Job Polarization and Unskilled Employment Losses in France

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Introduction

Topics: technical change, labor taxation policies, unskilled employment

Job polarization:

- Diffusion of ICT
  - Acemoglu and Autor (2010), Autor and Dorn (2013)
- Job polarization in developed countries
  - Goos et al. (2009), Moreno-Galbis and Sopraseuth (2012), Catherine et al. (2015), Harrigan et al. (2016)
- Unskilled labor costless in the U.S
  - Autor et al. (2012), Autor et al. (2013)

Employment outcomes:

- This might not be the case in France...
  - Prescott (2004), Rogerson (2008)
- Underdeveloped service sector
  - Piketty (1998), Cahuc and Debonneuil (2004)
- The role of labor market institutions
  - Blanchard (2005), Langot et al. (2015)

Introduction

Motivation

How labor market policies influence employment outcomes arising from technical change ?

Contribution

- Consistent time series based on the FLFS
  - Employment structure (occupational level)
  - Employment level
- Interaction between job polarization and labor taxation
  - Intertwine effect of technical change and labor taxation
  - Link the occupational structure to the employment level
- General equilibrium model with occupational choice
  - Parsimonious
  - Counter-factual analysis
- Measure unskilled employment losses/gains
  - Job polarization
  - Differentiated payroll tax reduction policies

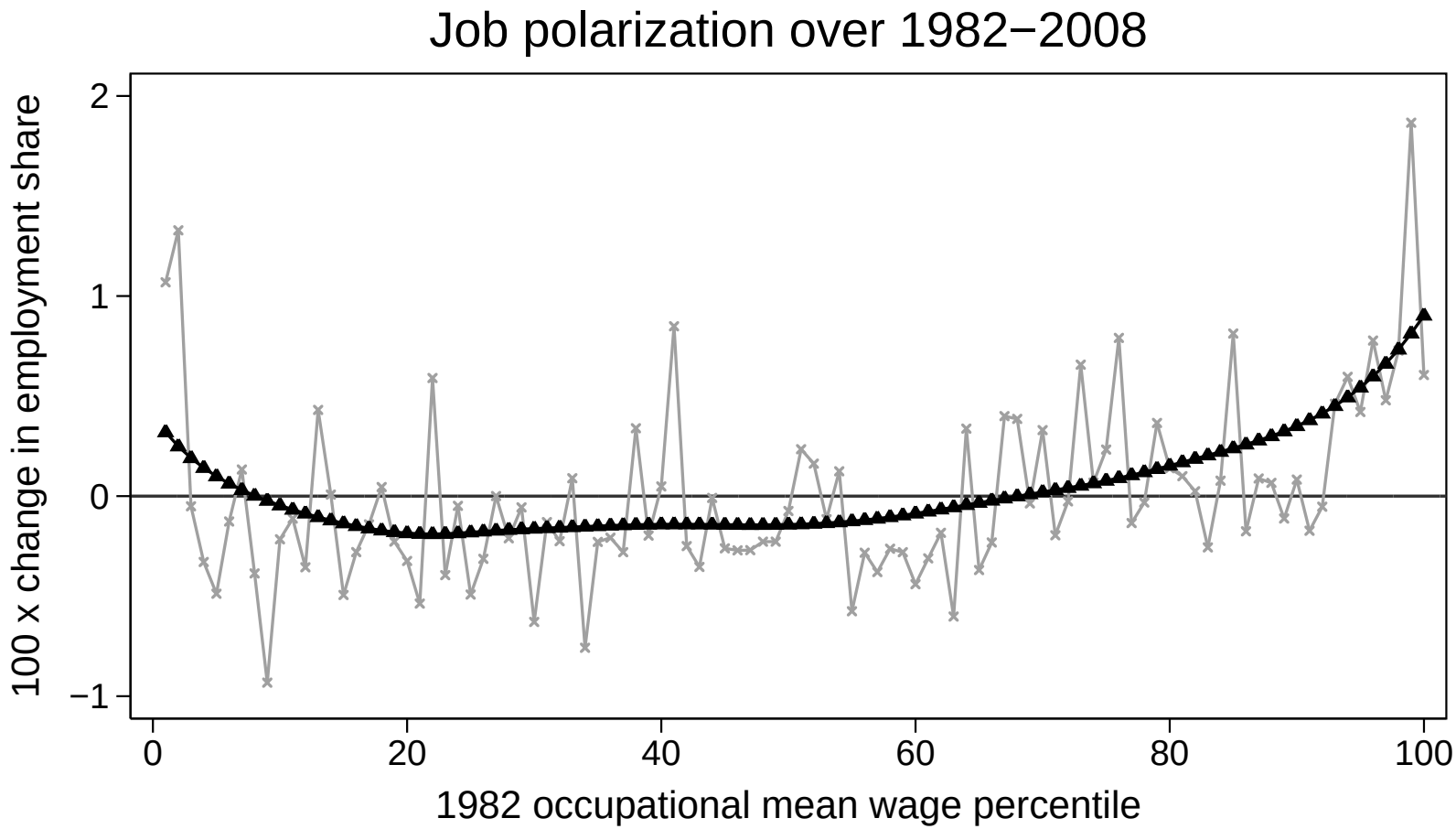
Data outlines

- FLFS from 1982-2008
- Civilian population
- 15-64 year olds
- Two samples
  - Employed salary workers[1] (Job polarization)
  - Entire working age population (Employment outcomes)
- Changes in survey design in 1990 and 2003
  - Occupational crosswalk Appendix
  - Statistical break correction model Appendix
- Task definition Appendix

[1] Drop CSE 11, 12, 13, 21, 22, 23, 31, 44, 69

Job polarization

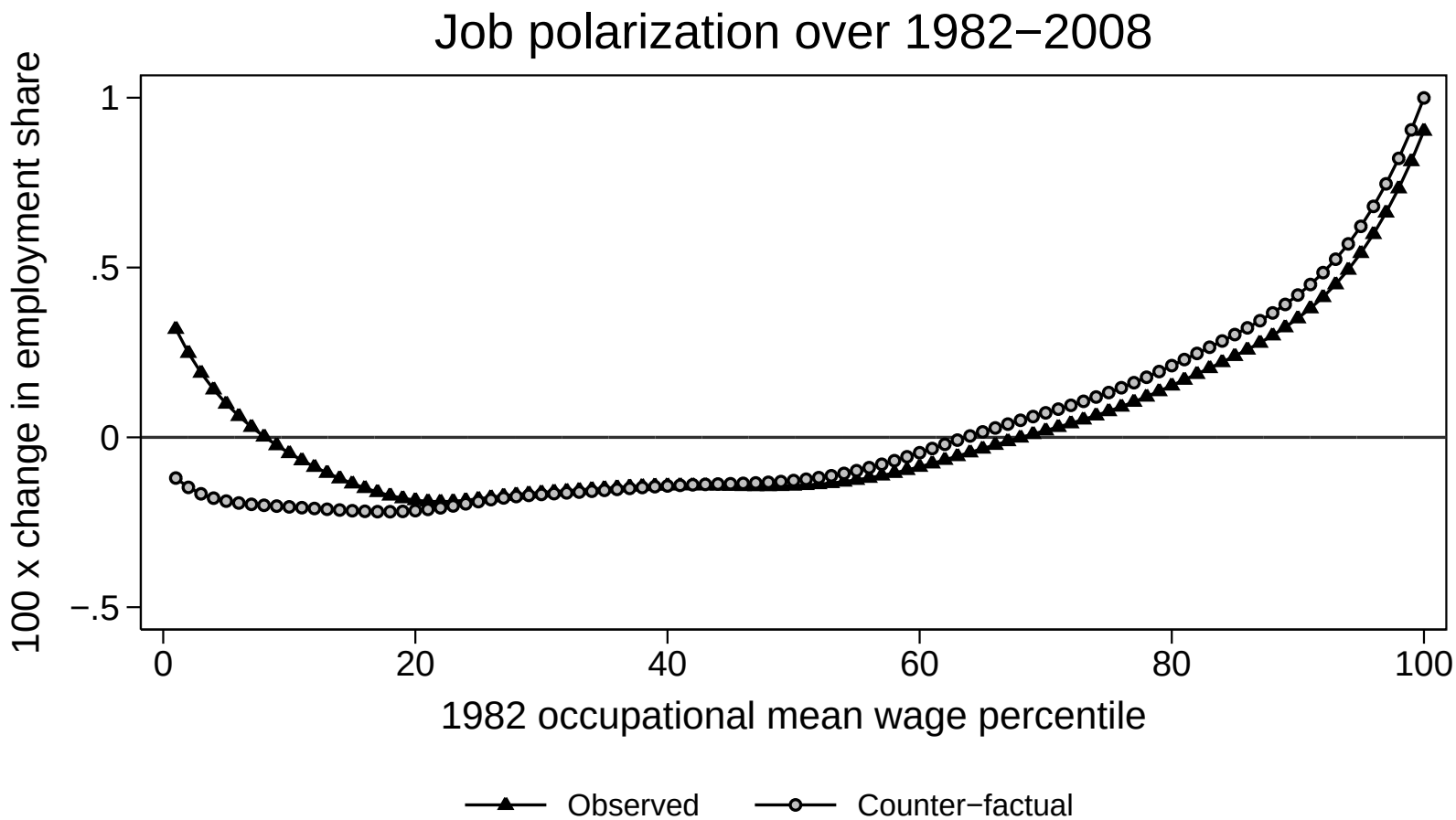
Robustness Rank



Note: Sample includes salary workers who are 15−64 year old during the sample year (appendix A). Observed variable (grey) is smoothed (black) by using a locally linear model with a .5 bandwidth. Source: Enquête emploi, INSEE. Author's computations.

Job polarization

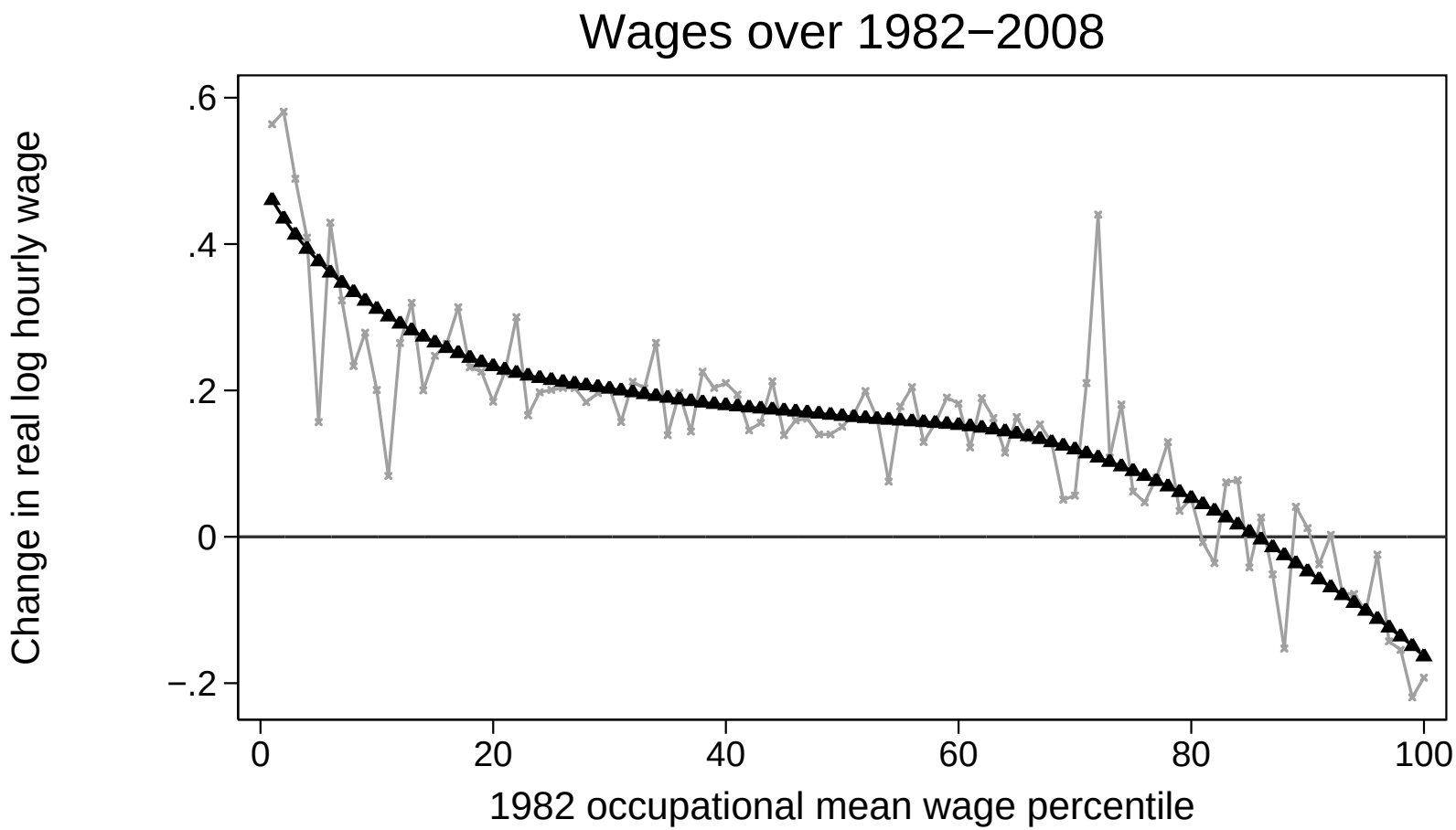
▸ DFL re-weighting



Note: Sample includes salary workers who are 15−64 year old during the sample year (appendix A).
Observed variable is smoothed by using a locally linear model with a .5 bandwidth.
Source: Enquête emploi, INSEE. Author's computations.

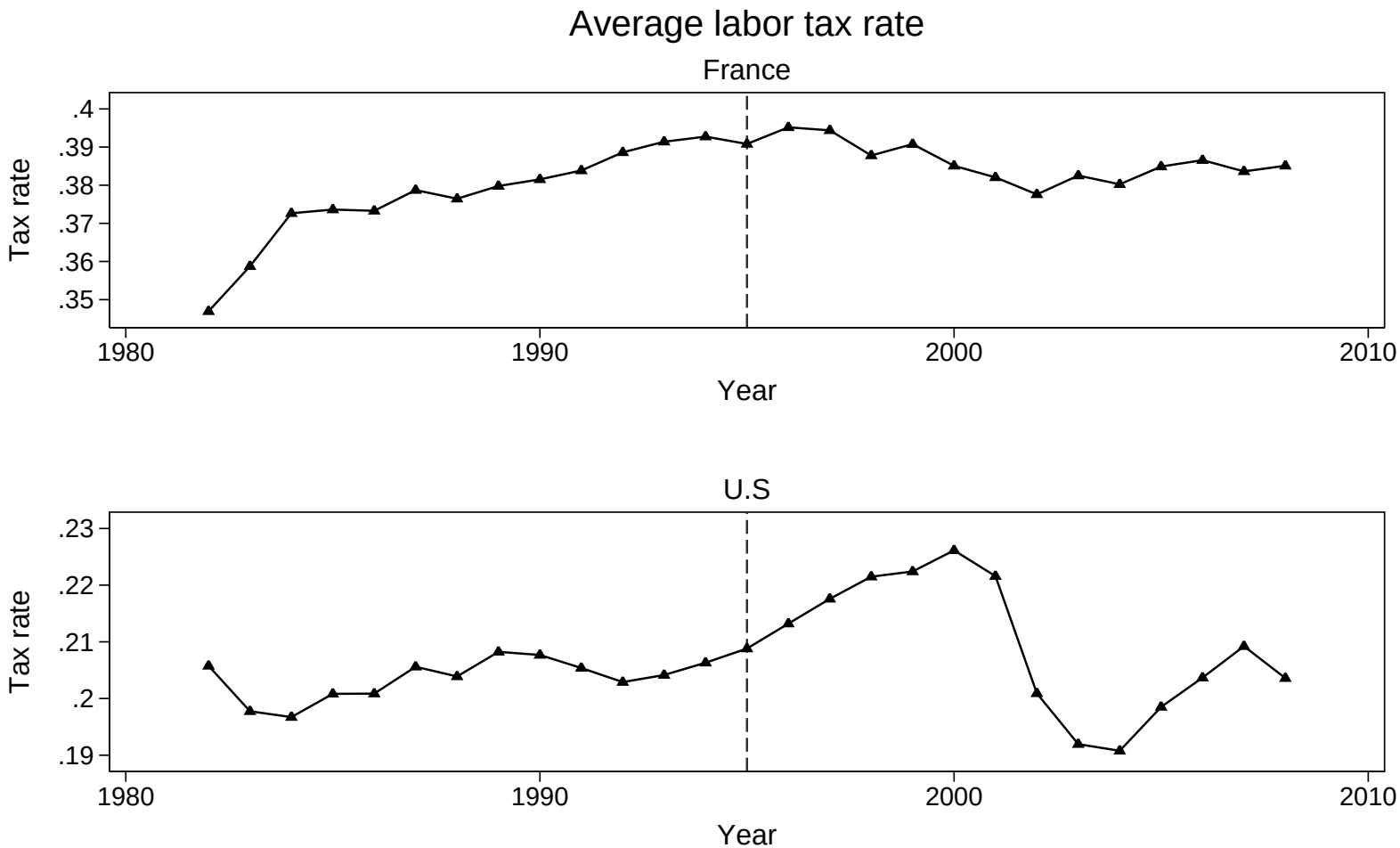
Wages

Robustness



Note: Sample includes salary workers who are 15−64 year old during the sample year (appendix A)
Observed variable (grey) is smoothed (black) by using a locally linear model with a .5 bandwidth.
Source: Enquête emploi, INSEE. Author's computations.

