Wage Inequality in Turkey: 2002-2010

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Outline

Outline

Motivation I

Important changes in demography, economic structure and macroeconomic environment:

- Post 2001 crisis, a new macroeconomic environment
- Sustained growth: average growth of GDP per worker is 3.4% (2002-10)
- Important structural transformations:
  - share of wage earners in total labor force has increased by 12%, (49% in year 2002 and 61% in year 2010),
  - share of unpaid family workers has decreased by 8% (21% in 2002 and 13% in 2010)
- Relatively important increase in minimum wages:

Growth rate	2002	2003	2004	2005	2006	2007	2008	2009	2010
WorkerPub	-9.20	-2.70	1.70	2.70	-2.70	3.10	-1.90	-0.50	-3.60
WorkerPri	-1.00	-0.40	3.50	0.50	-0.70	2.50	-2.50	2.30	0.30
Officer	5.70	-0.90	2.60	2.60	6.20	3.90	6.50	8.20	-1.40
MinWage	8.00	3.70	24.30	4.20	-0.90	-0.70	8.50	2.60	0.90

Source: SPO

Motivation II

- Relatively important increase in college share in employment:

	2002	2003	2004	2005	2006	2007	2008	2009	2010
ColShare	10	11	11.30	12.40	13.20	13.90	14.80	15.60	16

Source: HLFS

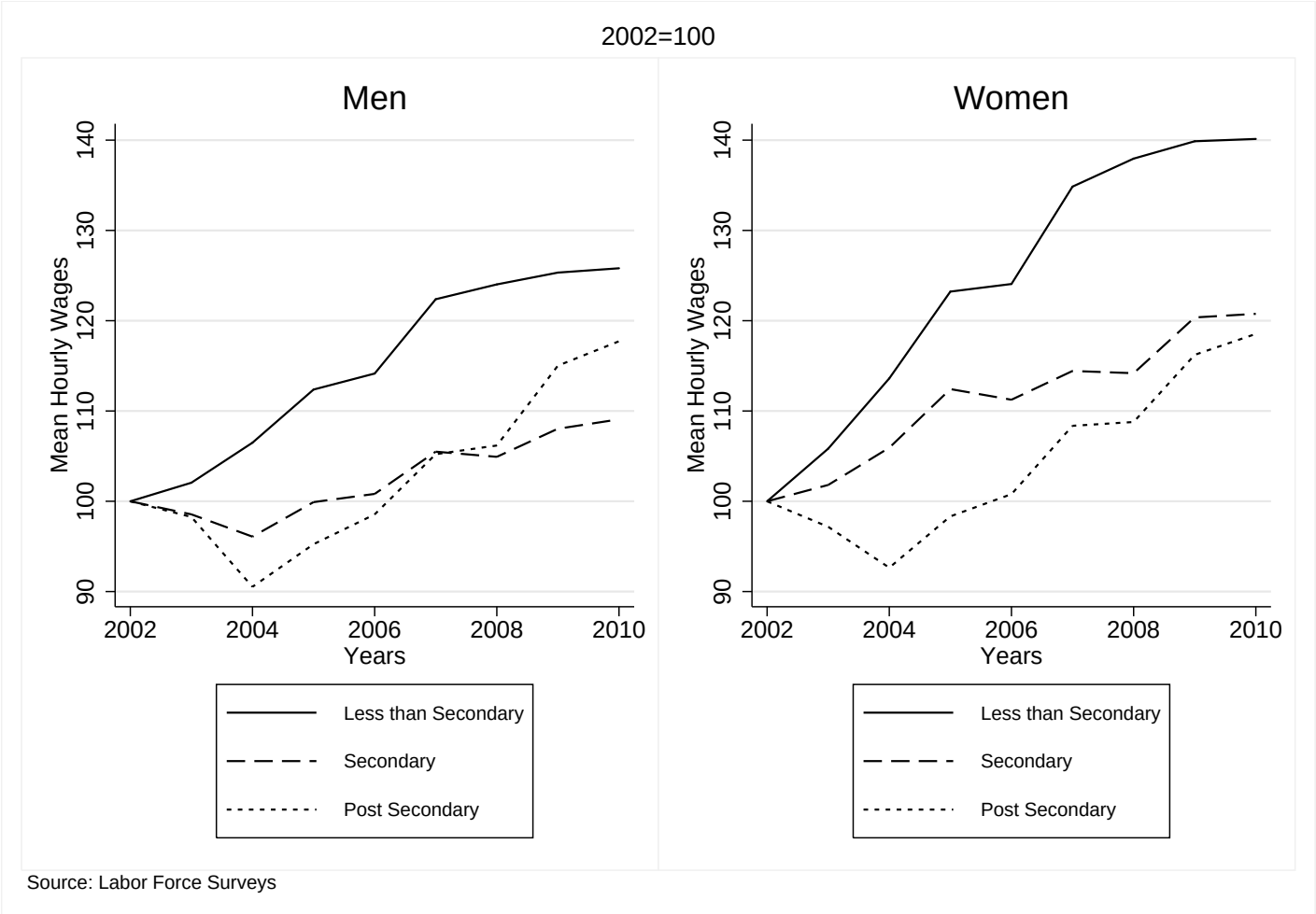
- How these changes affect wage inequality in Turkey?

Related literature I

- Extensive literature on determinants and evolution of wage inequality in USA and Europe: Katz and Murphy (1992), Katz and Autor (1999), Acemoglu (2002), Acemoglu and Autor (2011), Lemieux (2006a, 2006b), Card and DiNardo (2002) among others.
- Lack of consensus on determinnats of wage inequality
  - Skill-Biased Technological Change; trade and shifts in sectoral employment
  - Institutional Changes: minimum wage and unionization; Composition effects, measurement errors (noisy data)

