The Great Compression of the Wage Structure in France, 1968-2008

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Introduction

- Large literature on wage inequality:
  - Increase in dispersion in US, UK, more recently in Germany
  - Other countries less clear (see Atkinson): often stable
  - Main explanations: Role of SBTC & Supply-Demand Factors (Katz & Murphy), Institutions (DiNardo & Card). Debate over relative importance of each factor.
- Here, focus on France 1970-2008, Males
  - Document relation wage inequality / education supply
  - Emphasize role of differences in the timing of educational expansions with respect to the US or the UK
  - Explain why *upper*-tail wage inequality did not increase

Specificities of France

- Changes in Supply of education:
  - Unlike US or UK, large increase in educational attainment in France over the period
    - US/UK: stagnation after 1970 (see Card & Lemieux)
    - France: two periods of rapid expansion between 1970/1978 and after 1990
  - Part of the differences in recent evolution of wage structure are explained by differences in timing of educational expansion between France and US/UK

Outline

1. We describe the evolution of the wage structure
   - wage inequality apparently remained stable or declined over time
   - the skill premium decreased substantially within narrowly defined demographic groups
   - Residual inequality remained unchanged
2. Analyze the role of changes in labor force composition in explaining the previous facts.
   - Does the decline in wage dispersion or the skill premium over the period reflect a change in employment probabilities across workers? No.
3. Use a model with imperfect substitution between age groups to estimate elasticity skill premium/relative supply

Literature on Wage Inequality

- Card, Lemieux & Kramarz (1999)
  - no relationship between computer utilization across at the end of the 1980s and subsequent wage change in France
- Goux and Maurin (2000)
  - main source of wage inequality in France was not technological but institutional
- Our contribution:
  - Use data up to 2008, while previous studies stopped in 1993
    - Important given the 1990s are characterized by a large increase in education levels in the labor force
  - Look at the relationship education supply / wage inequality
    - Institution such as the minimum wage cannot explain decline in absolute level of the wage of skilled workers
  - Control for composition effects

Data

- Use log ***real*** wages and log wage gap
- LFS 1990-2008: no information on wages before 1990.
- FQP: 1970, 1977, 1985. Annual wages.
- Focus on full time workers.
- DADS: no civil servants, large public firms.
  - Use aggregate series published by INSEE: full time full year.
  - Micro data from matching DADS-EDP from 1991-2008.

Education expansion in last 30 years

- Observe large educational expansion in two distinct periods
- Policy changes:
  - 1953: increase in compulsory schooling from 14 to 16 for cohorts born after 1957.
    - Large acceleration from 1968 to 1975
  - 1985: New high-school diplomas
    - Magnac & Thesmar: most of the increase in education levels due to change in selectivity