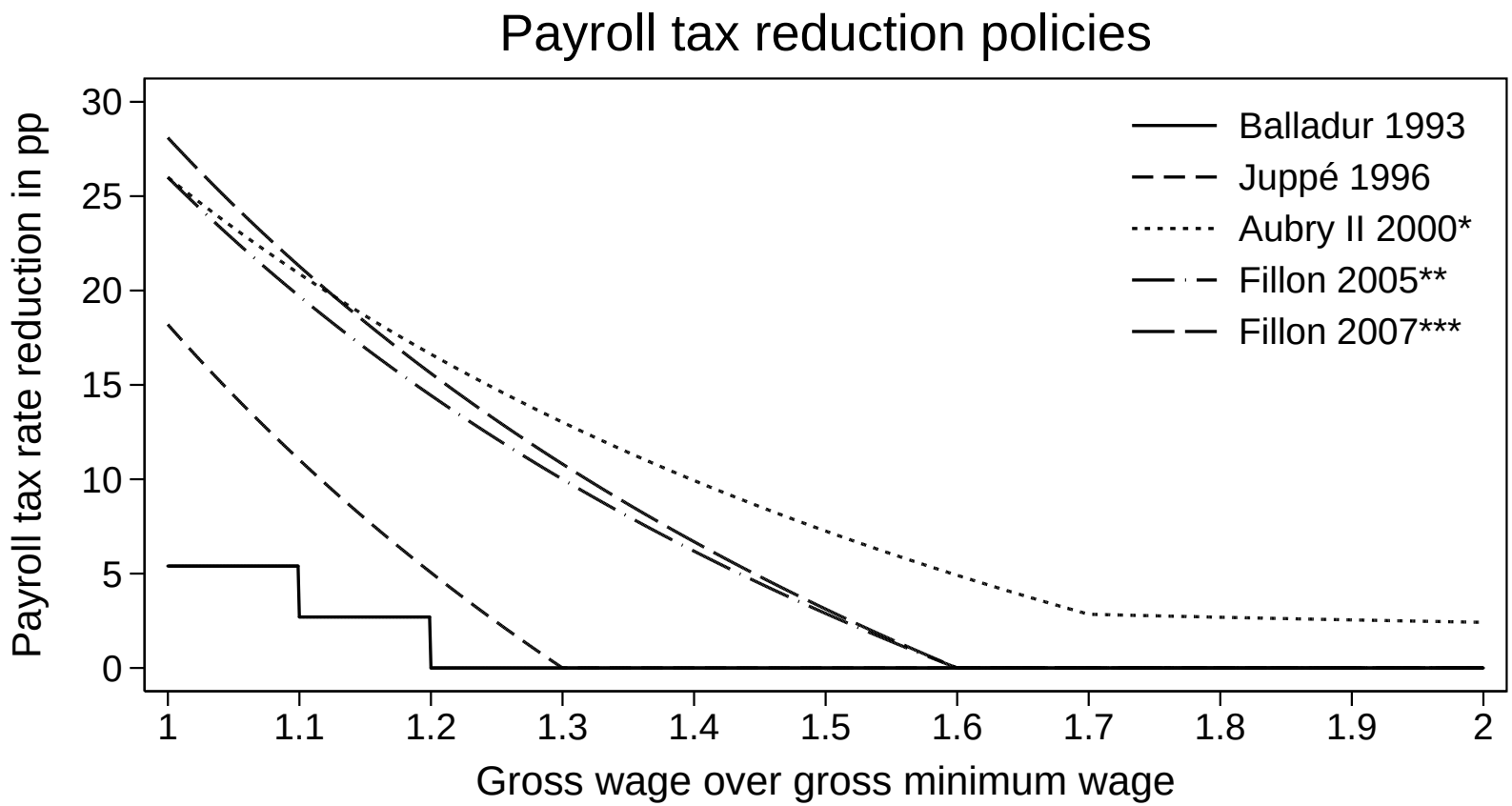
Average labor tax rate[2]



Source: McDaniel (2007)

[2] $\tau = \tau_{inc} + \tau_{SS}$

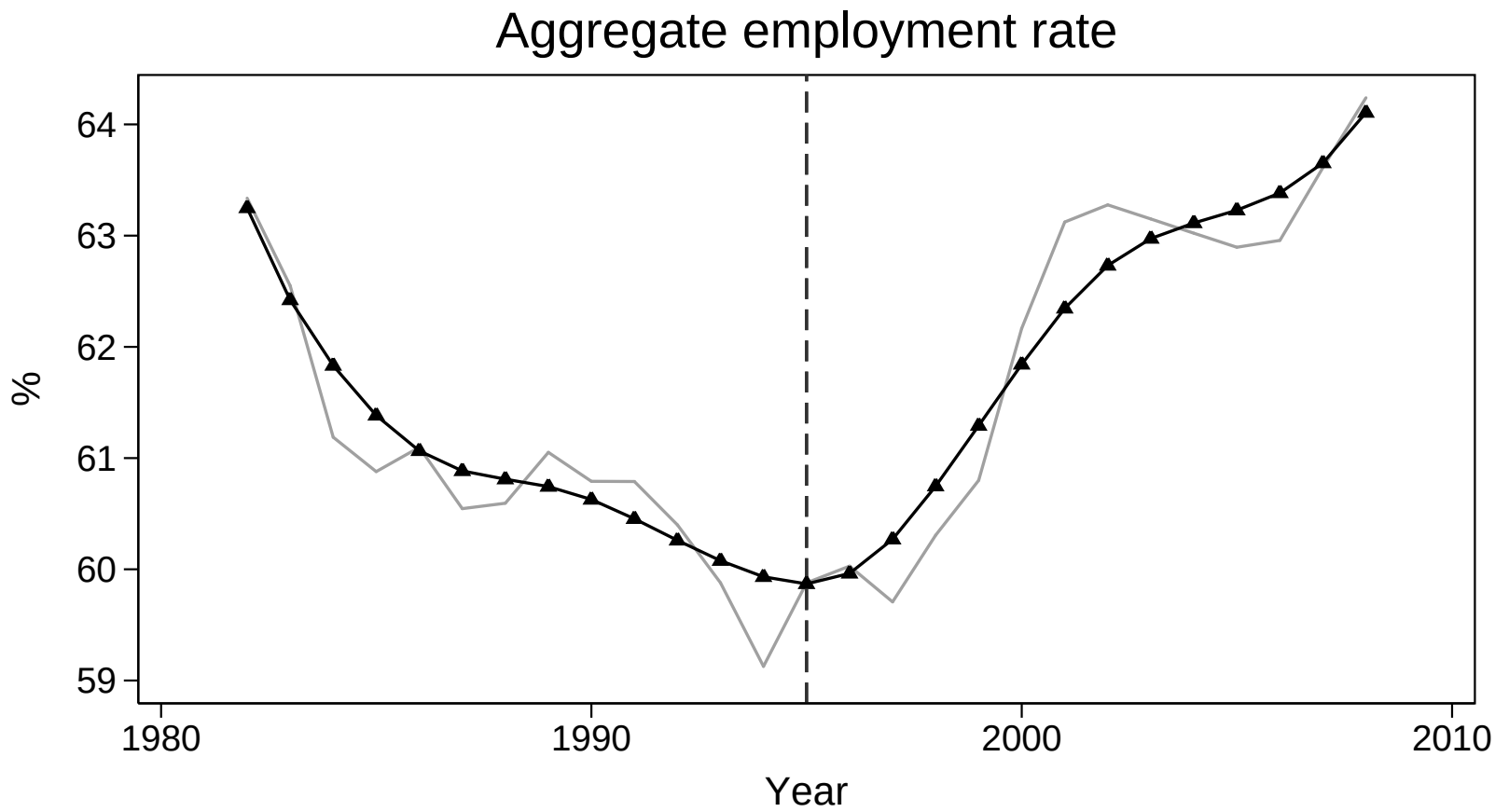
Differentiated payroll tax reduction policies



* Apply only for firms that implemented the 35−hour working time reductions (GMR).
** Also apply for firms with more than 19 employees after the 2007 reform.
*** Apply only for firms with less than 20 employees.

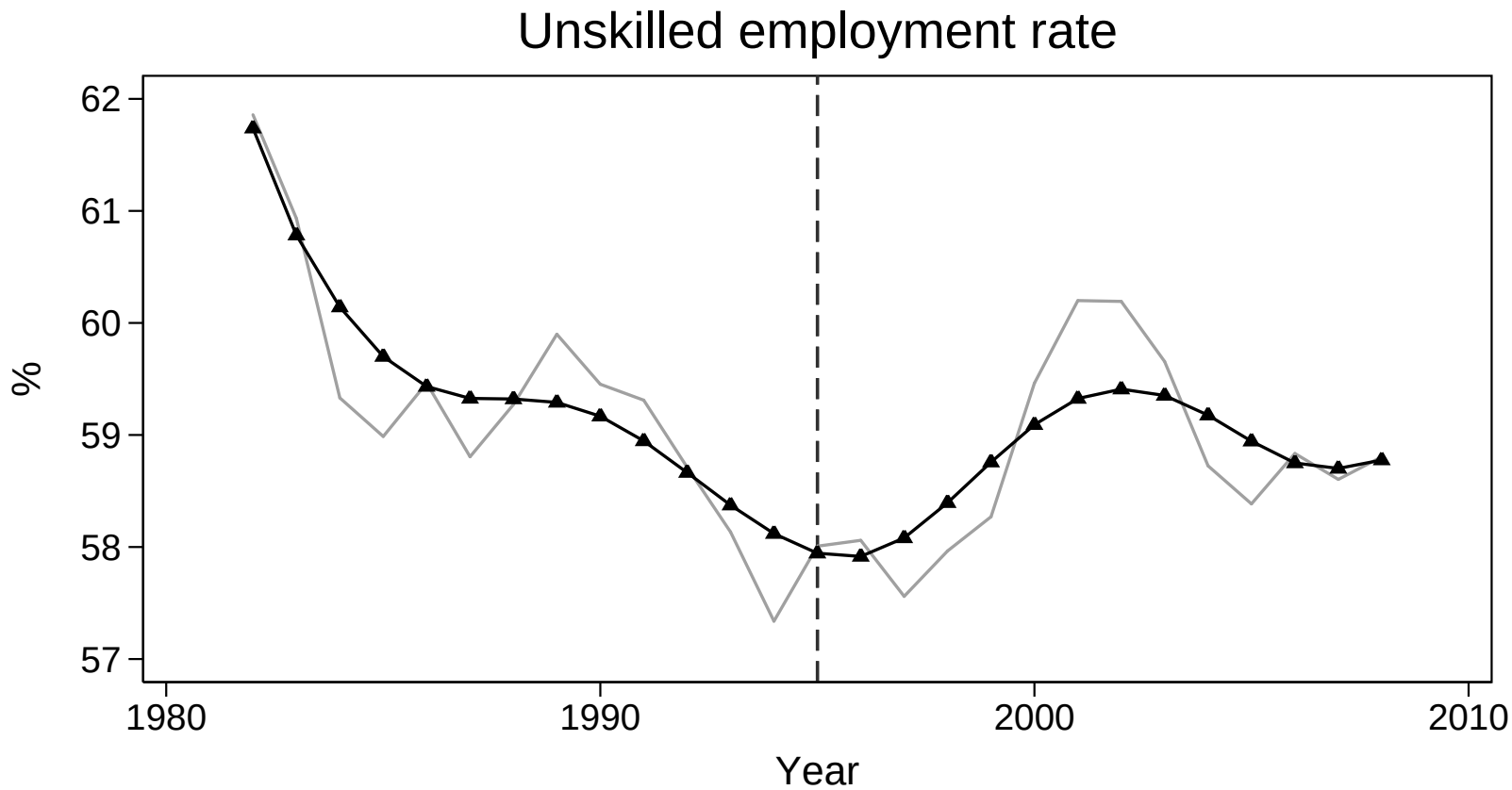
Sources: Legislation, Ourliac and Nouveau (2012) and author's computation.

Employment outcomes



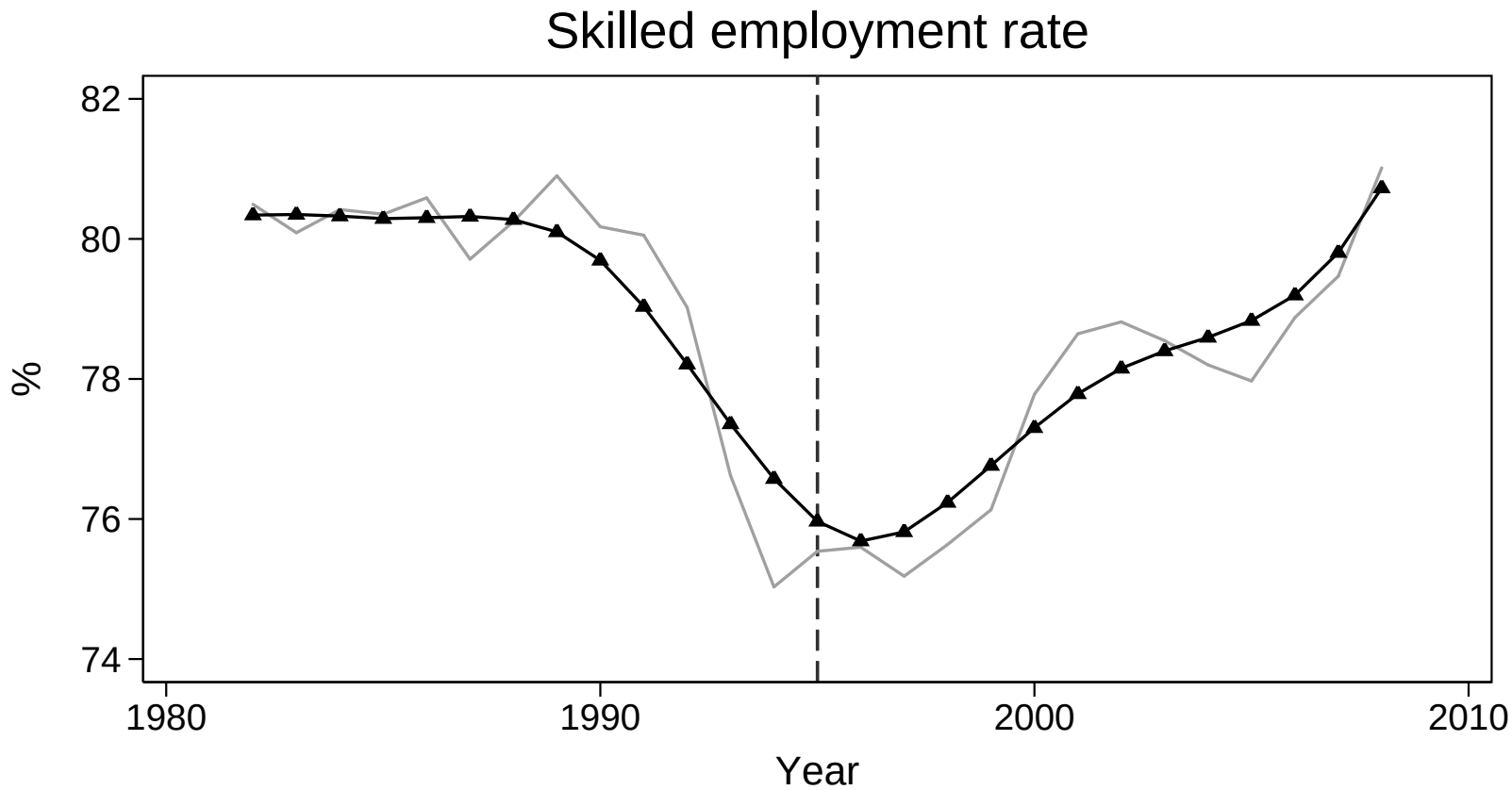
Note: Sample includes 15−64 year old individuals during the sample year (appendix A). Observations are corrected for 1990, 2003 breaks (grey) and then smoothed (black) using a locally linear model with a 0.4 bandwidth.
Source: Enquête emploi, INSEE. Author's computations.

Employment outcomes



Note: Sample includes 15−64 year old individuals during the sample year (appendix A). Unskilled indivuduals are defined as individuals who have at most a high−school degree (Bac). Observations are corrected for 1990, 2003 breaks (grey) and then smoothed (black) using a locally linear model with a 0.4 bandwidth.
Source: Enquête emploi, INSEE. Author's computations.