Outline

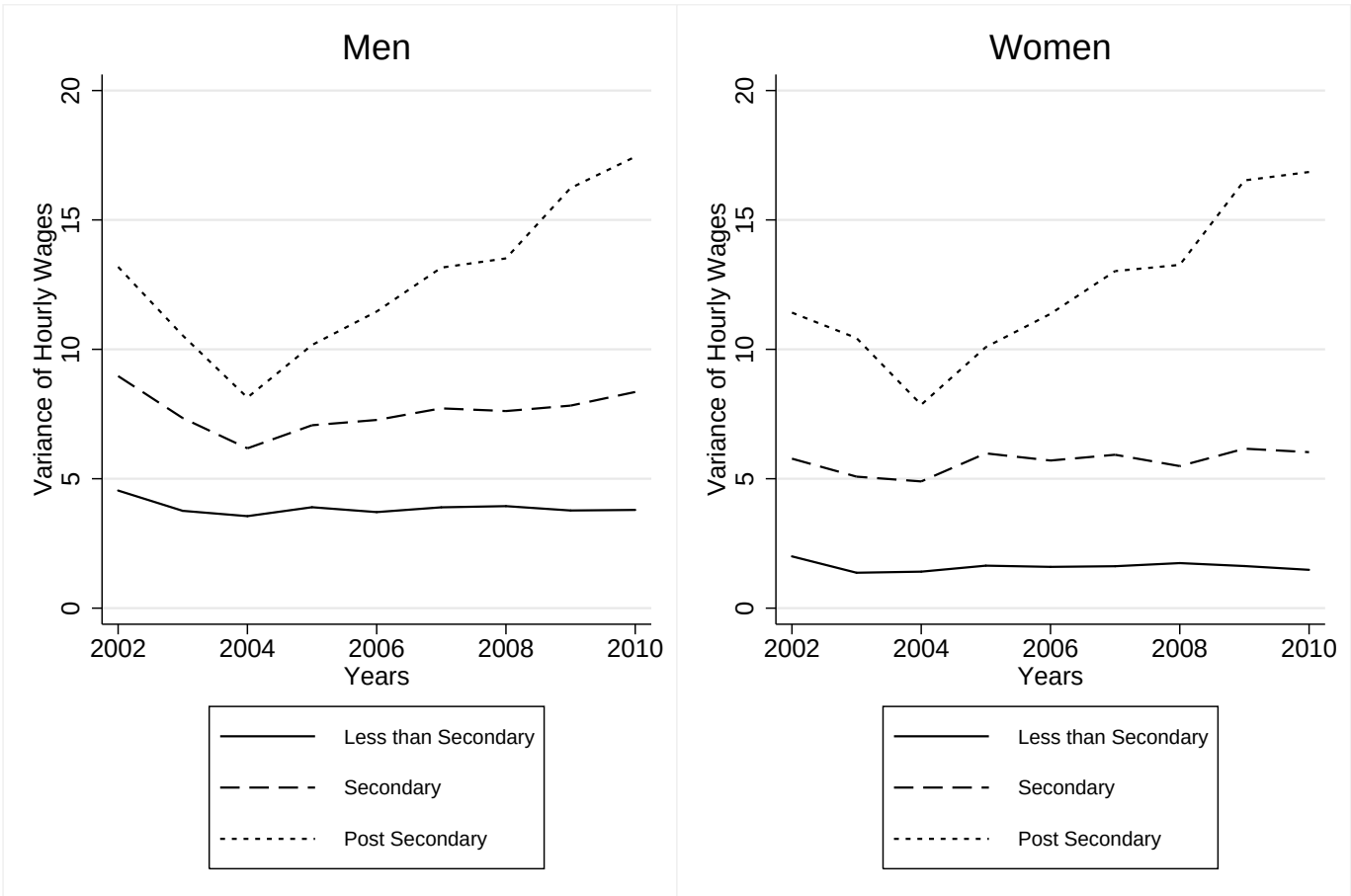
Real wage growth by education level



Source: Labor Force Surveys

- Increase in residual (within-group) wage inequality for college grad.
- Susbtantial increase in wages of less educated

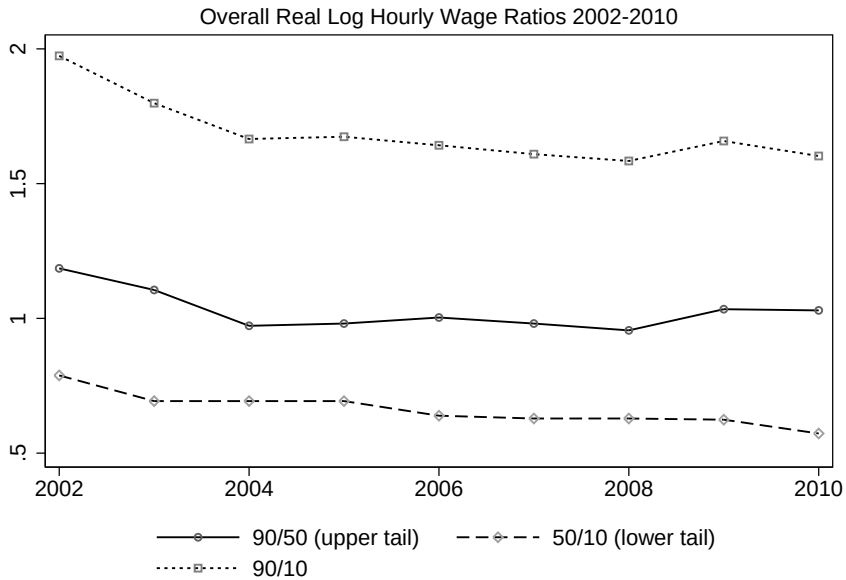
Variance of hourly wages by education level

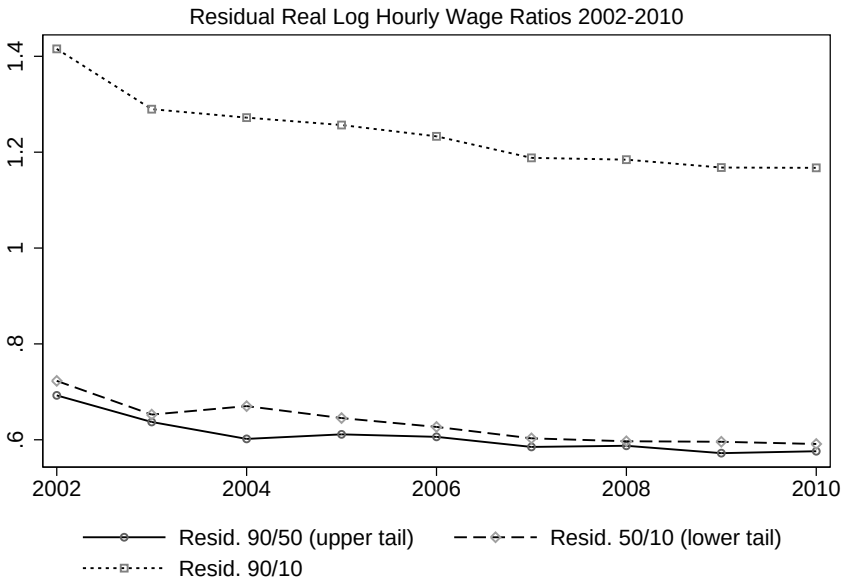


Source: Labor Force Surveys

- No clear tendency for secondary and below-secondary graduates.
- A sudden decrease in wage variance of post-secondary group in 2004 and a smooth increase thereafter.