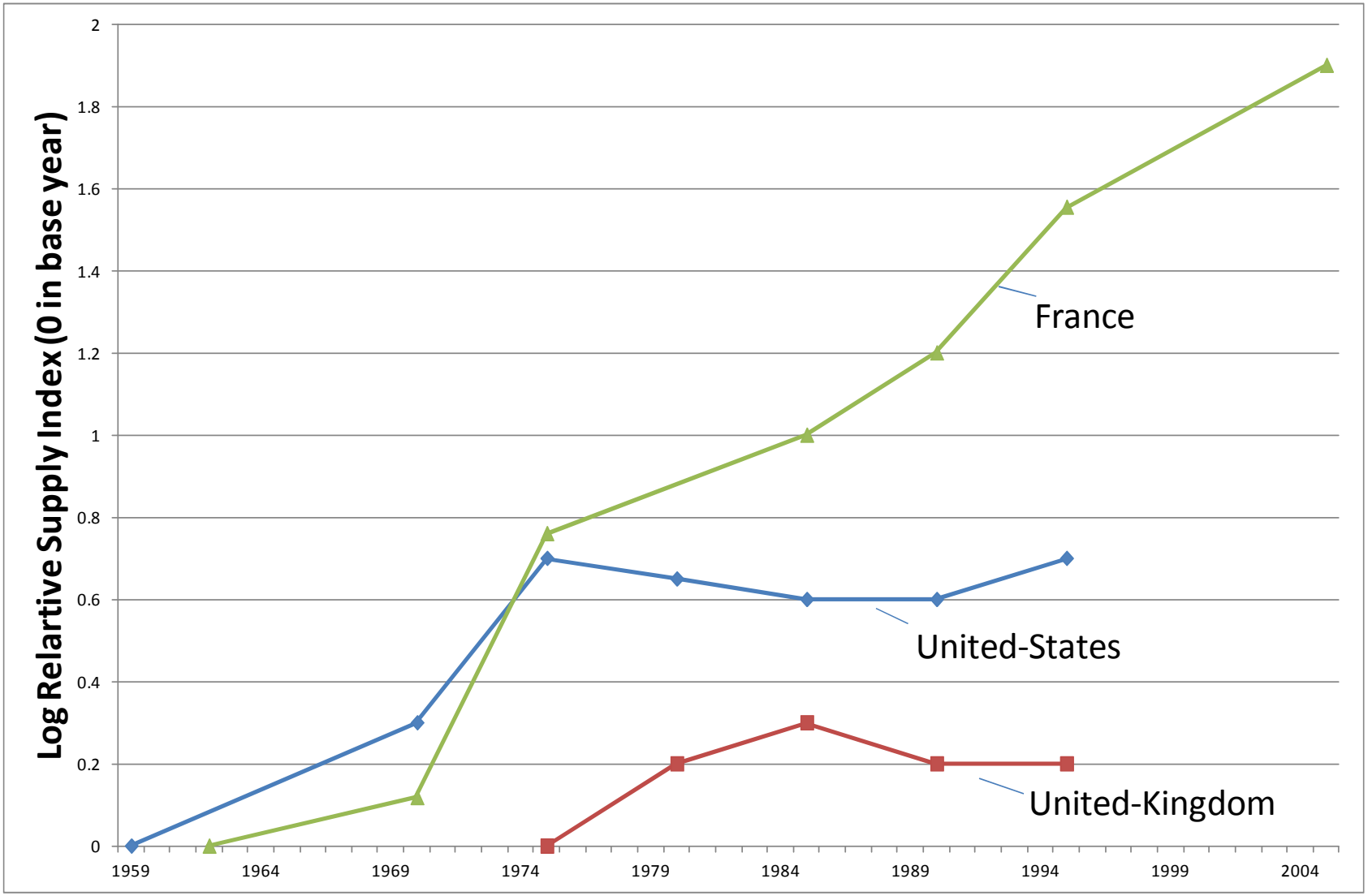
Evolution of the level of education of the labor force

Education								
	1962	1968	1975	1982	1990	1995*	1999	2008*
Primary	78.3%	68.3	56.5	50.2	39.5	31.2	24.5	20.6
Secondary	13.0%	20.1	26.1	28.9	35.9	38.9	40.7	37.1
High School	4.9%	7.5	9.5	11.2	11.2	12.4	14.7	18.3
University	3.7%	4.2	7.8	9.7	13.4	17.6	20.1	24
Annual Increase in Percentage Points of the Share of Skilled workers								
Δ>High-School	na	0.5%	0.8	0.5	0.5	1.1	1.2	0.8

Relatively low levels of education at the beginning of the 1960s:

- high-school graduation rate was 70% in US in 1960
- Only 8.6% in France in 1962
- But 42.3% in 2008