Employment outcomes



Note: Sample includes 15−64 year old individuals during the sample year (appendix A). Skilled indivuduals are defined as individuals who have at least a post high−school degree (Bac+2). Observations are corrected for 1990, 2003 breaks (grey) and then smoothed (black) using a locally linear model with a 0.4 bandwidth.
Source: Enquête emploi, INSEE. Author's computations.

Employment outcomes

Employment rate skill decomposition

$$e_t = \theta_t^{SK} e_t^{SK} + \theta_t^{UN} e_t^{UN}$$

Skill decomposition of aggregate employment rate change

$$\Delta e_{t-x,t} = \underbrace{\theta_{t-x}^{SK} \Delta e_{t-x,t}^{SK} + \theta_{t-x}^{UN} \Delta e_{t-x,t}^{UN}}_{\text{Employment Effect}} + \underbrace{e_t^{SK} \Delta \theta_{t-x,t}^{SK} + e_t^{UN} \Delta \theta_{t-x,t}^{UN}}_{\text{Skill Composition Effect}}$$

	Employment Effect			Skill Composition Effect			Total
	$\theta_{t-x}^{SK} \Delta e_{t-x,t}^{SK}$	$\theta_{t-x}^{UN} \Delta e_{t-x,t}^{UN}$	*Total*	$e_t^{SK} \Delta \theta_{t-x,t}^{SK}$	$e_t^{UN} \Delta \theta_{t-x,t}^{UN}$	*Total*	$\Delta e_{t-x,t}$
1982 – 1995	-0.36	-3.49	-3.84	1.94	-1.48	0.46	-3.38
1995 – 2008	0.51	0.74	1.25	10.98	-8.00	2.99	4.24
1982 – 2008	0.03	-2.72	-2.69	13.05	-9.50	3.55	0.86

Employment outcomes

▸ Tasks × skills

Employment rate skill x task decomposition

$$e_t = \sum_{k\in\{m,r,a\}} \theta_t^{SK} e_t^{SK,k} + \sum_{k\in\{m,r,a\}} \theta_t^{UN} e_t^{UN,k}$$

Skill x task decomposition of aggregate employment rate change

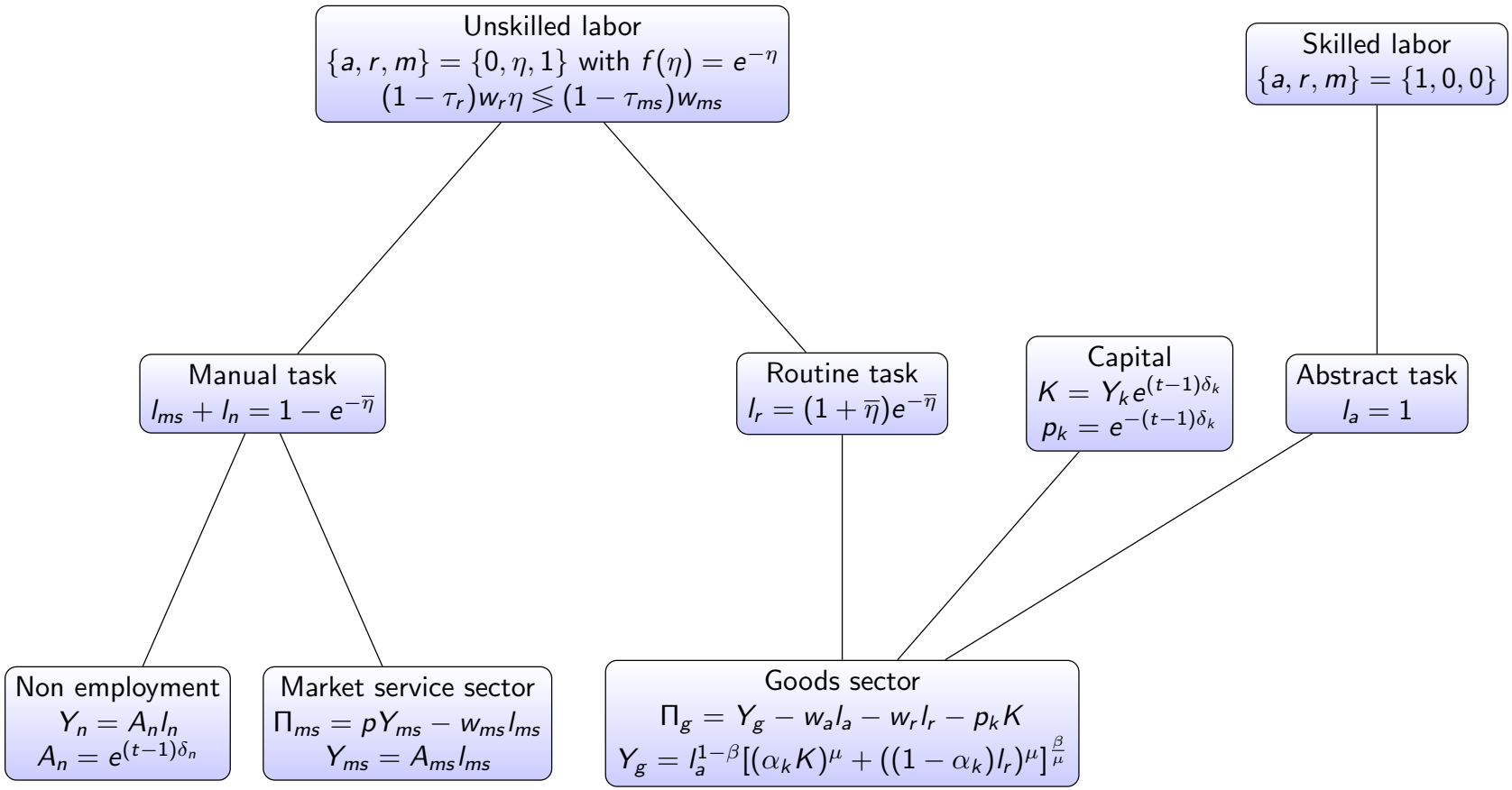
$$\Delta e_{t-x,t} = \underbrace{\sum_{k\in\{m,r,a\}} \left(\theta_{t-x}^{SK}\Delta e_{t-x,t}^{SK,k} + \theta_{t-x}^{UN}\Delta e_{t-x,t}^{UN,k}\right)}_{\text{Employment Effect}} + \underbrace{\sum_{k\in\{m,r,a\}} \left(e_t^{SK,k}\Delta\theta_{t-x,t}^{SK} + e_t^{UN,k}\Delta\theta_{t-x,t}^{UN}\right)}_{\text{Skill Composition Effect}}$$

	Employment Effect							Skill Composition Effect						
	$\theta_{t-x}^{SK}\Delta e_{t-x,t}^{SK,k}$			$\theta_{t-x}^{UN}\Delta e_{t-x,t}^{UN,k}$			*Total*	$e_t^{SK,k}\Delta\theta_{t-x,t}^{SK}$			$e_t^{UN,k}\Delta\theta_{t-x,t}^{UN}$			*Total*
	M	R	A	M	R	A		M	R	A	M	R	A	
1982 – 1995	0.03	0.15	-0.53	2.47	-6.70	0.74	-3.84	0.02	0.24	1.68	-0.24	-0.86	-0.39	0.46
1995 – 2008	0.13	0.51	-0.13	2.37	-2.06	0.43	1.25	0.29	1.93	8.76	-1.64	-4.24	-2.12	2.99
1982 – 2008	0.12	0.54	-0.63	4.92	-8.82	1.18	-2.69	0.34	2.30	10.41	-1.95	-5.04	-2.51	3.55

Model outlines

- Rogerson (2008) meets Autor and Dorn (2013)
- Three inputs
  - Skilled workers
  - Unskilled workers
  - Capital
- Two market sectors
  - Goods sector
  - Market service sector
- A non-market sector (non-employment)
  - No wages
  - Not taxed
- Three types of exogenous trends
  - Diffusion of new technologies
  - Labor taxation policies
  - Relative non-market productivity

Supply side


Unskilled labor
$\{a, r, m\} = \{0, \eta, 1\}$ with $f(\eta) = e^{-\eta}$
$(1 - \tau_r)w_r\eta \lesseqgtr (1 - \tau_{ms})w_{ms}$
Skilled labor
$\{a, r, m\} = \{1, 0, 0\}$
Manual task
$l_{ms} + l_n = 1 - e^{-\overline{\eta}}$
Routine task
$l_r = (1 + \overline{\eta})e^{-\overline{\eta}}$
Capital
$K = Y_k e^{(t-1)\delta_k}$
$p_k = e^{-(t-1)\delta_k}$
Abstract task
$l_a = 1$
Non employment
$Y_n = A_n l_n$
$A_n = e^{(t-1)\delta_n}$
Market service sector
$\Pi_{ms} = pY_{ms} - w_{ms}l_{ms}$
$Y_{ms} = A_{ms}l_{ms}$
Goods sector
$\Pi_g = Y_g - w_a l_a - w_r l_r - p_k K$
$Y_g = l_a^{1-\beta}[(\alpha_k K)^\mu + ((1 - \alpha_k)l_r)^\mu]^{\frac{\beta}{\mu}}$

Demand side

Representative household

$$
\begin{aligned}
\underset{\{C_g, C_{ms}, C_n, l_n\}}{max} \quad & \left[a_g C_g^{\varepsilon} + (1 - a_g) F(C_{ms}, C_n)^{\varepsilon}\right]^{\frac{1}{\varepsilon}} \\
s.t. \quad & C_g + pC_{ms} = \sum_{i \in \{a,r,ms\}} (1 - \tau_i) w_i l_i + T \\
& F(C_{ms}, C_n) = \left[a_s C_{ms}^{\nu} + (1 - a_s) C_n^{\nu}\right]^{\frac{1}{\nu}} \\
& 1 - e^{-\overline{\eta}} = l_{ms} + l_n \\
& Y_n = A_n l_n \\
& Y_n = C_n
\end{aligned}
$$

with $\varepsilon < 0$, $\nu > 0$ and non negativity constraints.

Closing the model

Market clearing conditions

$$\begin{aligned} Y_g &= C_g + p^K K \\ Y_{ms} &= C_{ms} \\ Y_n &= C_n \end{aligned}$$

Government budget constraint

$$T = \sum_{i \in \{a,r,ms\}} \tau_i w_i l_i$$

General equilibrium conditions

$$
\begin{aligned}
w_r &= \beta(1-\alpha_k)^{\mu} l_r^{\mu-1} l_a^{1-\beta} \left[((1-\alpha_k) l_r)^{\mu} + (\alpha_k K)^{\mu}\right]^{\frac{\beta}{\mu}-1} \\
w_a &= (1-\beta)\, l_a^{-\beta} \left[((1-\alpha_k) l_r)^{\mu} + (\alpha_k K)^{\mu}\right]^{\frac{\beta}{\mu}} \\
p_k &= \beta \alpha_k^{\mu} K^{\mu-1} l_a^{1-\beta} \left[((1-\alpha_k) l_r)^{\mu} + (\alpha_k K)^{\mu}\right]^{\frac{\beta}{\mu}-1} \\
w_{ms} &= A_{ms} p \\
\overline{\eta} &= \frac{(1-\tau_{ms})\, w_{ms}}{(1-\tau_r)\, w_r} \\
l_{ms} + l_n &= 1 - e^{-\overline{\eta}} \\
l_r &= (1+\overline{\eta})\, e^{-\overline{\eta}} \\
l_a &= 1 \\
p &= \frac{a_s\,(1-a_g)}{a_g} \frac{F(C_{ms}, C_n)^{\varepsilon-\nu} C_{ms}^{\nu-1}}{C_g^{\varepsilon-1}} \\
l_{ms} &= \left(\frac{A_{ms}}{A_n}\right)^{\frac{\upsilon}{1-\upsilon}} \left(\frac{(1-\tau_{ms})\, a_s}{(1-a_s)}\right)^{\frac{1}{1-\upsilon}} l_n
\end{aligned}
$$

General equilibrium conditions

$$
\begin{aligned}
C_g + pC_{ms} &= \sum_{i \in \{a,r,ms\}} (1-\tau_i) w_i l_i + T \\
T &= \sum_{i \in \{a,r,ms\}} \tau_i w_i l_i \\
Y_{ms} &= A_{ms} l_{ms} \\
Y_n &= A_n l_n \\
Y_g &= C_g + p_k K \\
Y_{ms} &= C_{ms} \\
Y_n &= C_n \\
p_k &= e^{-(t-1)\delta_k} \\
A_n &= e^{(t-1)\delta_n}
\end{aligned}
$$

Calibration

- Enquête emploi (INSEE), EU KLEMS, social security report (Amer et al., 2009), Rogerson (2008).
- Empirically relevant case: $\varepsilon < \frac{\mu}{\beta}$, $\varepsilon < 0$, $\mu > 0$ Asymptotic analysis

Employment data to match

Year	$e_t^{UN} = e_t^{UN,r} + e_t^{UN,m}$	$e_t^{UN,r} = \int_{\overline{\eta}}^{+\infty} e^{-\eta} d\eta$	$e_t^{UN,m} = l_{ms}$	$1 - e_t^{UN} = l_n$
1982	.6174	.5498	.0676	.3826
2008	.5878	.4671	.1207	.4122

Labor share data to match

Year	Labor share	ΔLabor share
1982	.7684	-
2008	.6539	-11.45pp

External parameters Tax rates

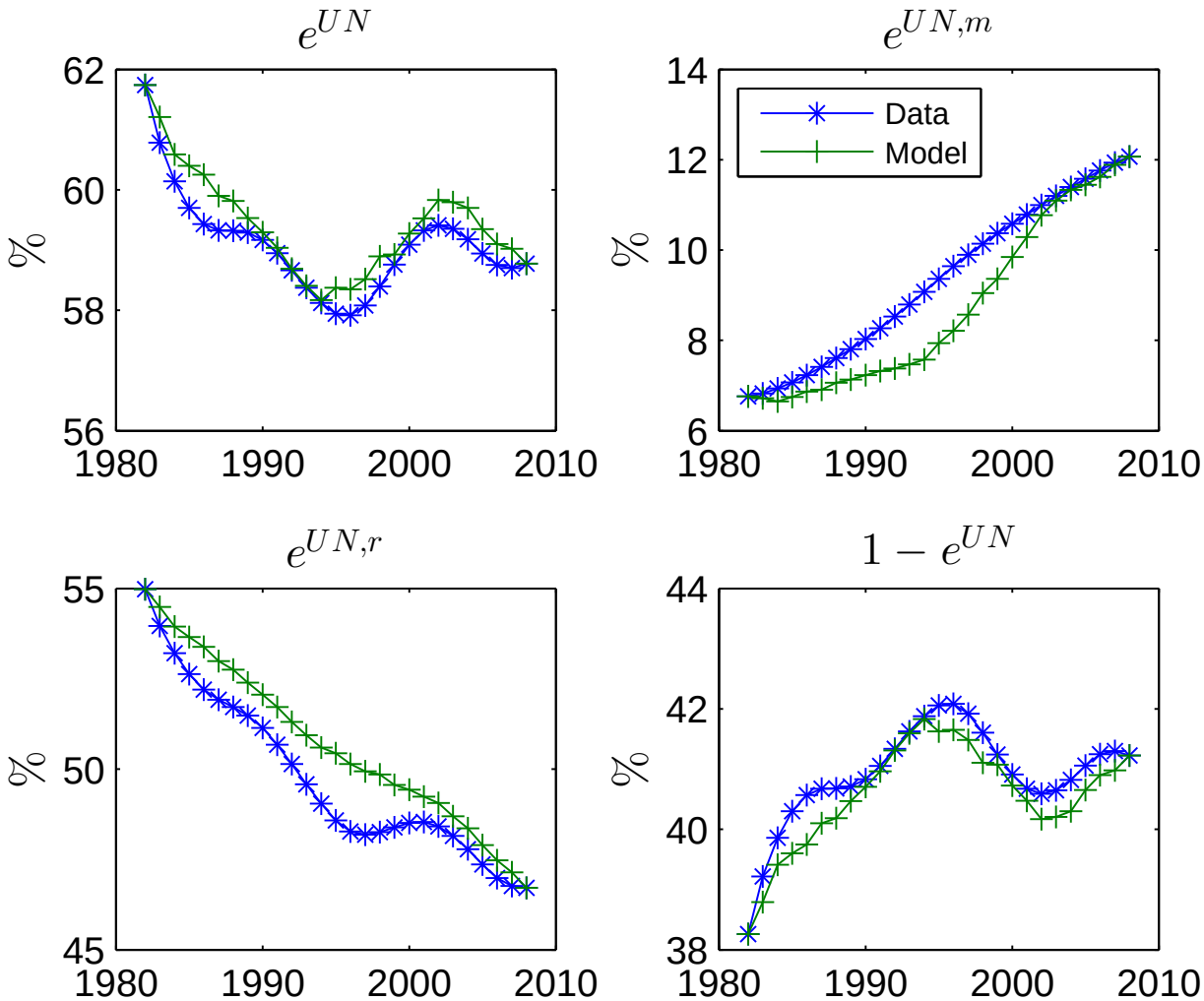
β	A_{ms}	ν	$\tau_{a,1982}=\tau_{r,1982}=\tau_{ms,1982}$	$\tau_{a,2008}$	$\tau_{r,2008}$	$\tau_{ms,2008}$
.67	1	.45	.35	.39	.34	.29