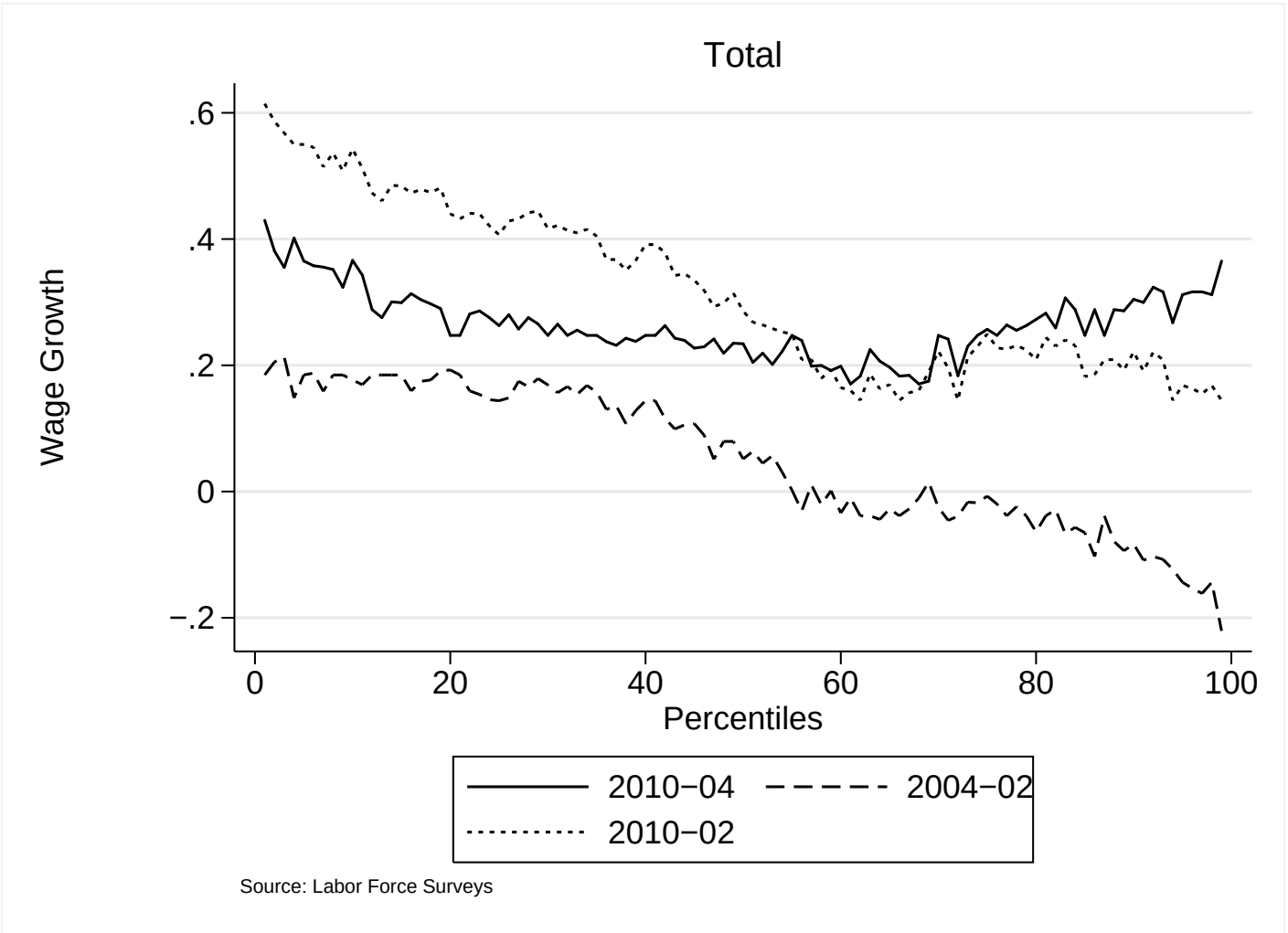
Overall and residual wage inequality





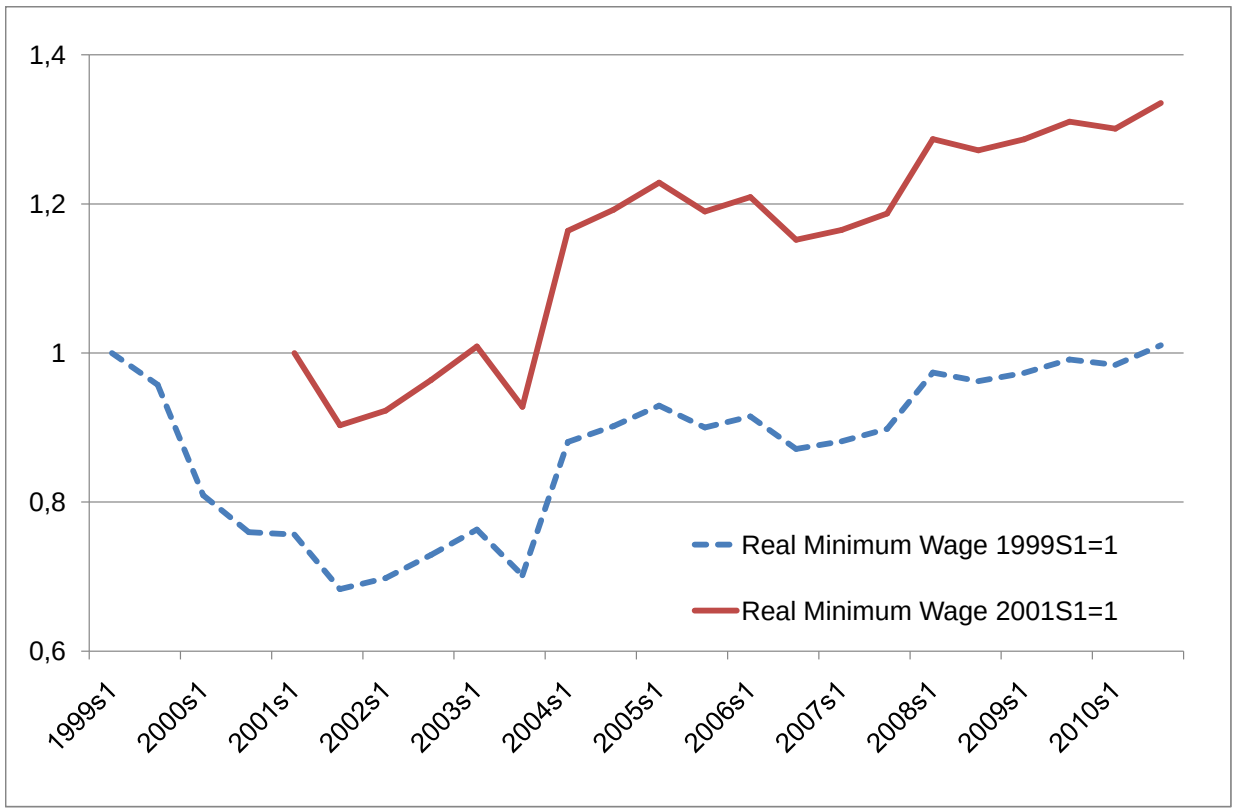
- The overall 90/10 wage inequality measure depicts log wage differentials for 90*th* and 10*th* percentiles.
- Similarly, the residual 90/10 measure is computed as the difference between log wages of 90*th* and 10*th* percentiles in a regression of the log wage on a full set of interactions between age groups and education levels.

Percentile Wage Growth 2010-2002



- 2002-2004: convergence of real wage, decrease in inequality
- 2004-2010: Polarization of wages

Evolution of real minimum wage



- Substantial increase in minimum wage after 2004 is just compensating the previous losses

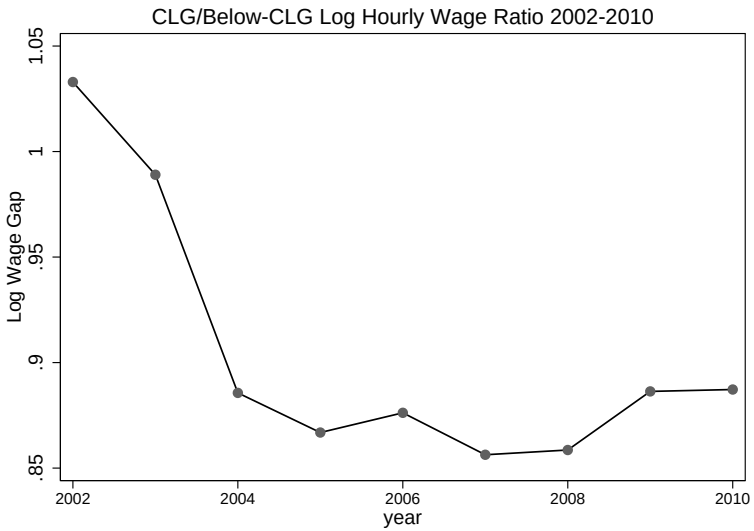
Relative wages and shares

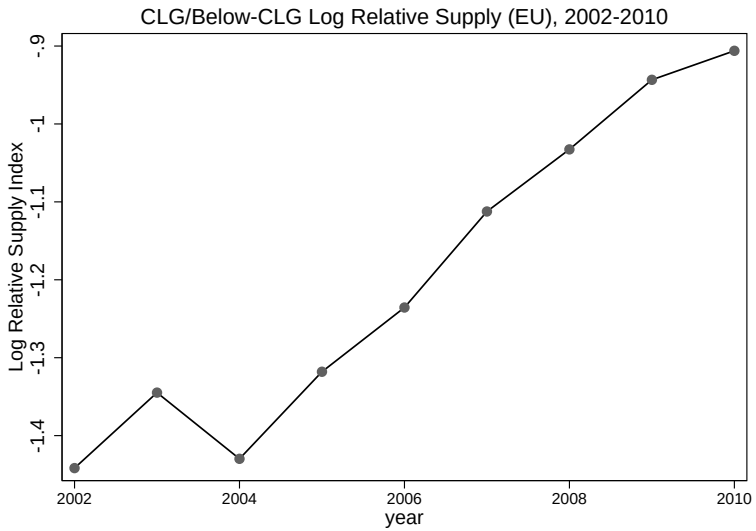
Table : Log changes in real wages and relative shares (in efficiency units)

	Changes in log(wages)			Changes in log(shares)		
	2002-04	2004-10	2002-10	2002-04	2004-10	2002-10