Change in the relative supply of skilled workers: France vs US or UK



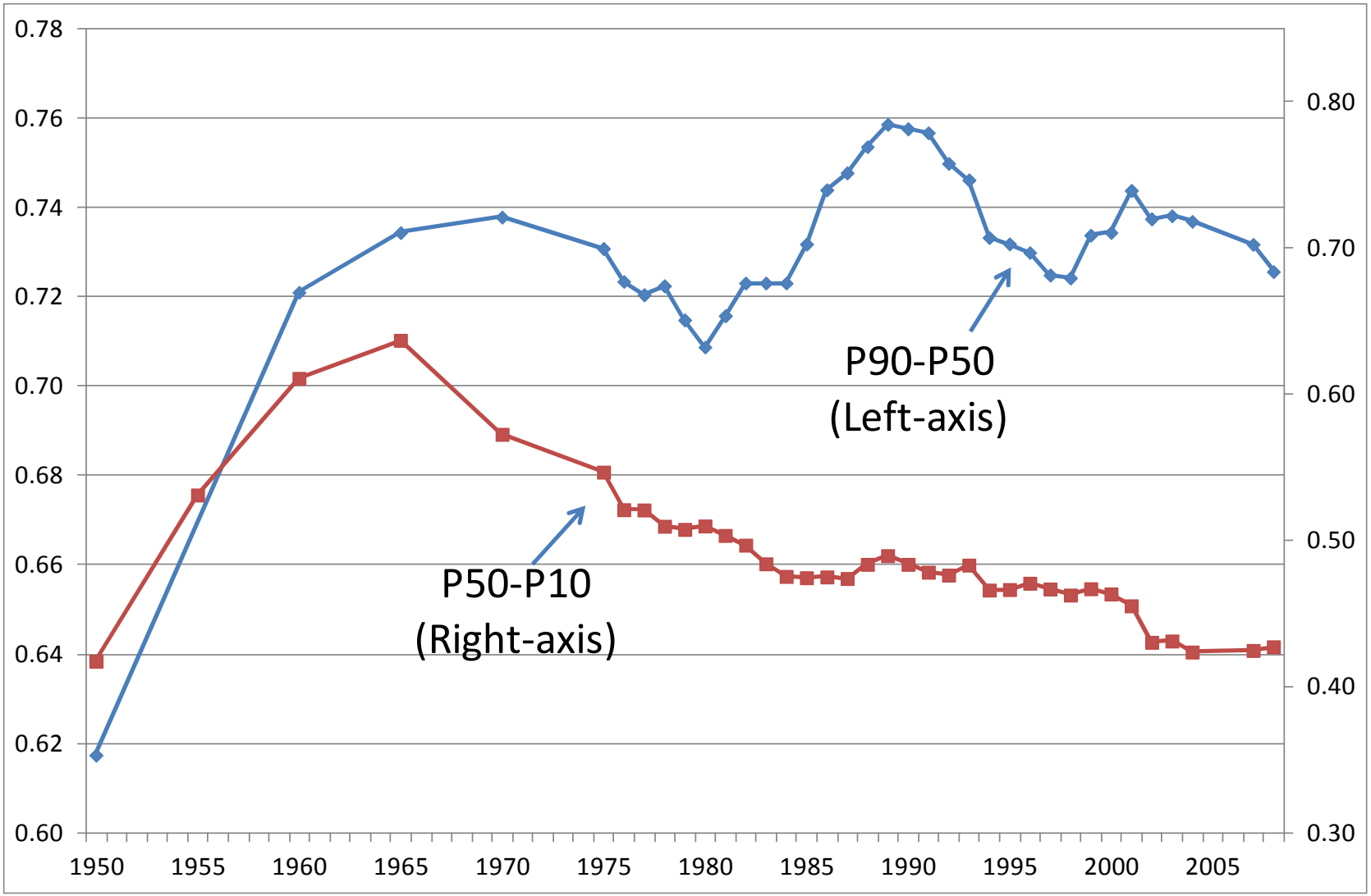
Normalized to zero in base year.

Figures from Card & Lemieux for the US & UK.

Wage inequality

- Use log difference P90-P50 and P50-P10
  - Distinguish what happens at the top & bottom of distribution
- Document:
  - Overall inequality
  - Skill premium (*between group* inequality):
    - Model with 2 groups: wage difference between workers with high-school or more and those with less than high-school
  - Residual inequality (*within group* inequality)

Upper and Lower tail Inequality: DADS data, male FTFY



Comparisons across sources

	DADS	LFS-FQP Observed
P90-P50		
1964	0.73	
1970	0.74	
1977	0.72	0.66
1985	0.73	0.66
1990	0.76	0.67
2000	0.73	0.66
2005	0.74	0.65
P50-P10		
1964	0.64	
1970	0.57	
1977	0.52	0.47
1985	0.47	0.45
1990	0.48	0.40
2000	0.46	0.42
2005	0.42	0.36

- Broadly similar trends in DADS / FQP LFS
- Larger levels of wage inequality in DADS due to exclusion of public sector workers from the DADS