Calibrated parameters

δ_k	α_k	δ_n	a_s	a_g	ε	μ
.031	.40	-.016	.37	.96	-.84	.42

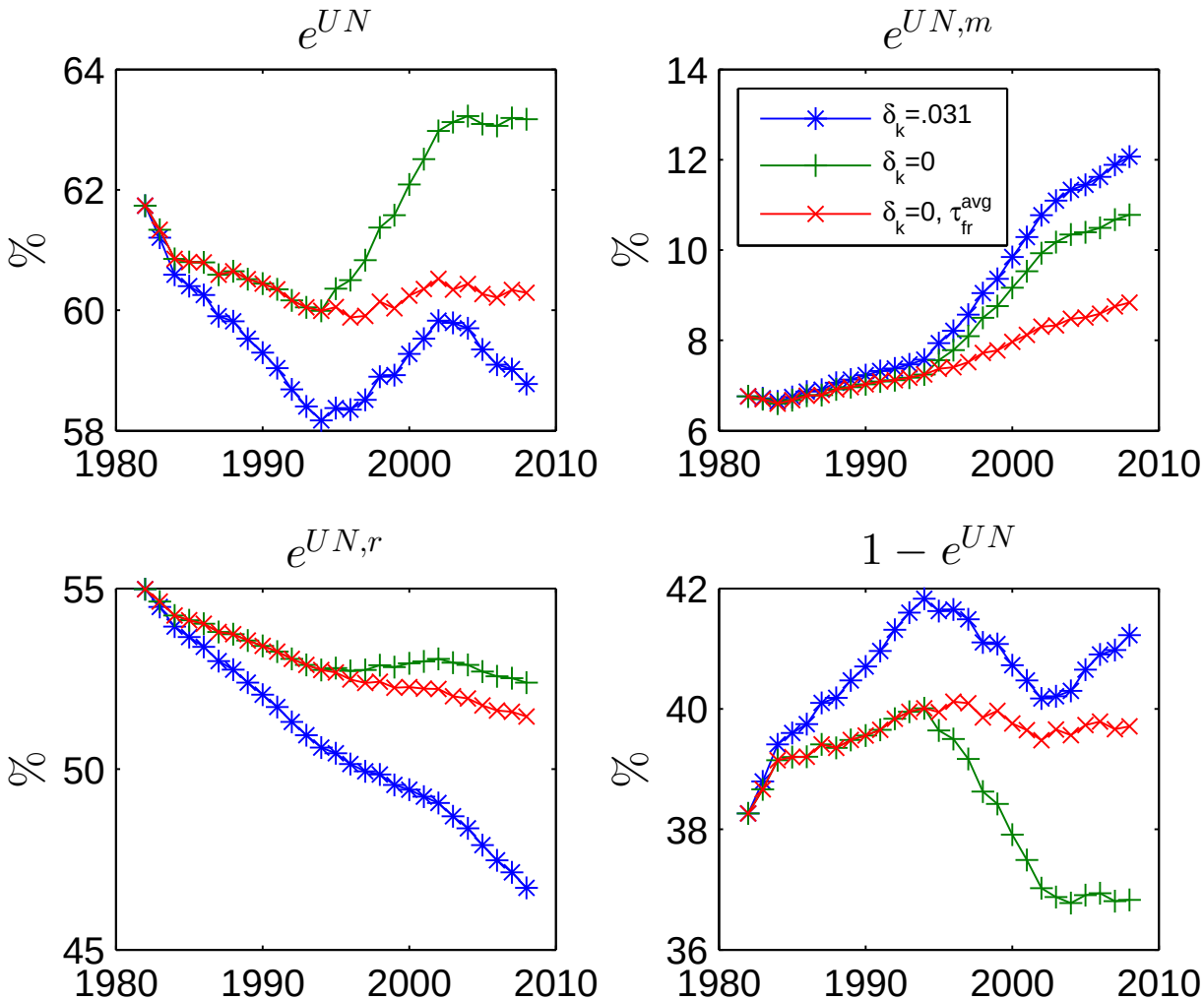
Results

Model fit



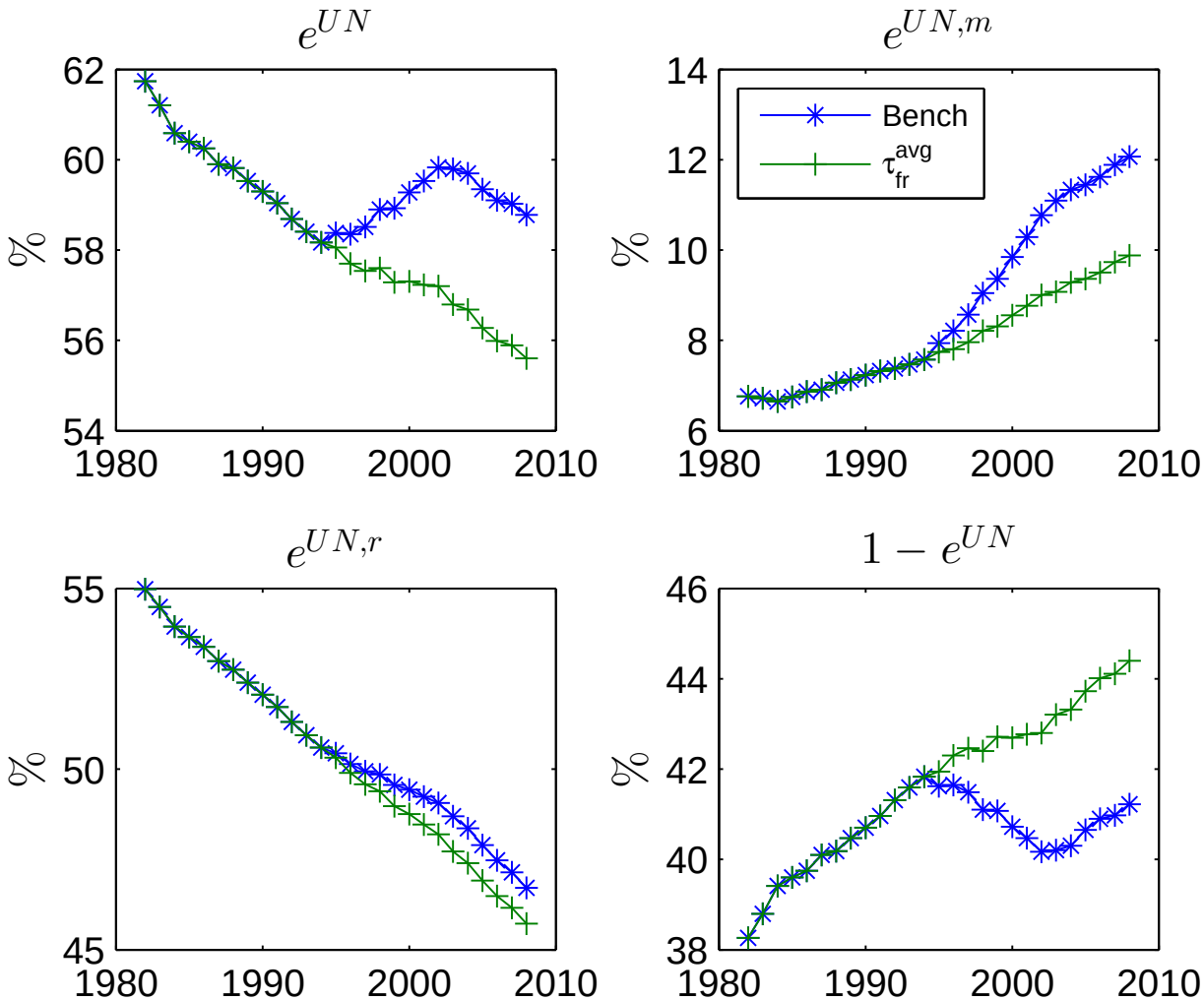
Results

The role of capital diffusion



Results

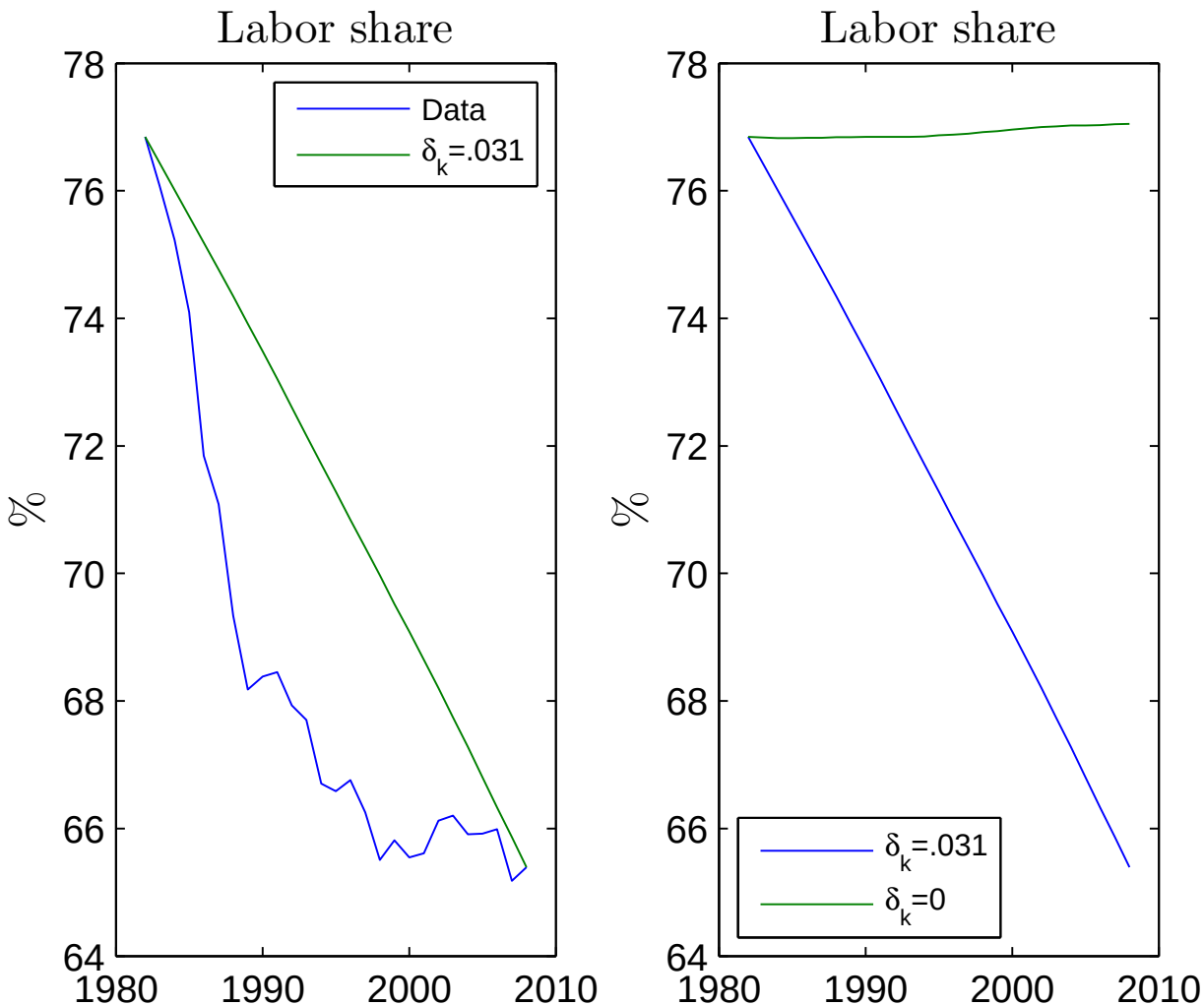
The role of differentiated payroll tax reduction policies



Results

Other

Labor share



Conclusion

- Four French stylized facts
  - Job polarization
  - Unskilled employment losses
  - Imperfect reallocation of unskilled workers from routine to manual jobs
  - High average labor tax rate but massive differentiated payroll tax reductions since 1993
- General equilibrium model with occupational choice
  - Parsimonious
  - Match the data
  - Counter-factual analysis
  - Unskilled employment losses from high and increasing labor taxation
  - Unskilled employment gains from differentiated payroll tax subsidies

Thank You

References

John M. Abowd, Francis Kramarz, David N. Margolis, and Thomas Philippon. The Tail of Two Countries: Minimum Wages and Employment in France and the United States. IZA Discussion Paper 203, Institute for the Study of Labor (IZA), 2000.

Daron Acemoglu and David Autor. Skills, Tasks and Technologies: Implications for Employment and Earnings. NBER Working Paper 16082, National Bureau of Economic Research, Inc, 2010.

Daron Acemoglu and Veronica Guerrieri. Capital Deepening and Nonbalanced Economic Growth. *Journal of Political Economy*, 116(3): 467–498, 2008.

Daron Acemoglu and Pascual Restrepo. The Race Between Machine and Man: Implications of Technology for Growth, Factor Shares and Employment. NBER Working Papers 22252, National Bureau of Economic Research, Inc, May 2016.

References

Nadia Amer, Mehdi Mamache, Sandra Bernard, Anton Mangov, Camille Bonaiti, Myriam Mikou, Eric Bonnet, Bruno Morin, Jonathan Bosredon, Marine Pardessus, Céline Carel, Julien Perlat, Olivier Chemla, Annie Perraud, Marianne Cornu-Pauchet, Jean-Philippe Perret, Thomas Filleur, Anne-Gisèle Privat, Arnaud Gollandeau, Béatrice Rolland, Gérard Groffe, Romain Roussel, Sylvain Grognet, Julien Samak, David Hoyrup, Nicolas Vanni, Roman Krakus, Damien Vergé, Audrey Lafon, Jean-Luc Vieilleribière, Éric Lefebvre, Sophie Vincent, Charlotte Lespagnol, and Benjamin Voisin. Rapport à la commission des comptes de la sécurité sociale. Technical report, Commission des comptes de la sécurité sociale, 2009.

David Autor. The polarization of job opportunities in the U.S. labor market: implications for employment and earnings. *Community Investments*, (Fall):11–16, 40–41, 2011.

David Autor. Polanyi's Paradox and the Shape of Employment Growth. NBER Working Paper 20485, National Bureau of Economic Research, Inc, 2014.

References

David H. Autor. The "Task Approach" to Labor Markets: An Overview. NBER Working Paper 18711, National Bureau of Economic Research, Inc, 2013.

David H. Autor and David Dorn. The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market. *American Economic Review*, 103(5):1553–97, 2013.

David H. Autor, Frank Levy, and Richard J. Murnane. The Skill Content Of Recent Technological Change: An Empirical Exploration. *The Quarterly Journal of Economics*, 118(4):1279–1333, November 2003.

David H. Autor, Lawrence F. Katz, and Melissa S. Kearney. The Polarization of the U.S. Labor Market. *American Economic Review*, 96 (2):189–194, 2006.

David H. Autor, Lawrence F. Katz, and Melissa S. Kearney. Trends in U.S. Wage Inequality: Revising the Revisionists. *The Review of Economics and Statistics*, 90(2):300–323, 2008.

References

David H. Autor, David Dorn, and Gordon H. Hanson. The China Syndrome: Local Labor Market Effects of Import Competition in the United States. NBER Working Paper 18054, National Bureau of Economic Research, Inc, 2012.

David H. Autor, David Dorn, and Gordon H. Hanson. Untangling Trade and Technology: Evidence from Local Labor Markets. NBER Working Paper 18938, National Bureau of Economic Research, Inc, 2013.

Paul Beaudry, David A. Green, and Benjamin M. Sand. The Great Reversal in the Demand for Skill and Cognitive Tasks. NBER Working Paper 18901, National Bureau of Economic Research, Inc, 2013.

Samuel Bentolila and Gilles Saint-Paul. Explaining Movements in the Labor Share. *The B.E. Journal of Macroeconomics*, 3(1):1–33, October 2003.

Olivier Blanchard. European Unemployment: The Evolution of Facts and Ideas. NBER Working Papers 11750, National Bureau of Economic Research, Inc, November 2005.

References

Timo Boppart. Structural change and the Kaldor facts in a growth model with relative price effects and non-Gorman preferences. ECON - Working Paper 002, Department of Economics - University of Zurich, 2011.

Ariel Burstein, Eduardo Morales, and Jonathan Vogel. Accounting for changes in between-group inequality. Working Paper 20855, National Bureau of Economic Research, January 2015.

Pierre Cahuc and Stéphane Carcillo. Les conséquences des allègements généraux de cotisations patronales sur les bas salaires. Sciences po publications, Sciences Po, October 2012.

Pierre Cahuc and Michèle Debonneuil. *Productivité et emploi dans le tertiaire*. 2004.

Pierre Cahuc and André Zylberberg. Labor Economics. MIT Press Books, The MIT Press, 2004.

Sylvain Catherine, Augustin Landier, and David Thesmar. Marché du travail : la grande fracture, 2015.