Female	14.75	25.00	39.75	-10.50	11.30	0.81
Male	7.37	22.49	29.86	3.04	-3.29	-0.25
Below-PSG	14.54	27.04	41.58	-5.47	-30.42	-35.90
PSG	8.94	21.72	30.66	8.85	18.10	26.95
HSG	3.92	14.84	18.76	13.47	-17.47	-3.99
VHS	1.87	13.15	15.01	-2.73	25.93	23.20
CLG	-3.85	23.25	19.41	0.96	39.89	40.85
20-24.Below-HSG	18.92	25.12	44.04	-6.90	-42.81	-49.71
50-54.Below-HSG	15.09	30.13	45.22	-0.01	-8.21	-8.22
20-24.HSG	10.47	23.50	33.97	-11.40	-21.07	-32.47
50-54.HSG	7.11	23.56	30.66	46.41	29.51	75.92
20-24.CLG	3.74	15.03	18.77	9.06	42.81	51.87
50-54.CLG	3.41	28.73	32.14	11.50	42.54	54.03

- Decrease in the share of below PS, and HS (less pronounced)
- Between 2002-2010: HSG and CLG real wage growth are almost equal (19 %) while shares are differ radically (41 % vs. -4 %).
- PSG and VHS have similar changes in log shares (23 % vs. 27%) but unequal wage growth rates (15 % vs. 31 %).
- Experience differentials do not seem to be important once education is controlled.