Role of composition effects

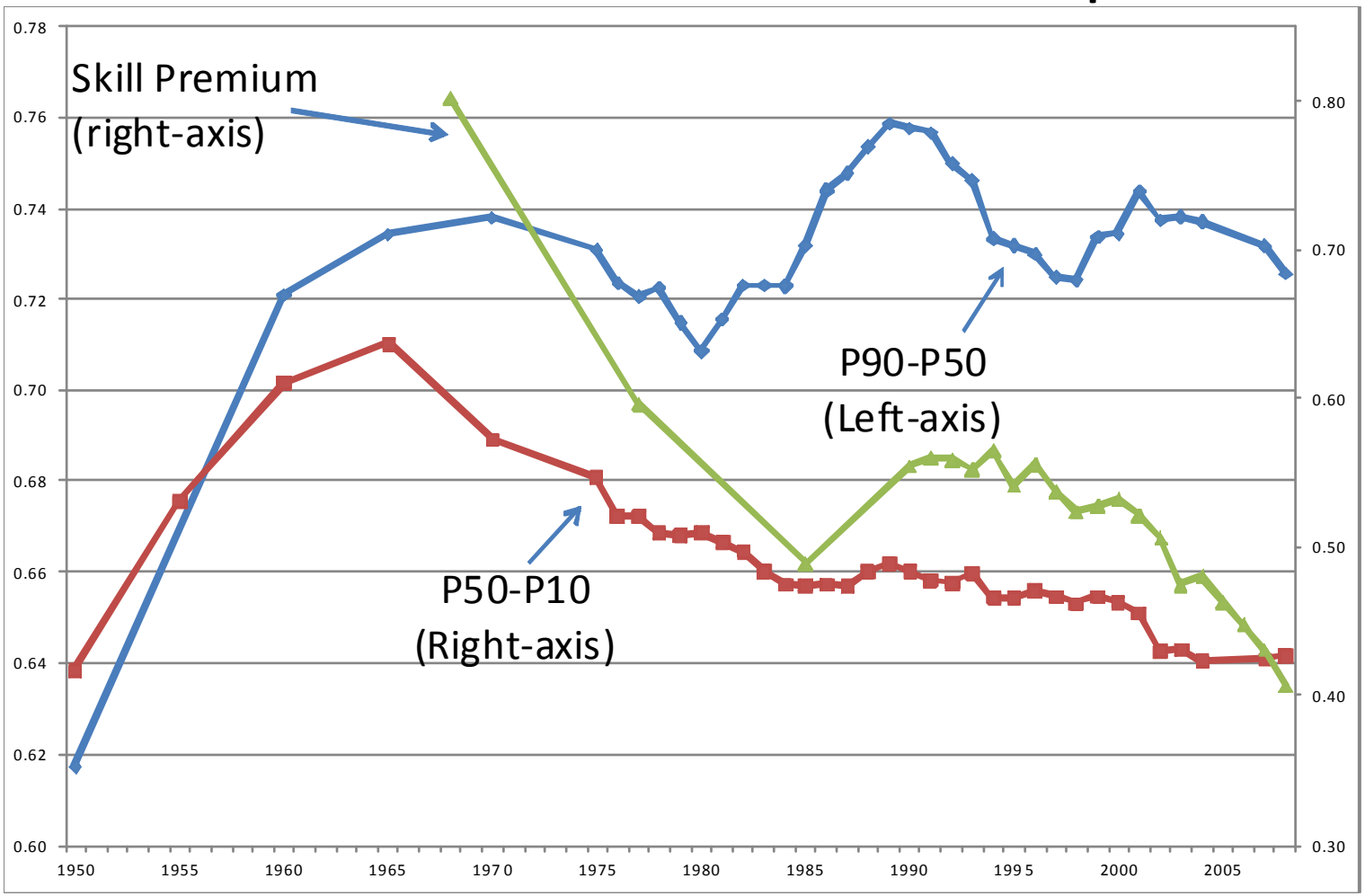
	LFS-FQP Observed	LFS: Constant Composition 1985 Xs
P90-P50		
1964		
1970		
1977	0.66	0.72
1985	0.66	0.66
1990	0.67	0.67
2000	0.66	0.62
2005	0.65	0.59
P50-P10		
1964		
1970		
1977	0.47	0.50
1985	0.45	0.45
1990	0.40	0.38
2000	0.42	0.36
2005	0.36	0.32

- Previous results might reflect a change in the distribution of education and experience
- Estimate a counterfactual evolution of wage inequality
- Keep constant the distribution of education and experience across 32 cells of education and experience at 1985 level

- Decrease in inequality not explained by composition effects!

- In sum: overall inequality has decreased
- Both upper and lower tail
  - Decrease in upper tail cannot be explained by the minimum wage
  - Also not explained by changes in the distribution of education and experience
- Results consistent across DADS / LFS
- Question: does it reflect a change within group or between group?
  - Changes in residual dispersion are not explained by the same factors than changes in dispersion between groups