References

Arnaud Chéron, François Langot, and Eva Moreno-Galbis. The "Dynamic" of Job Competition during the ICT Revolution. IZA Discussion Paper 2671, Institute for the Study of Labor (IZA), 2007.

Guido Matias Cortes, Nir Jaimovich, Christopher J. Nekarda, and Henry E. Siu. The Micro and Macro of Disappearing Routine Jobs: A Flows Approach. NBER Working Paper 20307, National Bureau of Economic Research, Inc, 2014.

John DiNardo, Nicole M. Fortin, and Thomas Lemieux. Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach. NBER Working Papers 5093, National Bureau of Economic Research, Inc, April 1995.

Horst Entorf, Michel Gollac, and Francis Kramarz. New Technologies, Wages and Worker Selection. CEPR Discussion Paper 1761, C.E.P.R. Discussion Papers, 1997.

Nicole Fortin, Thomas Lemieux, and Sergio Firpo. Decomposition Methods in Economics. NBER Working Papers 16045, National Bureau of Economic Research, Inc, June 2010.

References

Christian Gianella. Une estimation de l'élasticité de l'emploi peu qualifié à son coût. Technical report, Document de travail de la DESE n G 9912 bis., 1999.

Maarten Goos, Alan Manning, and Anna Salomons. Job Polarization in Europe. *American Economic Review*, 99(2):58–63, 2009.

Erica L. Groshen and Simon Potter. Has structural change contributed to a jobless recovery? *Current Issues in Economics and Finance*, 9(Aug), 2003.

Daniel S. Hamermesh. Labor demand. Princeton University Press Book, Princeton University Press, 1993.

James Harrigan, Ariell Reshef, and Farid Toubal. The March of the Techies: Technology, Trade, and Job Polarization in France, 1994-2007. NBER Working Papers 22110, National Bureau of Economic Research, Inc, 2016.

Nir Jaimovich and Henry E. Siu. The Trend is the Cycle: Job Polarization and Jobless Recoveries. NBER Working Paper 18334, National Bureau of Economic Research, Inc, 2012.

References

Nicholas Kaldor. A model of economic growth. *The Economic Journal*, 67(268):591–624, 1957. ISSN 00130133, 14680297.

Piyabha Kongsamut, Sérgio Rebelo, and Danyang Xie. Beyond Balanced Growth. CEPR Discussion Paper 1693, C.E.P.R. Discussion Papers, 1997.

Francis Kramarz and Thomas Philippon. The Impact of Differential Payroll Tax Subsidies on Minimum Wage Employment. IZA Discussion Paper 219, Institute for the Study of Labor (IZA), 2000.

Francis Kramarz and Thomas Philippon. The impact of differential payroll tax subsidies on minimum wage employment. *Journal of Public Economics*, 82(1):115–146, October 2001.

François Langot, Jean-Olivier Hairault, and Theptida Sopraseuth. Aggregate employment, job polarization and inequalities: A transatlantic perspective. Technical report, 2015.

McDaniel. Average tax rates on consumption, investment, labor and capital in the oecd 1950-2003. 2007.

Eva Moreno-Galbis and Thepthida Sopraseuth. Job Polarization in Aging Economies. Working Paper halshs-00856173, HAL, 2012.

References

Brent Neiman and Loukas Karabarbounis. The Global Decline of the Labor Share. *The Quarterly Journal of Economics*, 129(1):61–103, 2014.

L. Rachel Ngai and Christopher A. Pissarides. Trends in Hours and Economic Growth. IZA Discussion Paper 2540, Institute for the Study of Labor (IZA), 2007.

L. Rachel Ngai and Christopher A. Pissarides. Employment Outcomes in the Welfare State. CEP Discussion Paper dp0856, Centre for Economic Performance, LSE, 2008.

Lee Ohanian, Andrea Raffo, and Richard Rogerson. Long-term changes in labor supply and taxes: Evidence from OECD countries, 1956-2004. *Journal of Monetary Economics*, 55(8):1353–1362, 2008.

Mary O'Mahony and Marcel P. Timmer. Output, Input and Productivity Measures at the Industry Level: The EU KLEMS Database. *Economic Journal*, 119(538):F374–F403, 06 2009.

References

Benoît Ourliac and Cyril Nouveau. Les allègements de cotisations sociales patronales sur les bas salaires en france de 1993 à 2009. Working Papers 169, Direction de l'Animation de la Recherche, des Etudes et des Statistiques (DARES), 2012.

Olivier Passet. Note Xerfi Synthèse 6 - Politiques de baisse des charges : attention aux fausses certitudes sur le déficit français en emplois peu qualifiés, May 2015.

Thomas Piketty. L'emploi dans les services en France et aux États-Unis : une analyse structurelle sur longue période. *Économie et Statistique*, 318(1):73–99, 1998.

Christopher A. Pissarides. Unemployment And Hours Of Work: The North Atlantic Divide Revisited. *International Economic Review*, 48(1): 1–36, 2007.

Edward C. Prescott. Why do Americans work so much more than Europeans? *Quarterly Review*, (Jul):2–13, 2004.

Richard Rogerson. Understanding Differences in Hours Worked. *Review of Economic Dynamics*, 9(3):365–409, 2006.

References

Richard Rogerson. Structural Transformation and the Deterioration of European Labor Market Outcomes. NBER Working Paper 12889, National Bureau of Economic Research, Inc, 2007.

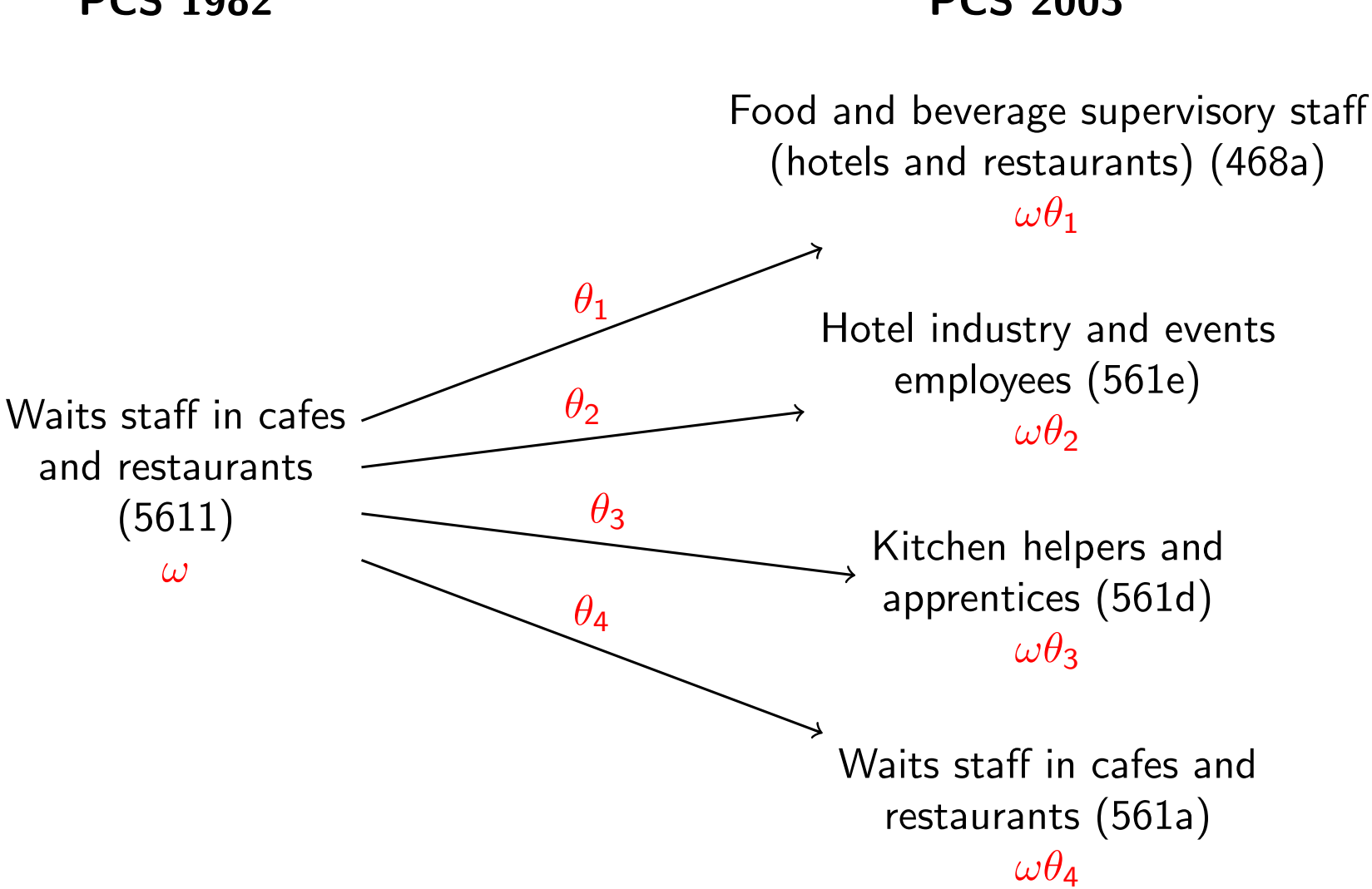
Richard Rogerson. Structural Transformation and the Deterioration of European Labor Market Outcomes. *Journal of Political Economy*, 116 (2):235–259, 2008.

French Tresory. Le recul de l'emploi industriel en france de 1980 à 2007: Quelle est la réalité ? *Trésor Eco*, 2010.

G. Verdugo, H. Fraisse, and G. Horny. Changes In Wage Inequality In France: The Impact Of Composition Effects (in French). Working paper 370, Banque de France, 2012.

Appendix

Occupational crosswalk



with $\sum_{i=1}^{4}\theta_i = 1$. Back

Statistical break correction model

Two steps correction

- First step

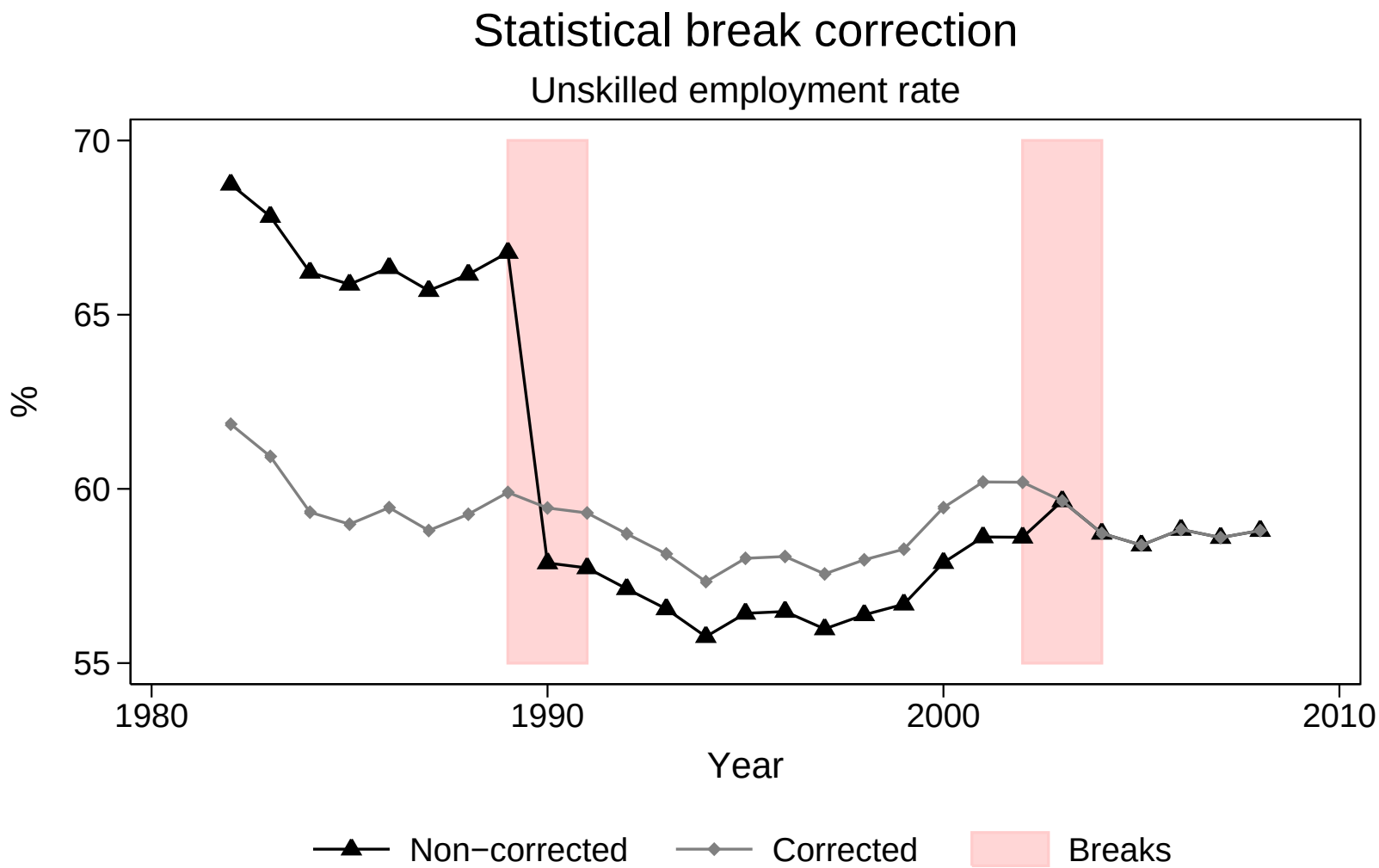
$$\begin{aligned} \widetilde{\widetilde{y}}_t &= \alpha_1 + \delta_1 t + \beta_1 \, ind2003_t + \varepsilon_t \\ \widetilde{y}_t &= \widetilde{\widetilde{y}}_t - \hat{\beta}_1 \, ind2003_t \end{aligned}$$

- Second step

$$\begin{aligned} \widetilde{y}_t &= \alpha_2 + \delta_2 t + \beta_2 \, ind1990_t + \varepsilon_t \\ y_t &= \widetilde{y}_t - \hat{\beta}_2 \, ind1990_t \end{aligned}$$

Back

Statistical break correction model



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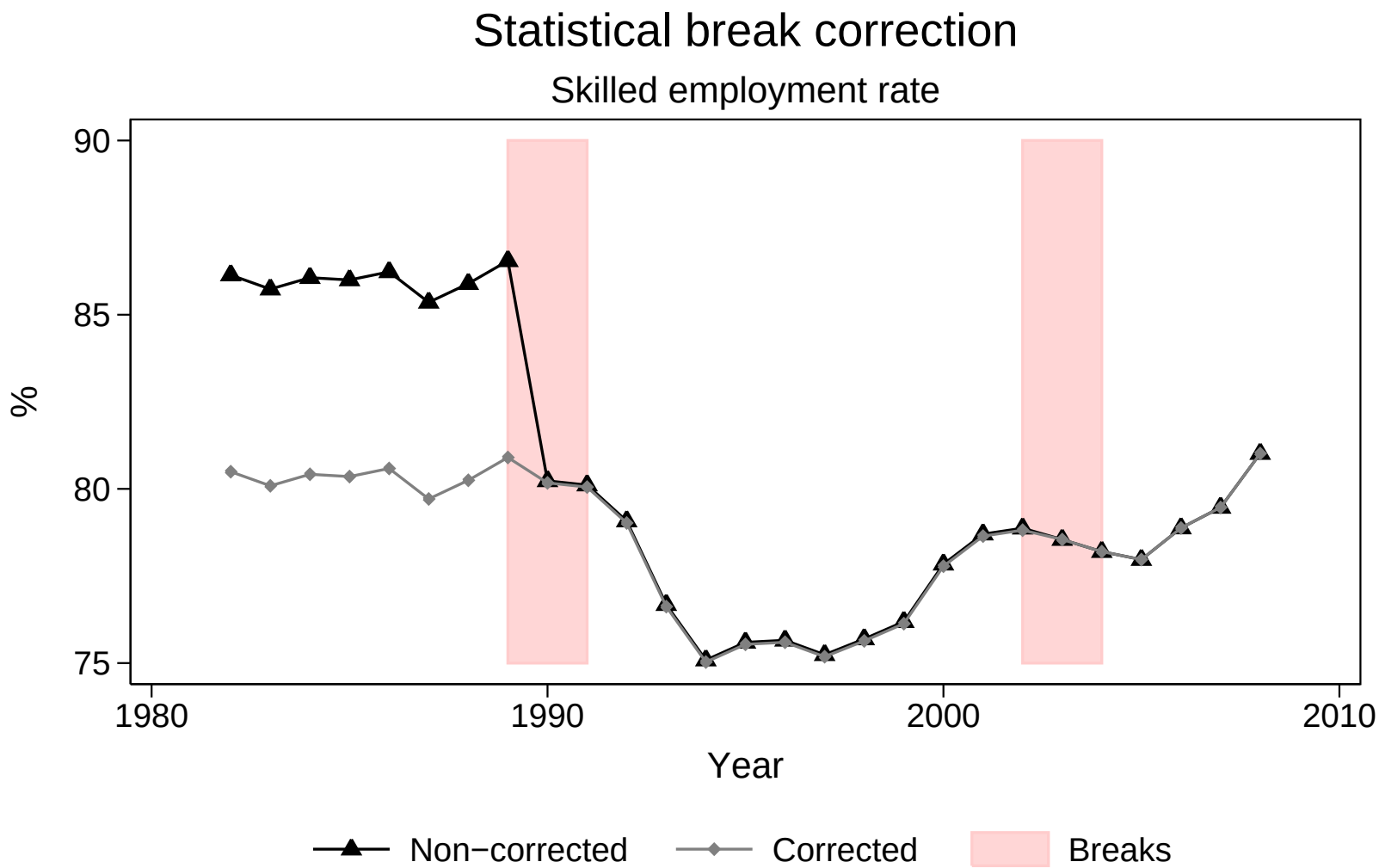
Statistical break correction model