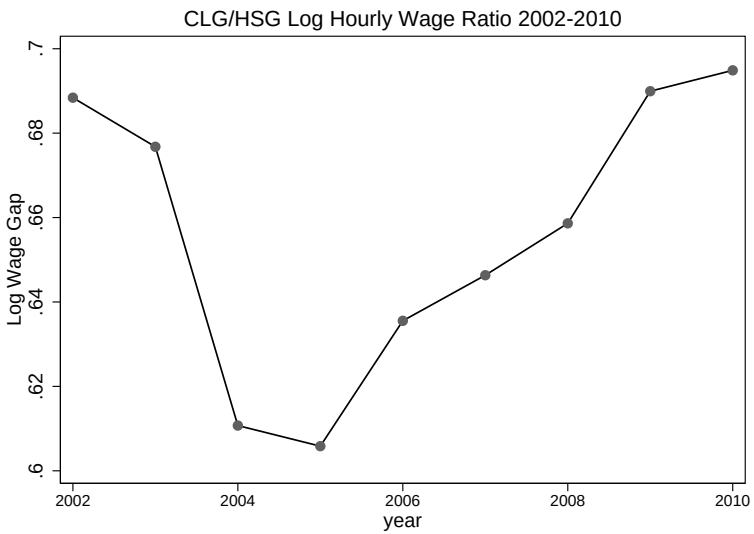
Relative wages and supplies I

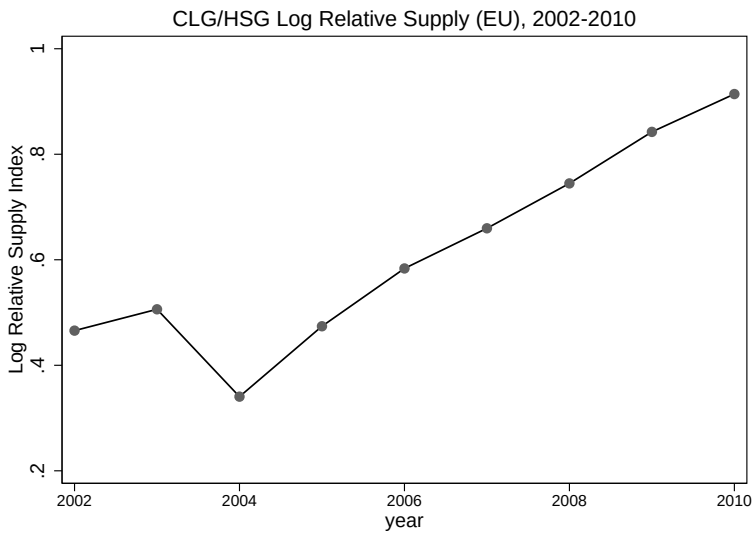




Not compatible with a simple supply-demand framework

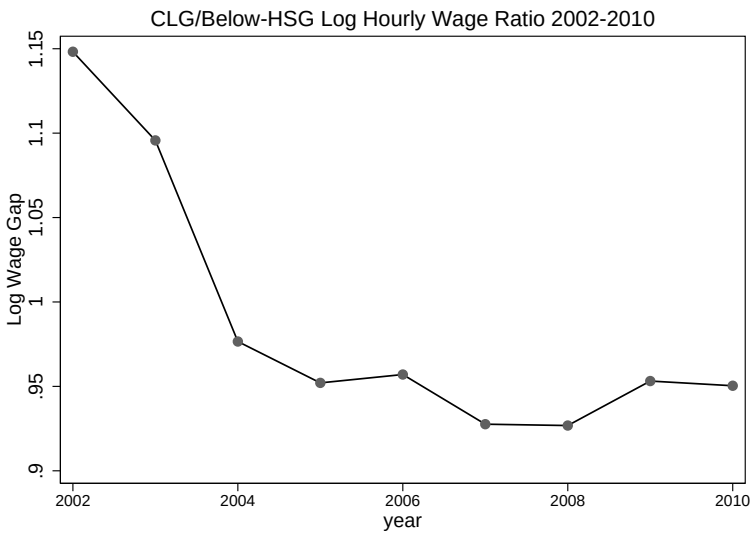
Relative wages and supplies II

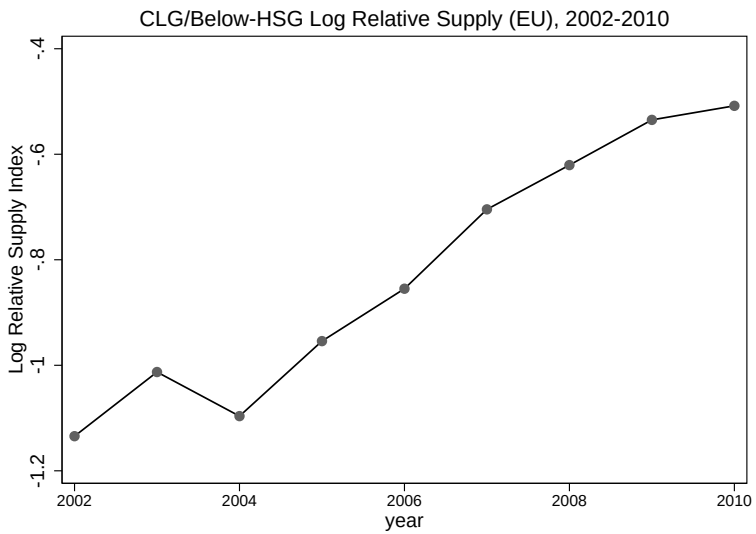




Not compatible with a simple supply-demand framework

