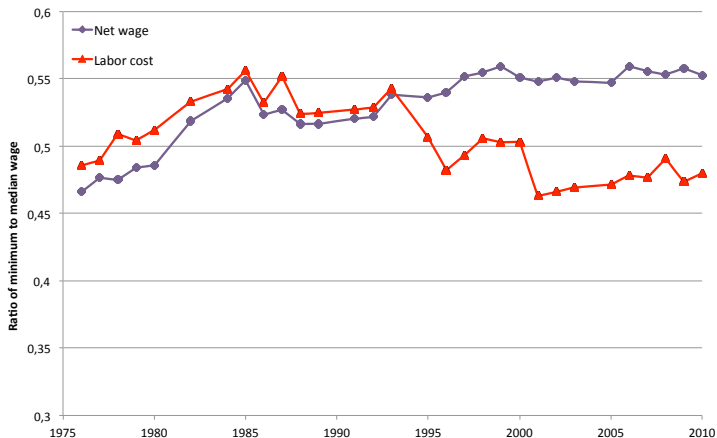


Figure 17: Ratio of minimum to median gross wage, OECD countries, 1975-2013



SOURCE: OECD.

Figure 18: Ratio of minimum to median wage, France: net versus labour cost



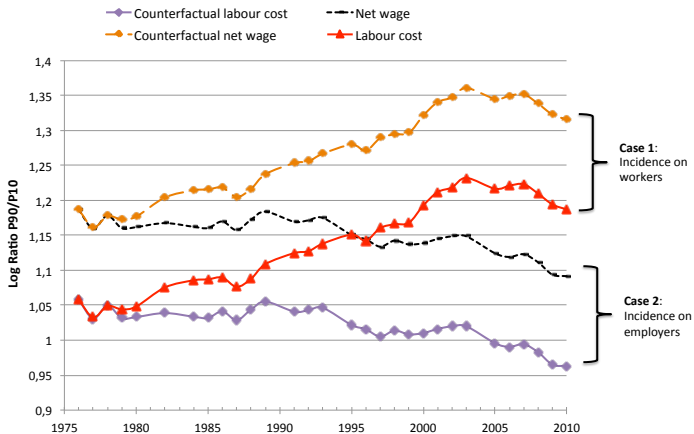
SOURCE: DADS data 1976-2010.

- **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?

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  - 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 19: Wage inequalities in the absence of tax changes: two polar cases



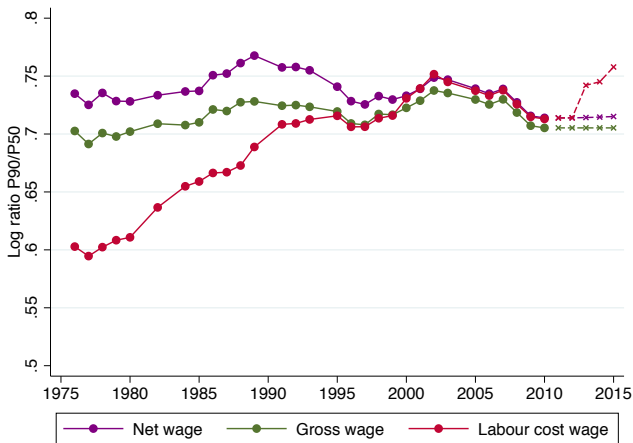
SOURCE: DADS data 1976-2010. The figure offers two scenarios of incidence, on workers or on employers, absent any behavioral responses, for male workers of the private sector working full-time full-year.

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  - SBTC should have hit all developed countries
  - Even in France, we use computers
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  - 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

# III-Can taxation reduce inequalities ?

Figure 20: P90-P50 ratio, full-time male workers, 1976-2010



SOURCE: DADS data 1976-2010.



- 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)

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  - ① lower incentive to accumulate skills (if incidence on workers)
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- ... 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

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  - France is no exception after all
  - Reinforces demand-side explanations for increased wage inequalities
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- **Incidence of SSCs**
  - SBTC provides macro-level evidence for long-run incidence of SSCs on employees

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- Other countries ?
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  - Compare supply of skills, net wages and labor costs across countries.
  - 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.)
  - Political economy aspect of doing redistribution with SSCs.

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

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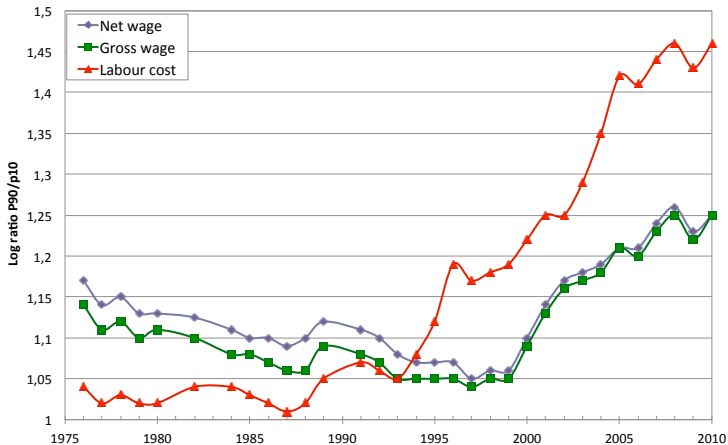
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EEA, August 2016



Figure 21: P90-P10 ratio, full-time male workers, 1976-2010



SOURCE: DADS data 1976-2010.