Evolution of the overall skill premium

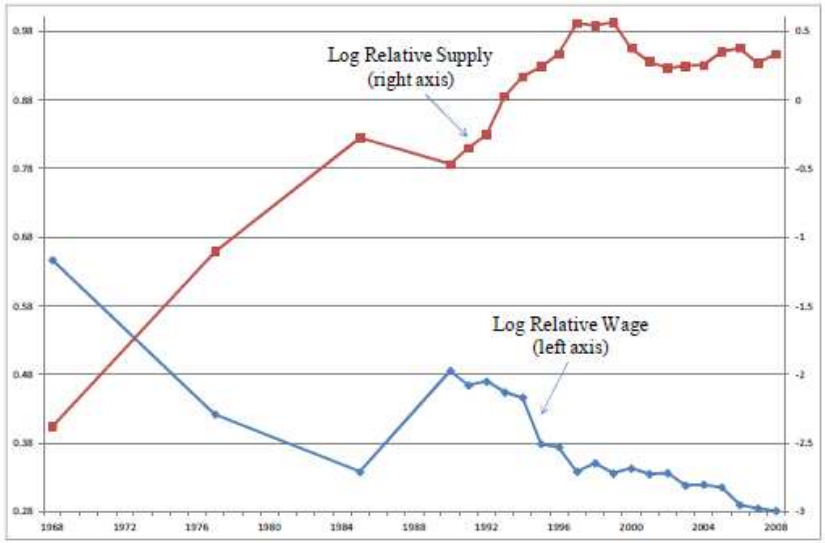


Skill premium is a weighted-average across experience groups using constant weight distribution

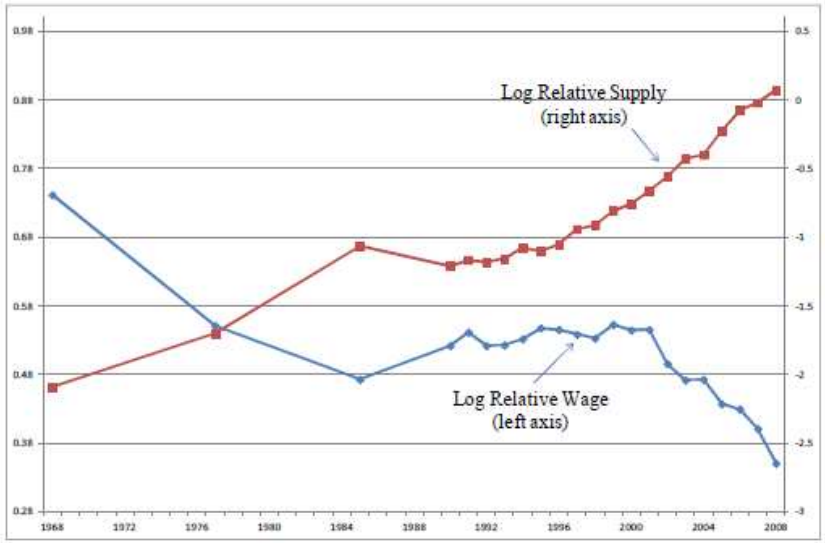
40 log points decline in the skill premium over the period

Slight increase during the 1980s

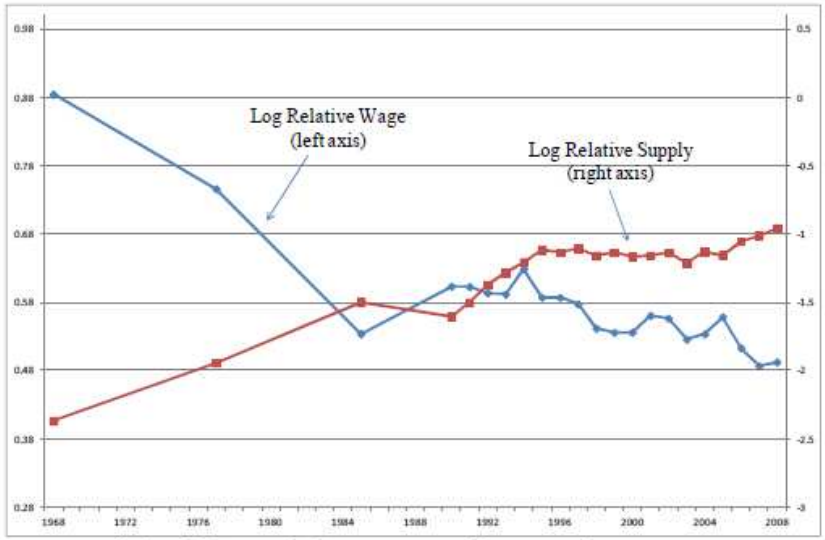
Skill premium within group and relative supply