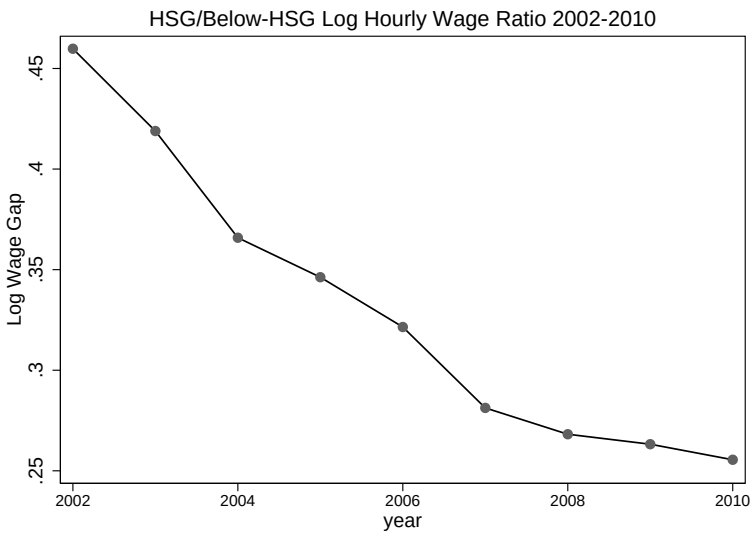
Relative wages and supplies III

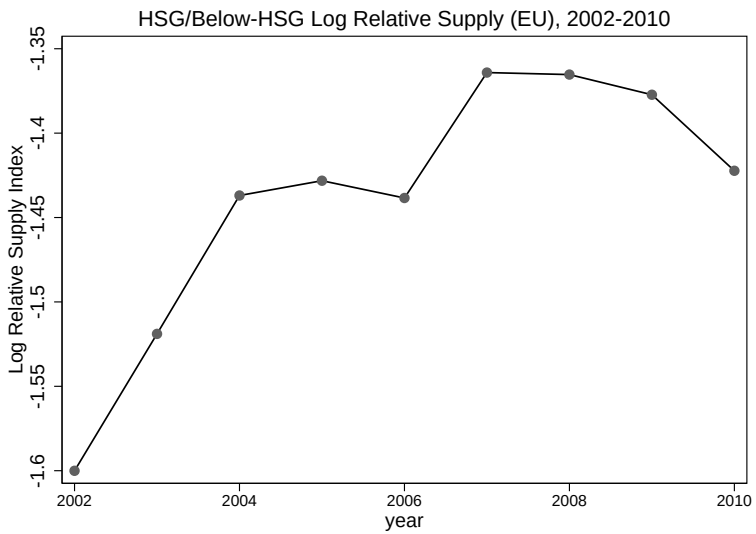




Not compatible with a simple supply-demand framework

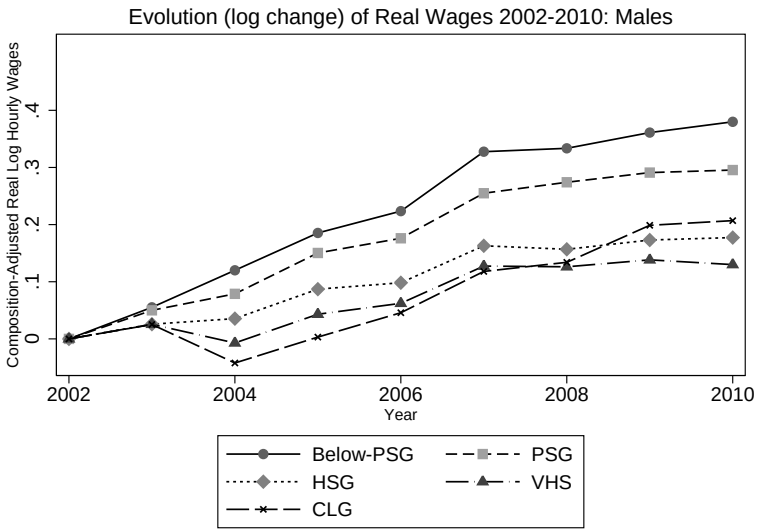
Relative wages and supplies IV

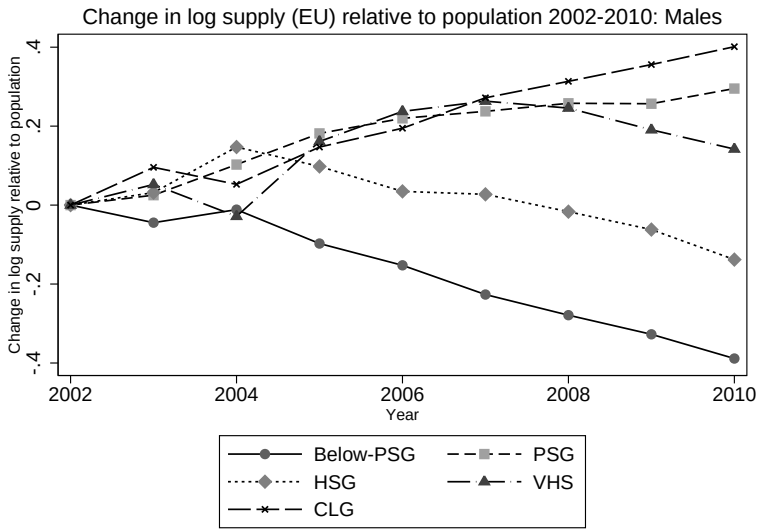


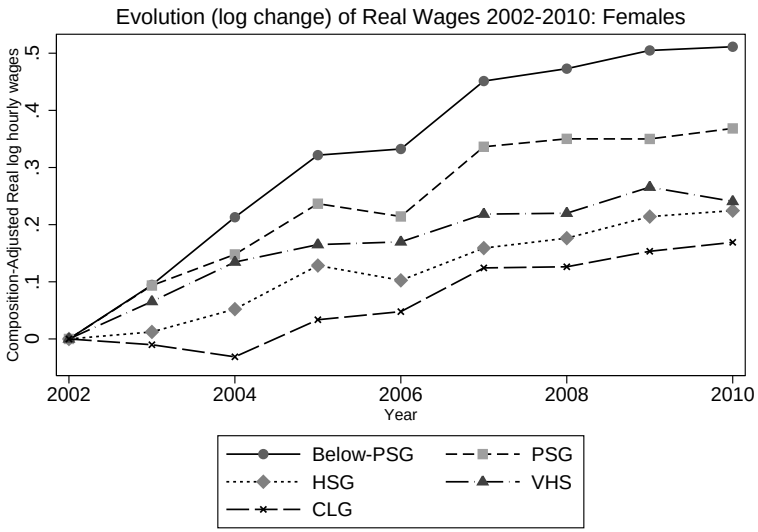


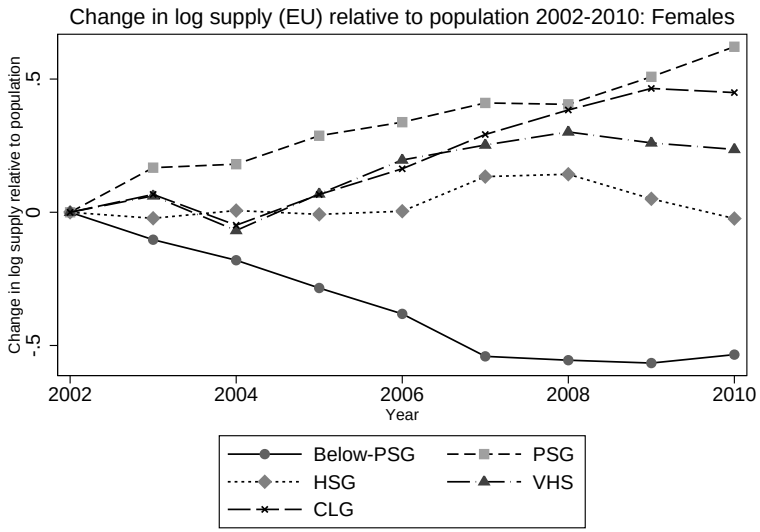