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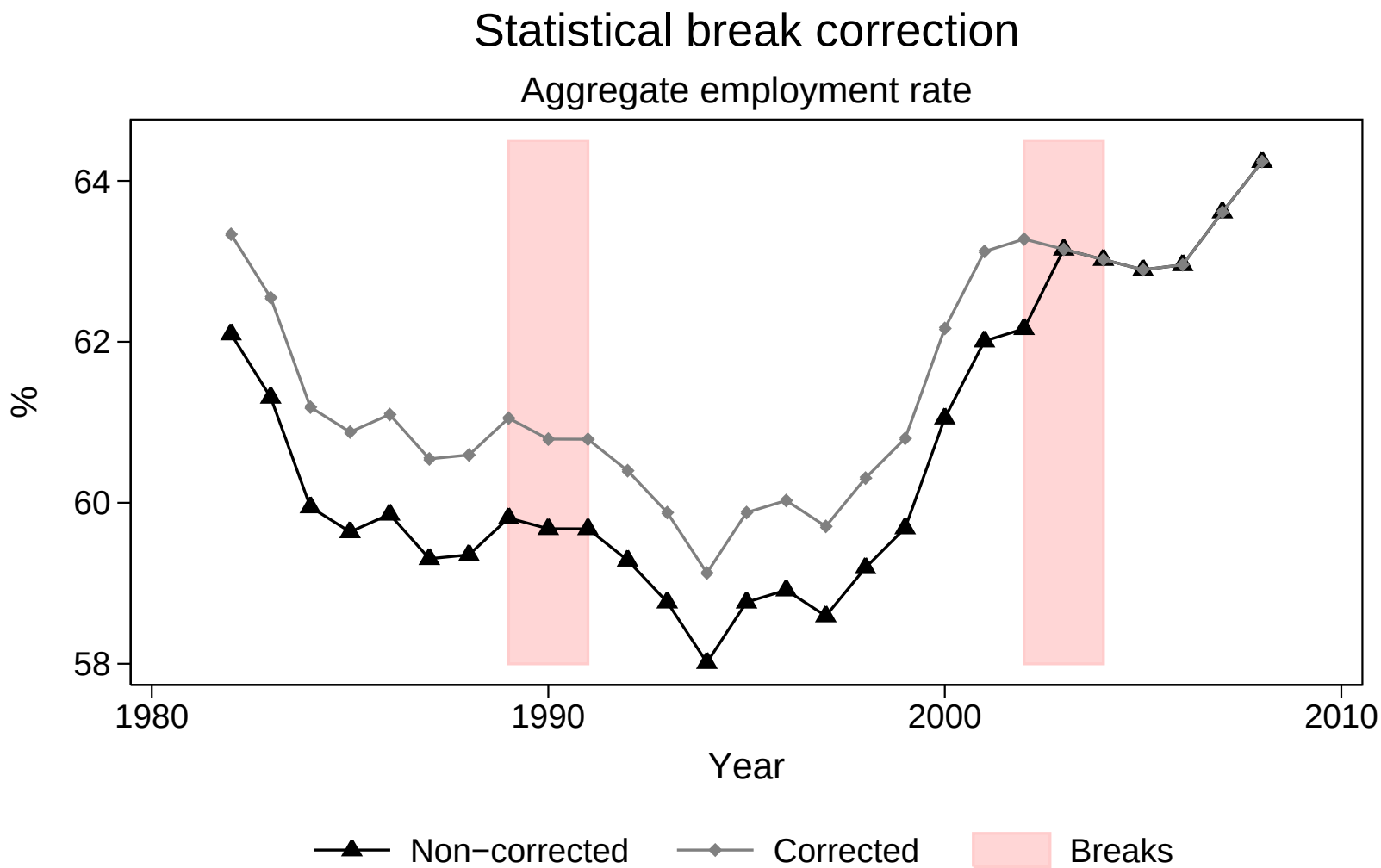
Statistical break correction model



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Data

Manual jobs: low-skilled manual services

- Personal service jobs
- Some public servants

Routine jobs: industrial, clerical and other manual jobs

- Business administrative personnel
- Maintenance, storage, and transportation workers
- Foremen, skilled and unskilled industry workers
- Salespeople
- Drivers

Abstract jobs: direction, scientific, and technical jobs

- Heads of companies
- Professors and scientific professions
- Business administration, engineers and technicians
- Technicians

Back

Data

Manual jobs

- CSE: 56, 52 (except 521a, 521b, 522a, 523a, 524a)
- Additional job codes: 631a, 636d, 684a

Routine jobs

- CSE: 11, 12, 13, 21, 48, 54, 55, 62, 63 (except 636a, 631d), 64, 65, 67, 68 (except 684a), 69
- Additional job codes: 521a, 521b, 522a, 523a, 524a

Abstract jobs

- CSE: 22, 23, 31, 33, 34, 35, 37, 38, 42, 43, 44, 45, 46, 47, 53
- Additional job codes: -

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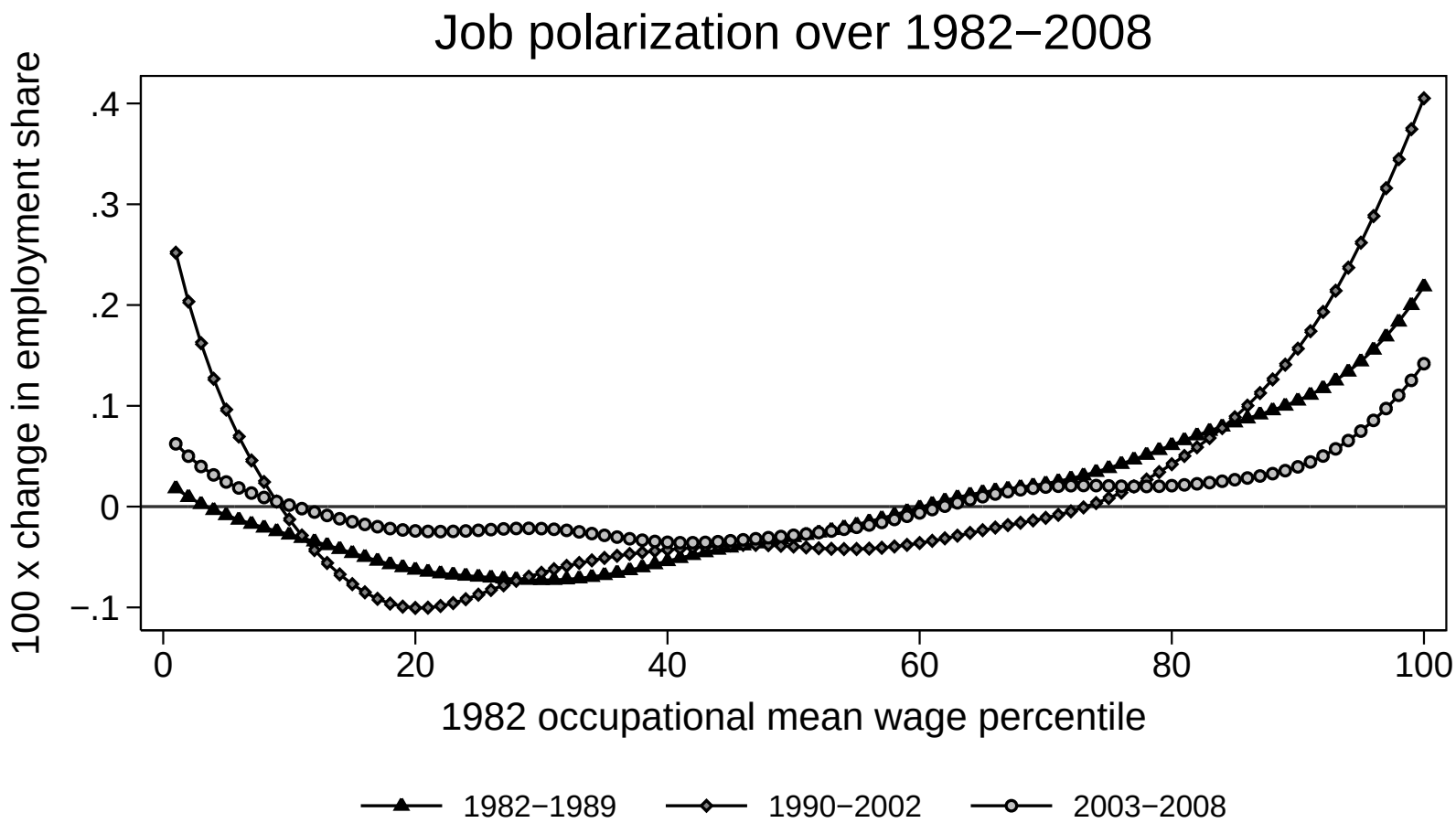
Job polarization



Note: Sample includes salary workers who are 15−64 year old during the sample year (appendix A).
Observed variable is smoothed by using a locally linear model with a .5 bandwidth.
Source: Enquête emploi, INSEE. Author's computations.

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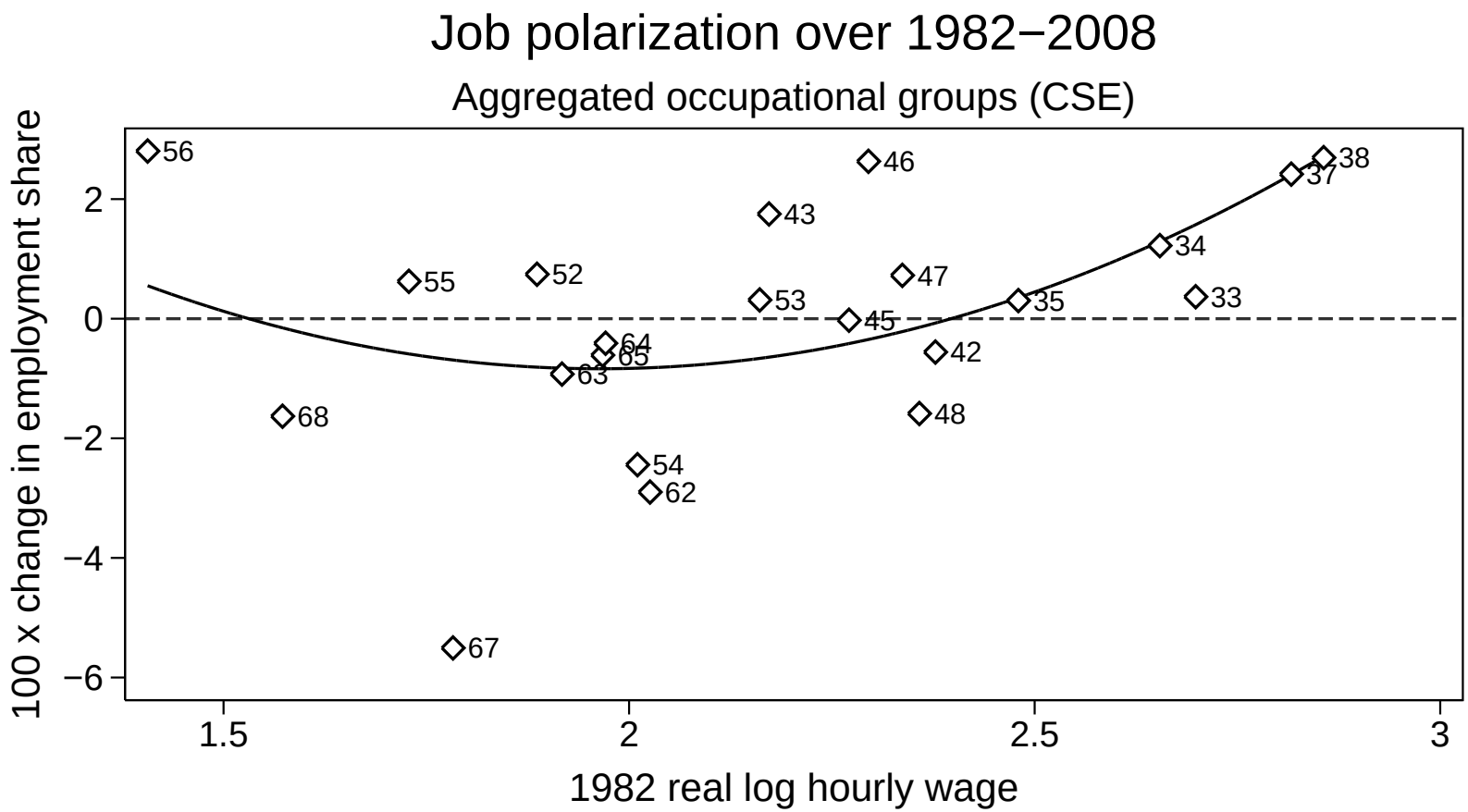
Job polarization



Note: Sample includes salary workers who are 15−64 year old during the sample year (appendix A). Observations are corrected for 1990, 2003 breaks. The smoothed curve is obtained by using a unweighted quadratic fit.
Source: Enquête emploi, INSEE. Author's computations.

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DFL re-weighting

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Sample weight

$$\omega_{i,t_0}^{t_0} = f\left(x_i \mid T_x = t_0, Occ\right) h\left(Occ \mid T_{Occ} = t_0\right)$$

Counter-factual sample weight

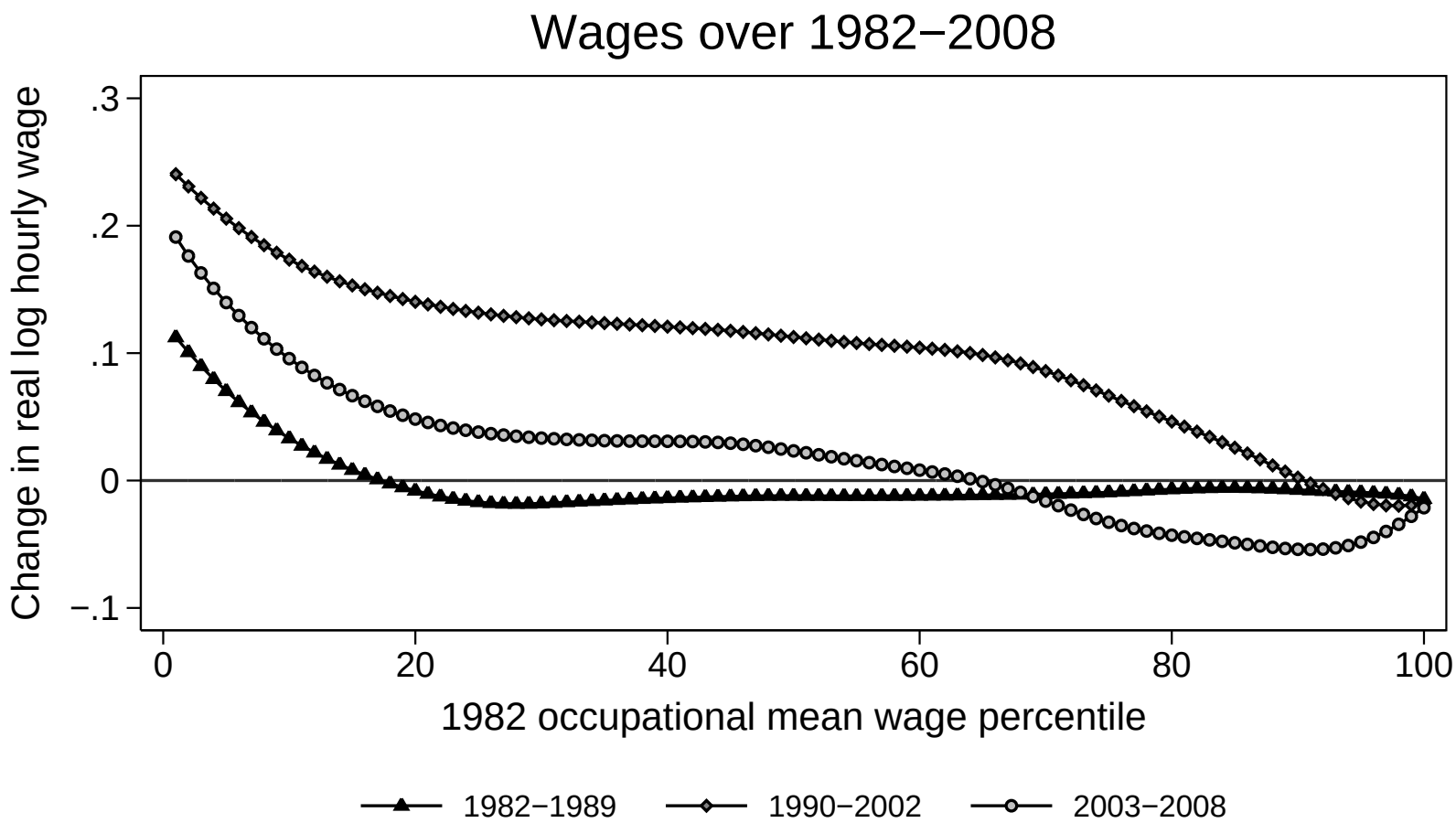
$$\begin{aligned}
\omega_{i,t_0}^{t_1} &= f\left(x_i \mid T_x = t_1, Occ\right) h\left(Occ \mid T_{Occ} = t_0\right) \\
&= \psi_i(Occ) f\left(x_i \mid T_x = t_1, Occ\right) h\left(Occ \mid T_{Occ} = t_1\right) \\
&= \psi_i(Occ) \omega_{i,t_1}^{t_1}
\end{aligned}$$

Re-weighting factor

$$\begin{aligned}
\psi_i(Occ) &= \frac{h\left(Occ \mid T = t_0\right)}{h\left(Occ \mid T = t_1\right)} \\
&= \frac{P\left(T = t_0 \mid Occ = Manual\right)}{1 - P\left(T = t_0 \mid Occ = Manual\right)} \frac{1 - P\left(T = t_0\right)}{P\left(T = t_0\right)}
\end{aligned}$$

since $h\left(Z = z\right) = \frac{h(Z \mid t_z = t_i) P(t = t_i)}{P(t = t_i \mid Z = z)}$ with $i = 0, 1$.