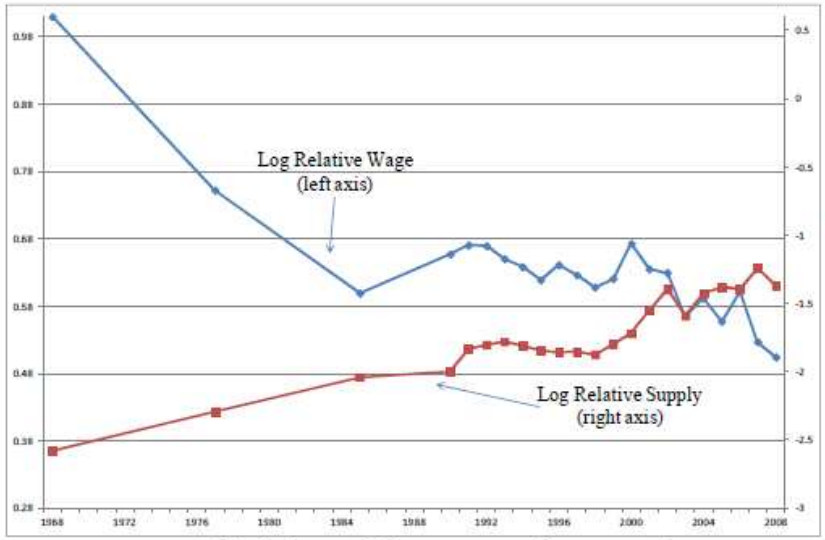
(a) 1 to 5 years of experience



(b) 11 to 15 years of experience

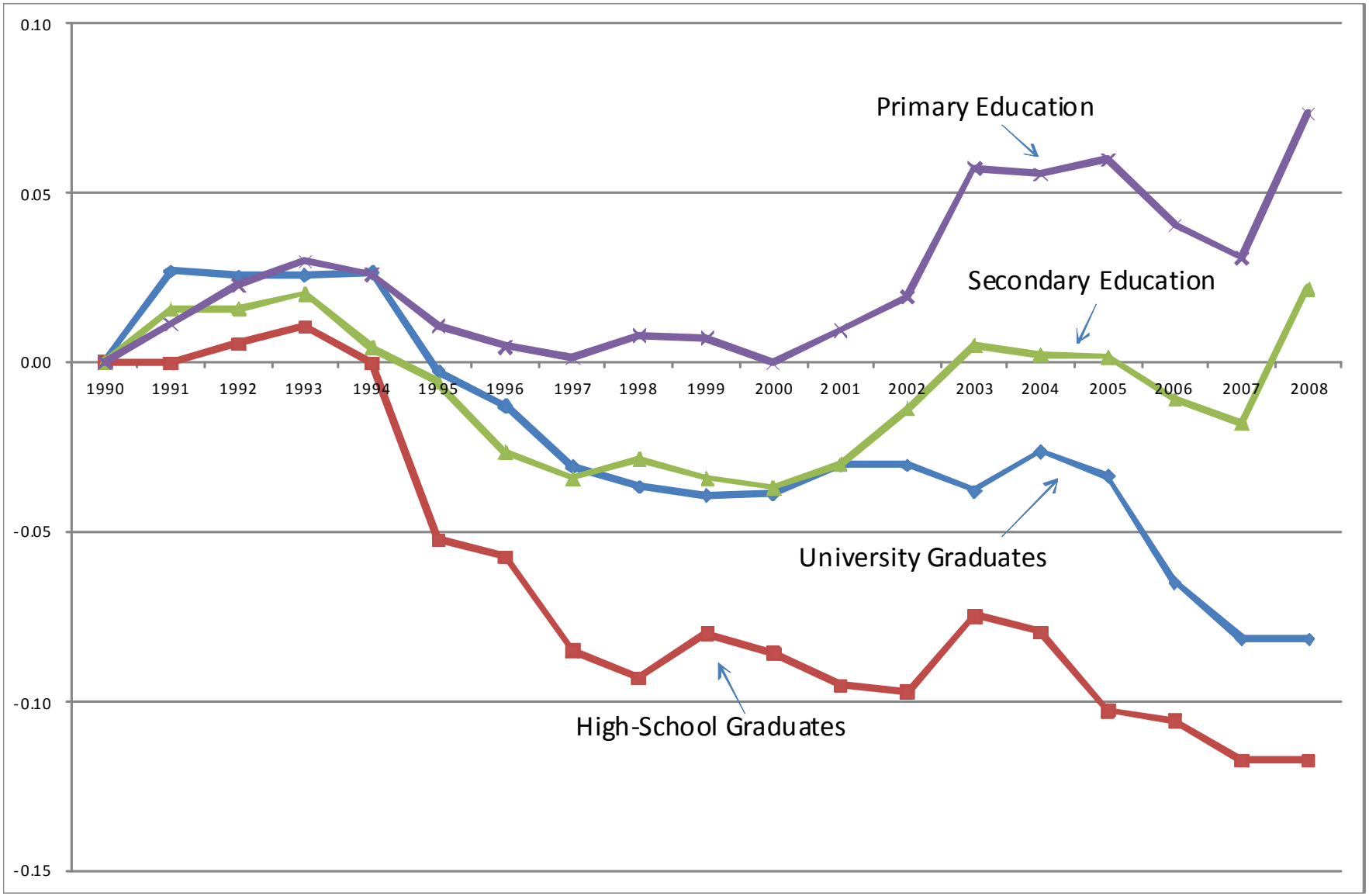


(c) 21 to 25 years of experience



(d) 31 to 35 years of experience

4 groups of education



Residual inequality

- Estimated by using the residuals of a regression on fixed effects for cells of education and experience