Compatible with a simple supply-demand framework

Relative wages and supplies V









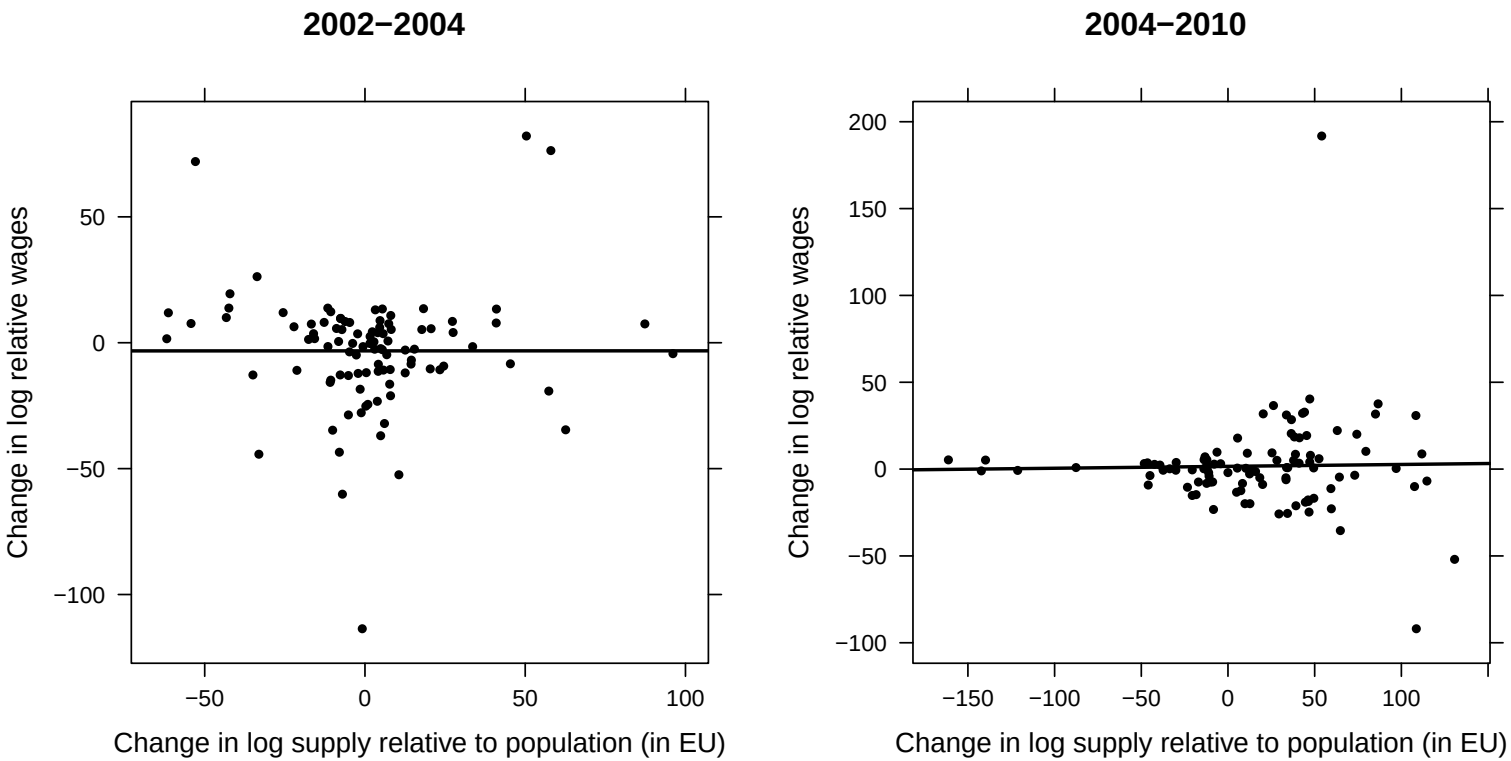
Relative supply *vs.* relative demand I

In a standard model, changes in supply are inversely correlated with changes in wages if demand schedule is stable. If this is true, below table should have only negative entries.