Wages



Note: Sample includes salary workers who are 15−64 year old during the sample year (appendix A).
Observed variable is smoothed by using a locally linear model with a .5 bandwidth.
Source: Enquête emploi, INSEE. Author's computations.

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Job rank in 1982

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10 Least Paid Occupations (ascending order)

683a	Baker, butcher apprentices
563a	Childcare assistants, nannies, host families
563b	Home health aides, housekeepers, family workers
564a	Janitors, caretakers
562b	Fully employed hairdressers
563c	Domestic workers
682a	Unskilled metalworkers, locksmiths, mechanical repairers
681b	Unskilled secondary construction workers
636b	Pork butchers (except meat industry)
684a	Cleaners

10 Most Paid Occupations (ascending order)

388d	Engineers and technical sales executives in IT and telecommunications
342a	Higher education instructors
386d	Engineers and managers in the production and distribution of energy, water
381a	Engineers, research and managers for agriculture, fisheries, water and forest
385b	Engineers and managers of manufacturing processing industries
383b	Engineers and managers in manufacturing of electrical, electronic materials
331a	Public service management personnel (State, local authorities, hospitals)
371a	Top administrative, finance and commercial management for large companies
333a	Magistrates
380a	Technical directors of large companies

Job rank in 1982

Back

10 Most Declining Occupations (ascending order)

675a	Unskilled workers in textile and dressmaking, tanneries, and leather work
543d	Administrative employees of various companies
542a	Secretaries
543a	Financial or accounting service employees
542b	Typists, stenographers, (non secretarial) word processing operators
681a	Unskilled structural works construction workers
671b	Unskilled workers in public works, concrete and extraction work, excluding state and local government
682a	Unskilled metalworkers, locksmiths, mechanical repairers
641a	Drivers and long-haul truck drivers (full employed)
675b	Unskilled production workers in woodworking and furniture

10 Most Growing Occupations (ascending order)

553a	Non-specialized vendors
451f	Class B administrative staff of local authorities and hospitals
525c	Civil service officials (outside of schools, hospitals)
523a	Deputy civil service administrators (including education)
341a	Professors specializing and certified in secondary education
431f	General care nurses, fully employed
526a	Caregivers (civil service or private sector)
388a	Engineers and research managers, research and development in computer science
563a	Childcare assistant, nannies, host families
563b	Home health aides, housekeepers, family workers

Task composition of employment by skill level

Skill level		Unskilled				Skilled			
Occupation		Manual	Routine	Abstract	Total	Manual	Routine	Abstract	Total
Year	1982	10.95	65.69	23.36	100	0.76	9.49	89.75	100
	1995	16.16	57.90	25.95	100	1.20	12.39	86.40	100
	2008	20.53	53.01	26.46	100	2.63	17.61	79.76	100

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Asymptotic labor allocation

- As $t \to +\infty$, $p_k(t) \to 0$ and $K(t) \to +\infty$

$$\lim_{t \to +\infty} l_s = \begin{cases} 1 & \text{if } \varepsilon < \frac{\mu}{\beta} \\ ]0;1[& \text{if } \varepsilon = \frac{\mu}{\beta} \\ 0 & \text{if } \varepsilon > \frac{\mu}{\beta} \end{cases}$$

$$\lim_{t \to +\infty} l_r = \begin{cases} 0 & \text{if } \varepsilon < \frac{\mu}{\beta} \\ 1 - l_s & \text{with } l_s \in]0;1[\text{ if } \varepsilon = \frac{\mu}{\beta} \\ 1 & \text{if } \varepsilon > \frac{\mu}{\beta} \end{cases}$$

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Asymptotic labor allocation

$$\lim_{t\to+\infty} l_{ms} = \begin{cases} \frac{1}{1+\Theta} & \text{if } \varepsilon < \frac{\mu}{\beta} \\ \frac{1}{1+\Theta} l_s & \text{with } l_s \in]0;1[\text{ if } \varepsilon = \frac{\mu}{\beta} \\ 0 & \text{if } \varepsilon > \frac{\mu}{\beta} \end{cases}$$

$$\lim_{t\to+\infty} l_n = \begin{cases} \frac{\Theta}{1+\Theta} & \text{if } \varepsilon < \frac{\mu}{\beta} \\ \frac{\Theta}{1+\Theta} l_s & \text{with } l_s \in]0;1[\text{ if } \varepsilon = \frac{\mu}{\beta} \\ 0 & \text{if } \varepsilon > \frac{\mu}{\beta} \end{cases}$$

with $\Theta = \left(\frac{A_{ms}}{A_n}\right)^{\frac{\nu}{\nu-1}} \left[\frac{a_s(1-\tau_{ms})}{1-a_s}\right]^{\frac{1}{\nu-1}}$

- $\downarrow \tau_{ms}, \downarrow A_n \Rightarrow \downarrow\downarrow\Theta \Rightarrow \begin{cases} \uparrow\uparrow l_{ms} \\ \downarrow\downarrow l_n \end{cases}$

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Wage ratios

If $\varepsilon < \frac{\mu}{\beta}$,

$$\lim_{t \to +\infty} \frac{w_{ms}}{w_r} = +\infty$$

$$\lim_{t \to +\infty} \frac{w_a}{w_{ms}} = \begin{cases} +\infty & \text{if } \varepsilon > 0 \\ \frac{\Omega}{1+\Theta} & \text{if } \varepsilon = 0 \\ 0 & \text{if } \varepsilon < 0 \end{cases}$$

$$\lim_{t \to +\infty} \frac{l_a w_a}{l_r w_r} = 0$$

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Calibration

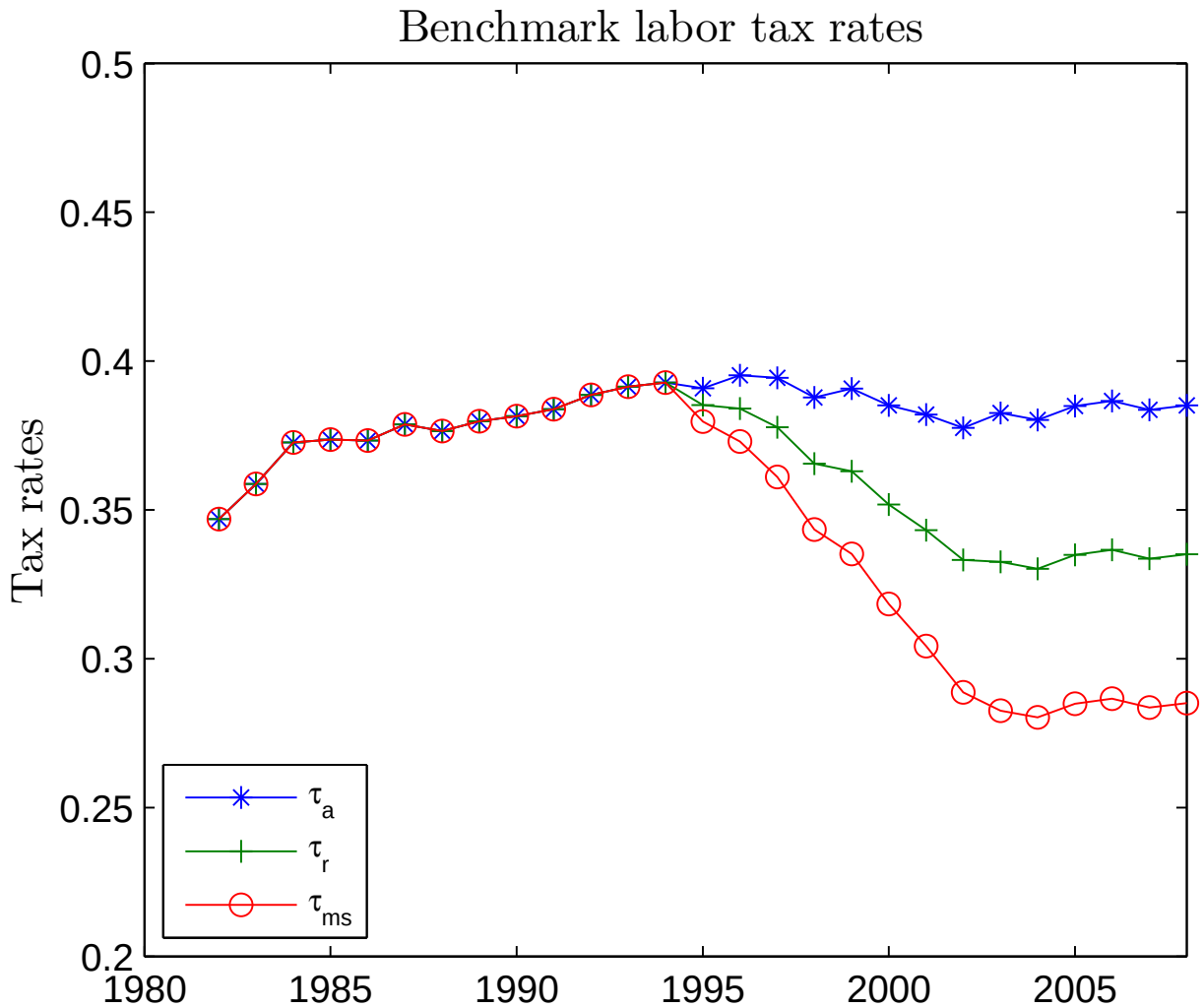

Figure : Average labor tax rate by task

Results

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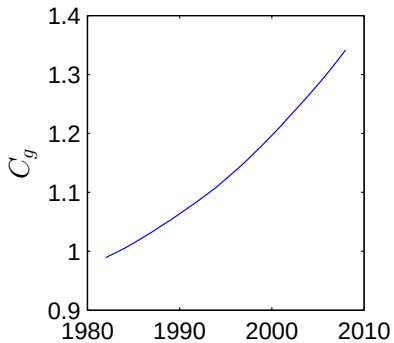
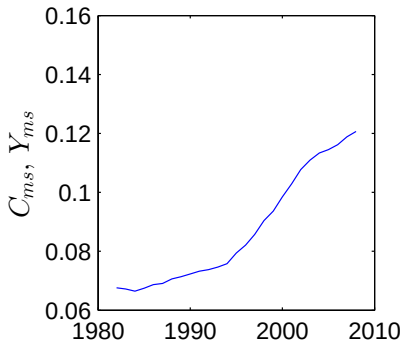
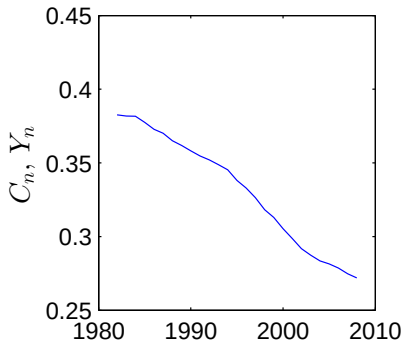
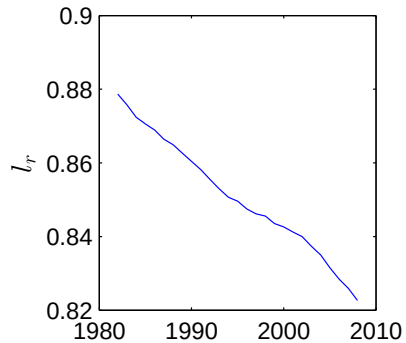
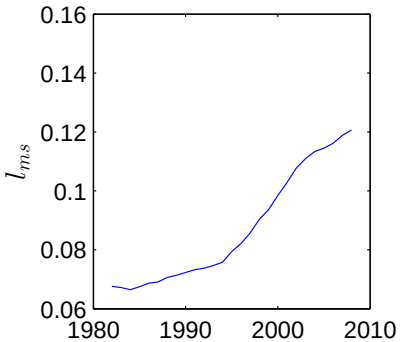
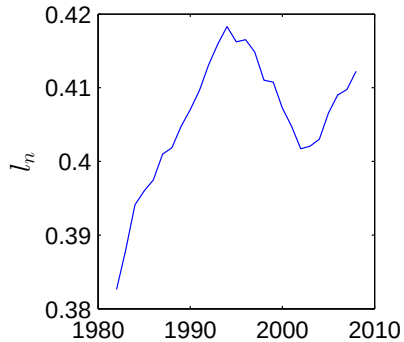