	LFS-FQP Observed	*Residual Inequality*
	P90-P50	
1977	0.66	0.44
1985	0.66	0.41
1990	0.67	0.44
2000	0.66	0.42
2005	0.65	0.44
	P50-P10	
1977	0.47	0.39
1985	0.45	0.33
1990	0.4	0.33
2000	0.42	0.34
2005	0.36	0.33

Residual wage inequality did not change much during the period

Slight decline within group

Implies that most change in wage inequality explained by change in skill premium (between group)

Comparison France/other countries

- Ranking of inequality levels has changed over time
- France during the 1960s had higher inequality levels than the US or the UK both at the top or bottom

France vs US/UK: P50-P10

Lower tail inequality broadly similar until the end of the 1960s

Still larger inequality levels than in Germany

	France DADS	US	UK	Germany	France LFS-FQP
	P50-P10			**P50-15**	
1964	0.64	0.61	0.39		
1970	0.57	0.58	0.39		
1977	0.52	0.69	0.39		0.42
1985	0.47	0.84	0.47	0.26	0.39
1990	0.48	0.8	0.58	0.27	0.34
2000	0.46	0.8	0.62	0.32	0.34
2005	0.42	0.83	0.61		

France vs US/UK: P90-P50

Higher upper tail inequality levels in France than in the US until the 2000s!

Still higher than in Germany

	France DADS	US	UK	Germany	France LFS
	P90-P50			**P85-P50**	
1964	0.73	0.51	0.59		
1970	0.74	0.55	0.54		
1977	0.72	0.55	0.52		0.51
1985	0.73	0.61	0.63	0.37	0.51
1990	0.76	0.66	0.65	0.39	0.5
2000	0.73	0.76	0.71	0.44	0.51
2005	0.74	0.86	0.73		

The Role of Changes in Employment Probability

- Does selection explain the previous results?
  - large fluctuations in employment rates which occurred for workers aged less than 25 and more than 55 years
  - use of monthly wages of full-time workers, which excludes part time workers and does not take into account differences in the number of hours worked across workers
- Solution:
  - Exclude workers <25 and >55
  - Impute wage for unemployed

A. P90-P50 Log Wage Gap			
	Monthly wages	**Hourly Wages, 25-55 years**	
	(1)	(2)	(3)
	Age 25-55	*Observed*	*Imputed for Unemployed*
1990	0.65	0.66	0.68
1995	0.63	0.62	0.64
2000	0.63	0.62	0.63
2005	0.62	0.55	0.56
2008	0.58	0.52	0.53

Restrict the sample to 25-55: also find a decrease in wage inequality

Use hourly wages: larger decrease in wage inequality

- Difference with respect to monthly wage sample is due to decrease in hours worked in middle of distribution

Including unemployed workers with imputed wages do not change the results.

In sum, results not driven by sample selection or sample definition

B. P50-P10 Log Wage Gap			
	Monthly wages	Hourly Wages, 25-55 years	
	Age 25-55	Observed	Imputed for Unemployed
1990	0.40	0.42	0.52
1995	0.40	0.44	0.53
2000	0.40	0.42	0.50
2005	0.37	0.37	0.52
2008	0.36	0.36	0.46

For lower tail inequality, we find larger difference when wages of unemployed are imputed

C. Skilled / Unskilled Log Wage Gap			
	Age 25-55	Median gap	Median gap + Imputed
1990	0.55	0.63	0.60
1995	0.56	0.62	0.62
2000	0.54	0.61	0.60
2005	0.47	0.54	0.52
2008	0.40	0.47	0.46

Finally, skill wage gap unaffected by selection or sample definition.

Summary

- Decline in inequality
  - Both upper and lower tail
  - Not explained by change in composition
  - Not explained by change in residual inequality
  - Explained by change in the skill premium
- Next section, we estimate whether simple demand and supply models can account for change in skill premium

The role of Supply and Demand Factors

- Evaluate whether relation education supply/ skill wage gap
- Hypothesis: represent labor market with a CES production function
  - How many groups?
- Use Card and Lemieux model:
  - Assumes imperfect substitution within skill groups
  - Use two groups of education: find no evidence of imperfect substitution within skilled / unskilled group

The Model

- CES Production function: $Y_t = \left(\sum_{d=1}^{D} \lambda_{dt} N_{dt}^{\rho} \right)^{\frac{1}{\rho}}$,
- Assume imperfect substitution within experience groups: $N_{d,t} = \left[\sum_{jt} \left(\alpha_{dj} N_{djt}^{\eta} \right) \right]^{\frac{1}{\eta}} \qquad \eta = 1 - \frac{1}{\sigma_x}$

$$\ln\left(\frac{W_{Ht}^{j}}{W_{Lt}^{j}}\right) = \ln\left(\frac{\lambda_t}{1-\lambda_t}\right) + (\rho - \eta)\ln\left(\frac{N_{Ht}}{N_{Lt}}\right) + \ln\left(\frac{\alpha_{Hj}}{\alpha_{Lj}}\right) + (\eta - 1)\ln\left(\frac{N_{Ht}^{j}}{N_{Lt}^{j}}\right)$$

- Econ models: $ln\left(\frac{W_{Ht}^{j}}{W_{Lt}^{j}}\right) = \gamma_j + \gamma_t + \gamma_2 \ln\left(\frac{N_{Ht}^{j}}{N_{Lt}^{j}}\right) + \epsilon_{jt}$
- Include interactions: (min wage in t) x j

Dependant Variable: Skill Premium Wage Gap, by Cohort and Year (Men)					
Period	1990-2008	1990-2008	1991-2008	1968-2005	1968-2005
Group Specific Relative Supply	-0.057*** (0.016)	-0.045** (0.020)	-0.130*** (0.022)	-0.101*** (0.033)	-0.071*** (0.025)
Trend					
Trend					
Agg. Supply Index					
N	152	152	143	56	42
R2	0.92	0.93	0.98	0.95	0.98
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Min Wage x Group Interaction	No	Yes	Yes	Yes	Yes
Group Definition	Exp.	Exp.	Exp	Exp.	Age
Sample	LFS	LFS	DADS	LFS-FQP	LFS-FQP

- Estimates implies elasticity of substitution across experience groups between 7 to 22.
- Overall effect of cohort supply remain large given larger changes in supply
  - If the relative supply had not changed for workers aged 26-30 since 1990 and assuming the elasticity of substitution to be 10, skill premium 10 log points higher.
  - If the supply of skills had remained at the 1969 level, skill premium 20 log points higher.
- Changes in supply within the age group explain a large share of the decline in the relative wage of skilled workers in this group

Robustness

Dependant Variable: University/less than High-School Wage Gap, by Cohort and Year (Men)				
A. LFS-FQP Data, Age 25-55, Experience groups, OLS Estimates				
Period	1968-2005	1968-2005	1990-2008	1990-2008
Group Specific	-0.107**	-0.124**	-0.092***	-0.078**
Relative Supply	(0.052)	(0.057)	(0.023)	(0.022)
N	42	56	114	114
Wage concept	Average	Median of employees	Median of employees	Median all indiv.
Imputation?	No	No	No	0 imputed
Year and Group FE	Yes	Yes	Yes	Yes
Cells Definition	Exp	Exp	Exp	Exp

- Robust to the exclusion of groups most affected by the minimum wage
- Similar results with the median
- Robust to the imputation of the wages of unemployed workers

B. DADS-EDP Data, 1991-2008, Age 25-55, OLS Estimates Cells definition: Experience groups				
Group Specific	-0.145***	-0.159***	-0.124***	-0.125***
Relative Supply	(0.017)	(0.018)	(0.014)	(0.014)
N	108	108	108	108
Wage concept	Average	Median	Average	Median
Sample	Full Year	Full-year	Daily Wage	Daily Wage
Year and Group FE	Yes	Yes	Yes	Yes

- DADS EPD sample:
  - robust to the definition of wages: full-year or daily wages.

Additional tests

- No evidence of imperfect substitution within skill groups:
  - No significant elasticity of subs between HS and Univ
  - No significant elasticity between primary and secondary education
  - Cannot reject perfect substitute
- No effects of taking into account payroll tax subsidies for unskilled workers
- No change if add women to the supply measure

Conclusion

- Results suggests that large changes in between group inequality appears related with effect of *cohort* specific supply
  - Higher elasticity of substitution than in the US, but large effect of supply nonetheless given higher change in education levels
- Confirm that wage inequality in France reflects increase in education levels
- Obviously change in skill premium also reflect change in quality of workers in skill groups (Carneiro and Lee)