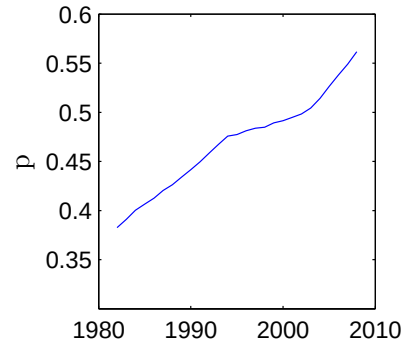


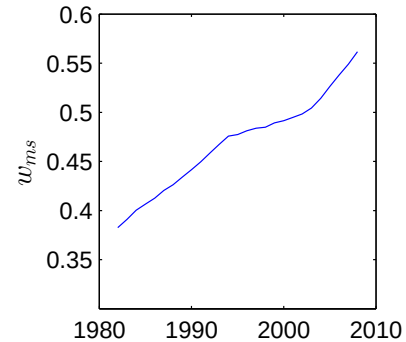


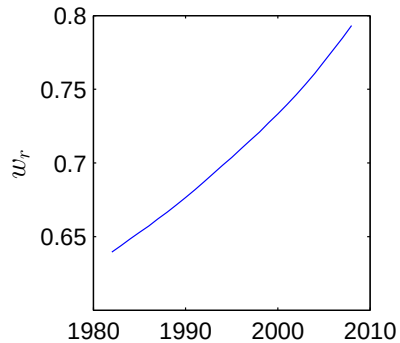


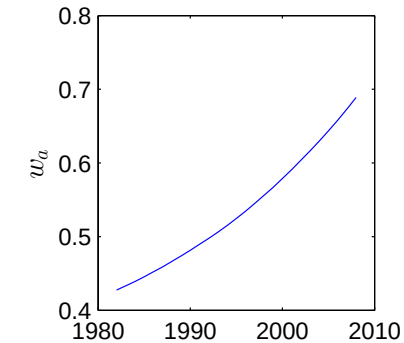


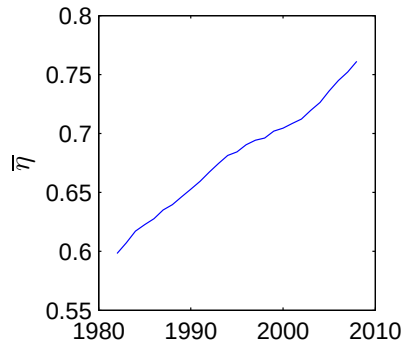


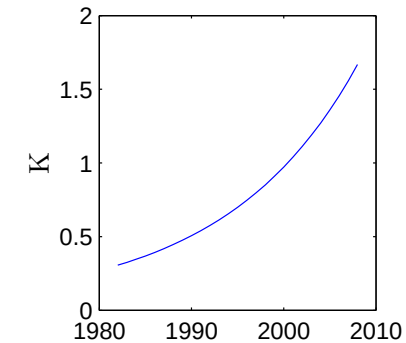






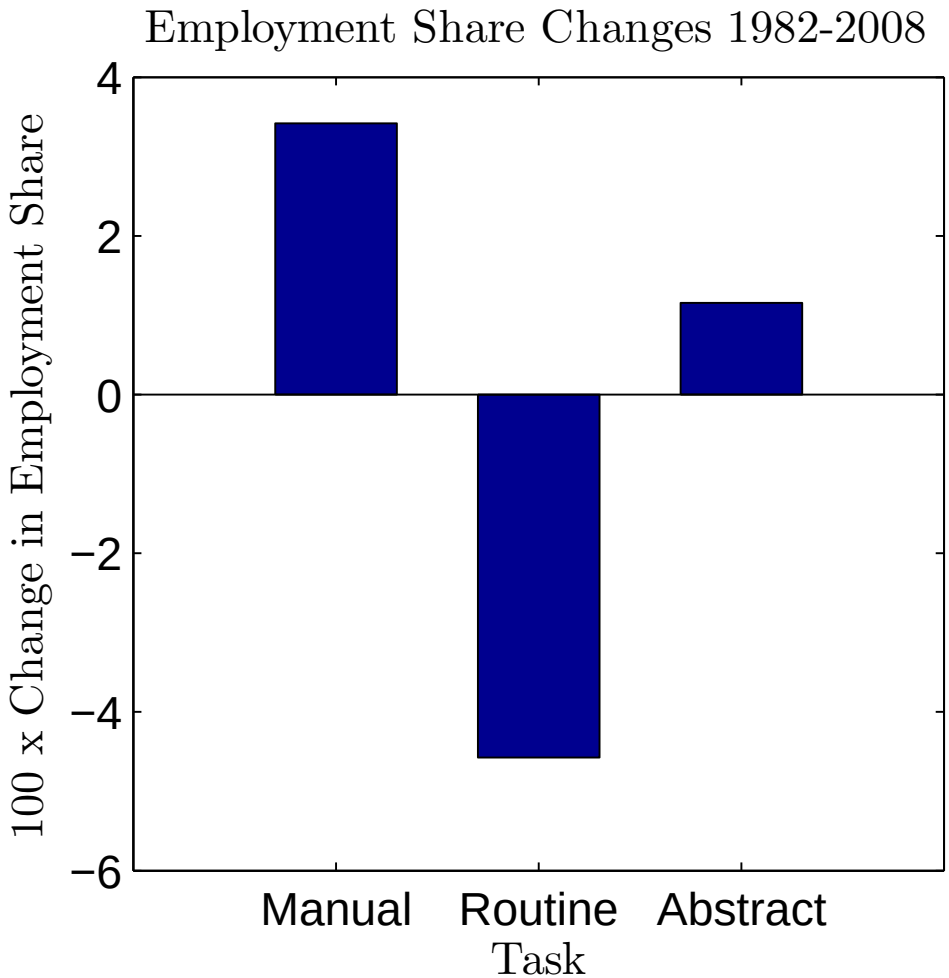






Results

Job polarization



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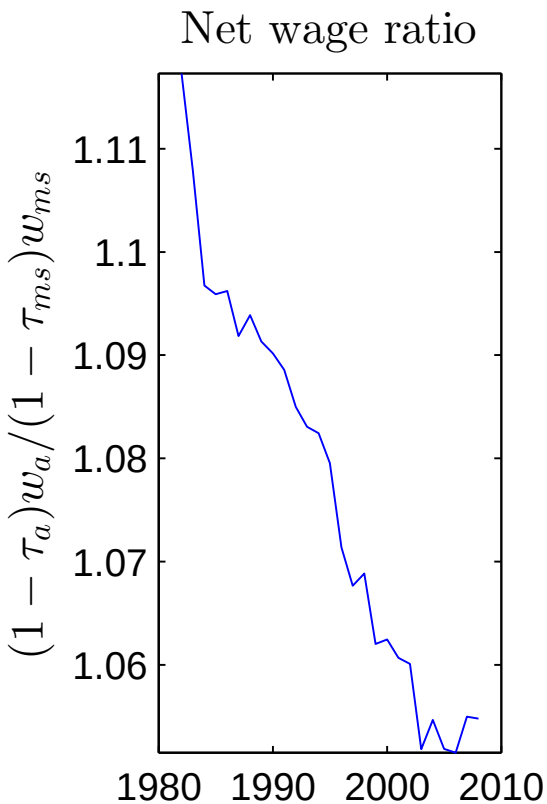
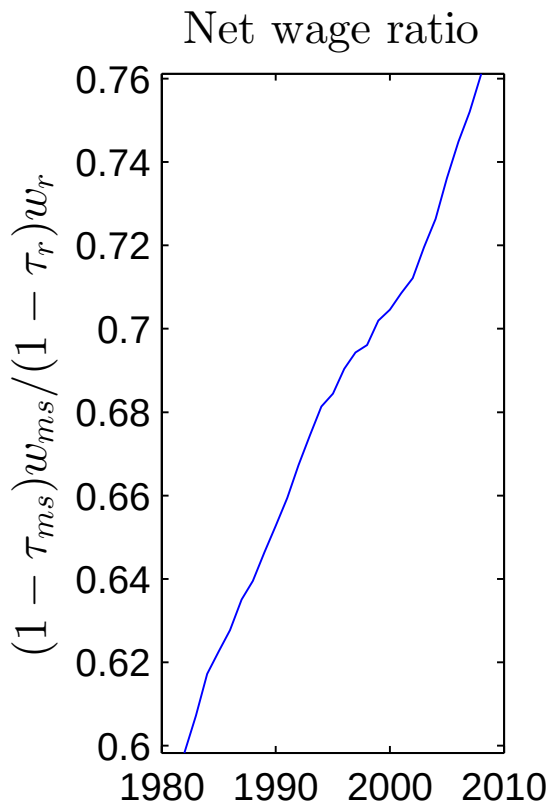
Results

Net wage ratios





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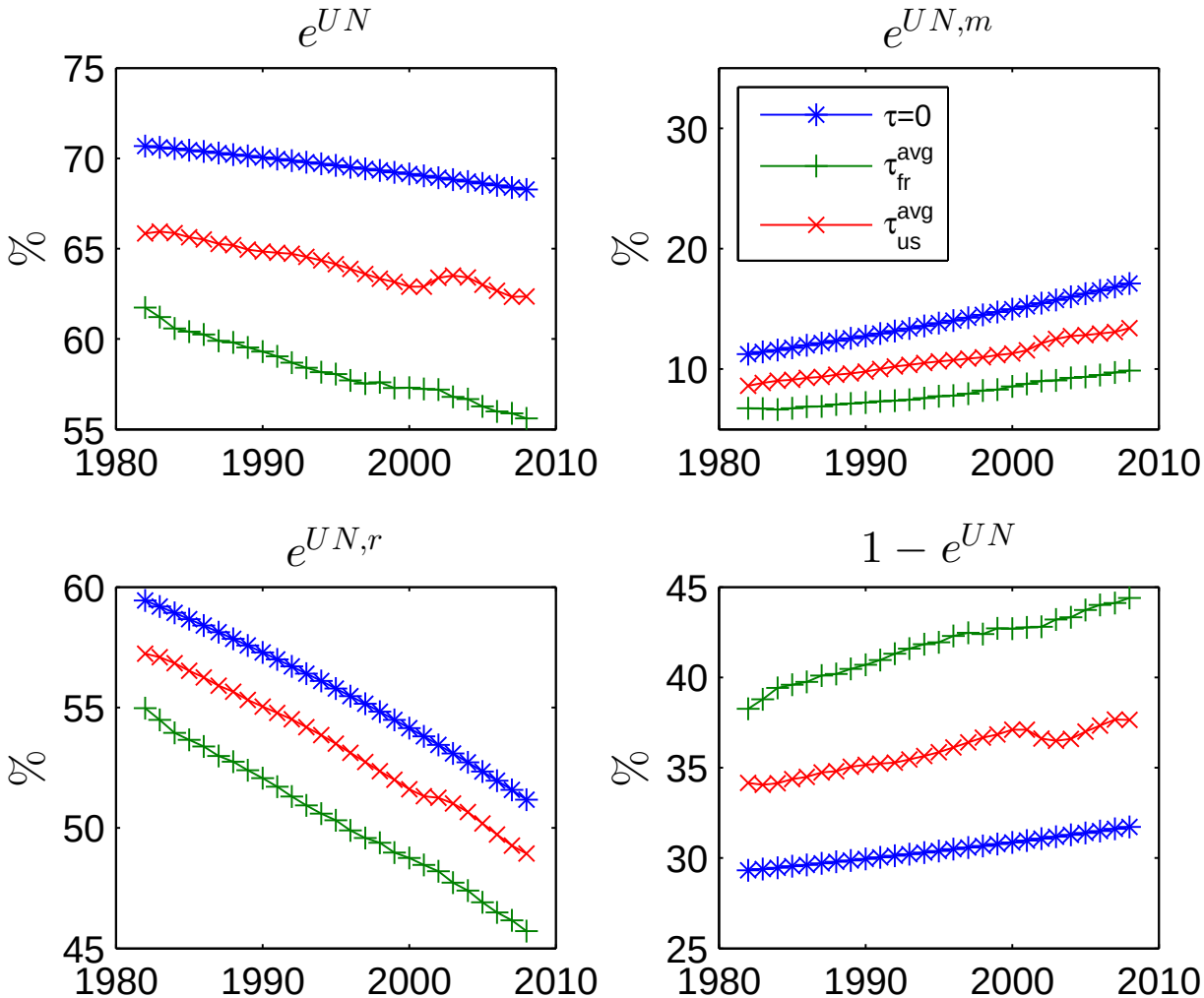
Results

Sensitivity analysis τ



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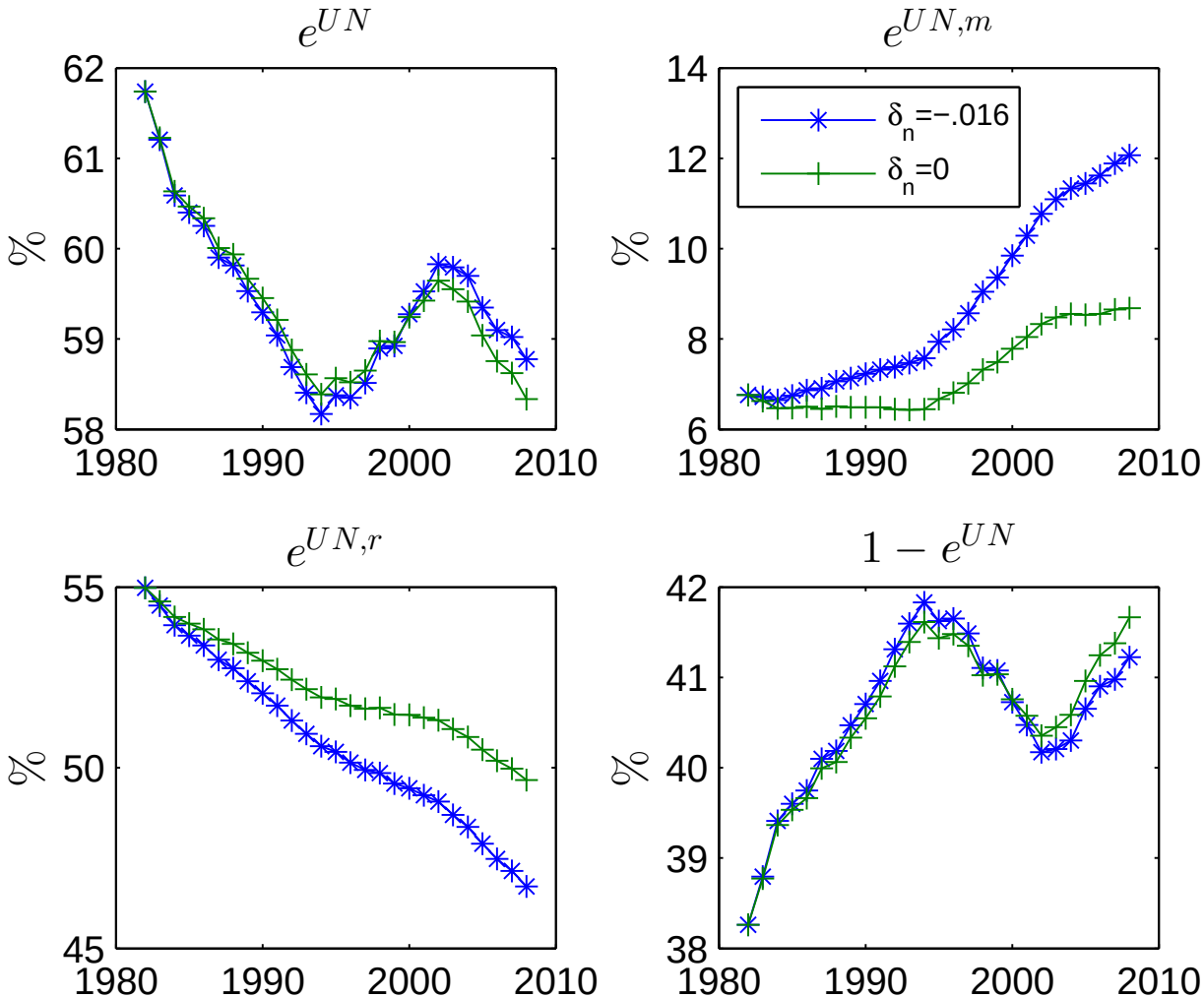
Results

Sensitivity analysis δ_n



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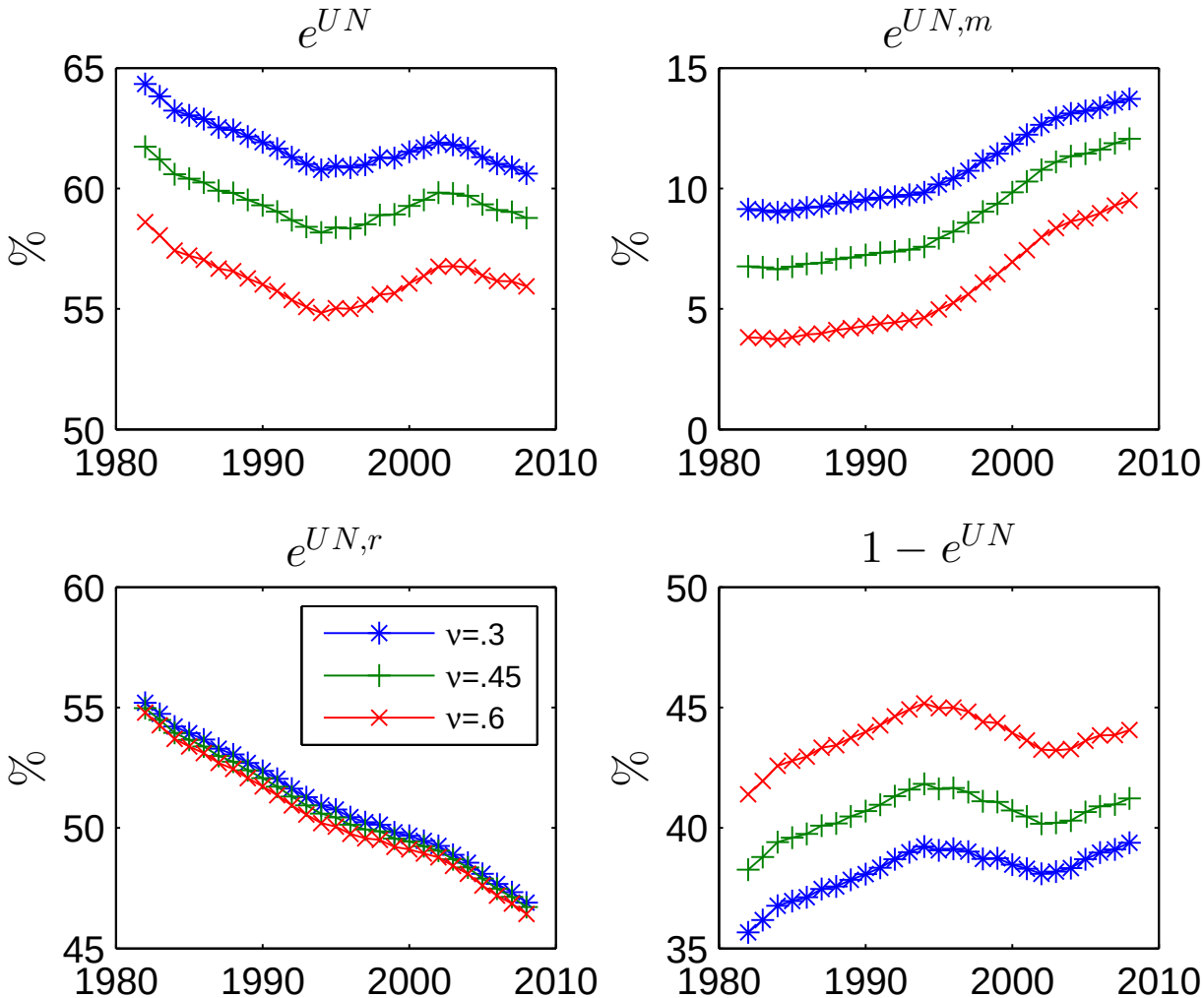
Results

Sensitivity analysis ν



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