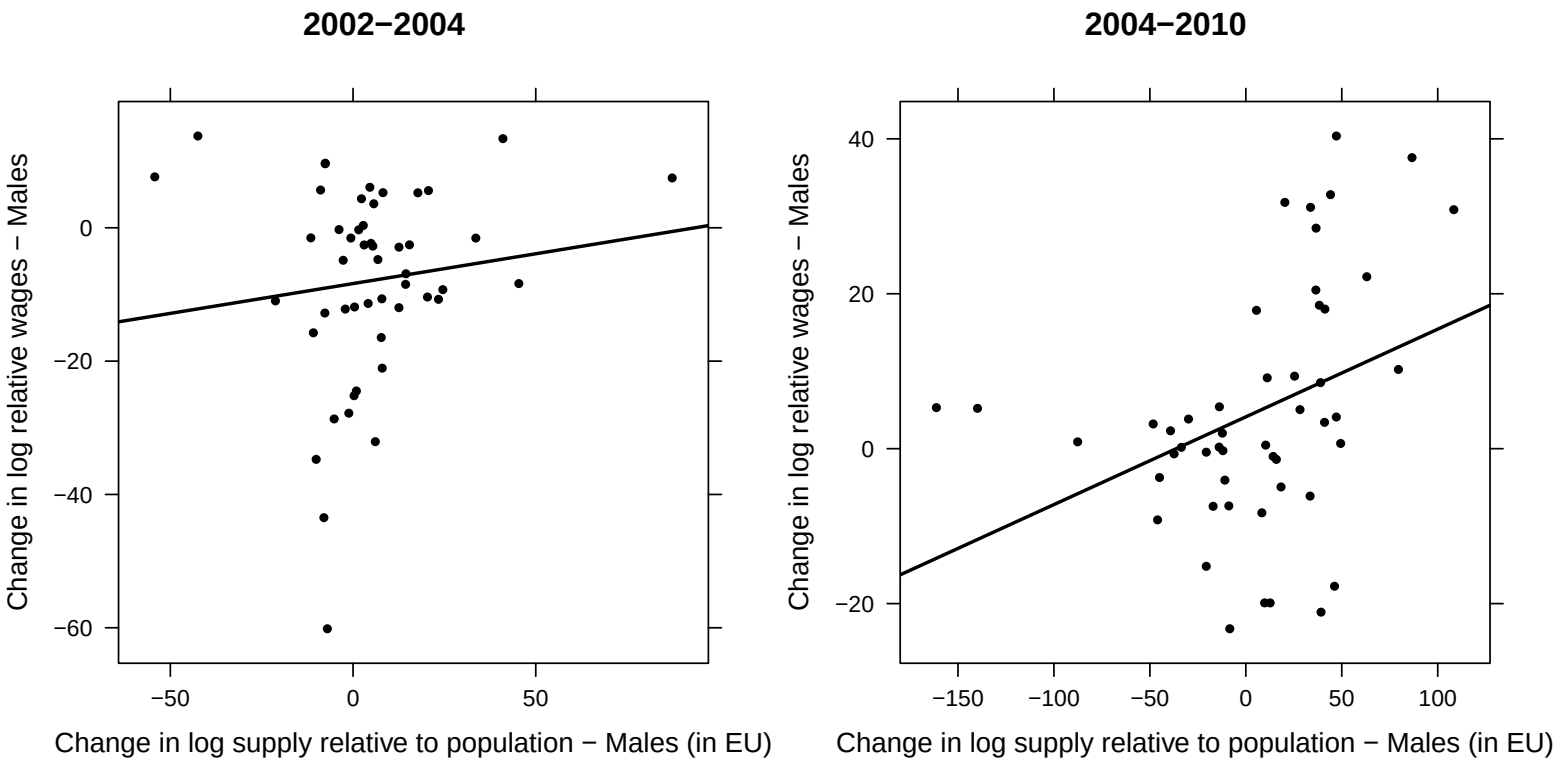
	2002	2003	2004	2005	2006	2007	2008	2009
2003	-0.0009							
2004	-0.0035	0.0011						
2005	-0.0124	-0.0049	-0.0011					
2006	-0.0161	-0.0078	-0.0007	0.0001				
2007	-0.0267	-0.0154	-0.0021	-0.0004	-0.0017			
2008	-0.0299	-0.0179	-0.0023	-0.0014	-0.0032	-0.0007		
2009	-0.0243	-0.0120	0.0073	0.0062	0.0021	0.0020	0.0015	
2010	-0.0225	-0.0106	0.0101	0.0098	0.0060	0.0043	0.0039	-0.0002

Table : Inner product of changes in relative wages with changes in relative supply for 100 ($= 2 \times 5 \times 10$) demographic groups

Relative supply *vs.* relative demand II



Relative supply *vs.* relative demand III



Outline

Average empl. sh. in industry/occupations I

Table : Average empl. sh. of education groups, 2002-10

indust./occup.	Below-PSG	PSG	HS	VHS	CLG
Agriculture	40.04	17.19	8.35	6.90	1.64
Mining	0.56	0.66	0.53	0.64	0.43
Manufacturing	18.96	24.30	17.70	27.35	12.00
Electricity and gas	0.26	0.39	0.57	1.50	0.65
Construction	7.15	6.46	4.14	4.71	3.01
Trade	18.71	28.59	34.10	26.07	13.90
Transportation	5.25	6.67	7.59	6.32	4.43
Finance	1.33	2.68	7.14	6.37	12.12
Other services	7.74	13.05	19.87	20.14	51.82
Prof. & Tech.	6.43	10.24	21.66	25.33	71.97
Cler.& Serv.	10.73	23.98	42.19	31.26	21.51
Prod. Workers	63.95	50.22	26.91	35.81	5.47
Unskilled workers	18.88	15.56	9.23	7.60	1.05

- Substantial differences between average employment shares of education groups across industries and occupations.
- Between industry and occupation shifts may have important consequences.

Evolution of empl. sh. in industry/occupations

Table : Overall industry and occupation employment distributions, 2002-2010

indust./occup.	2002	2004	2006	2008	2010	Total change
Agriculture	33.43	31.41	24.57	20.38	21.58	-11.86
Mining	0.57	0.52	0.61	0.60	0.57	-0.00
Manufacturing	18.27	18.32	19.80	21.36	20.20	1.92
Electricity and gas	0.47	0.36	0.40	0.43	0.79	0.32
Construction	4.81	5.23	6.27	6.43	6.93	2.12
Trade	19.82	20.87	22.95	23.51	21.27	1.45
Transportation	5.23	5.67	5.83	5.65	5.92	0.69
Finance	3.03	3.46	4.37	5.38	3.37	0.34
Other services	14.37	14.17	15.18	16.27	19.38	5.01
Prof. & Tech.	15.85	16.68	18.22	18.86	18.38	2.53
Cler. & Serv.	17.52	17.16	19.49	21.11	21.38	3.86
Prod. workers	54.88	52.51	47.71	44.24	44.32	-10.56
Unskilled workers	11.76	13.65	14.57	15.79	15.93	4.17

- Decrease in share of agriculture.
- Decrease in share of production workers.

Demand shifts - KM approach

		Between industry			Within industry			Overall (indust. and occup.)		
	Educ.	2002-04	2004-10	2002-10	2002-04	2004-10	2002-10	2002-04	2004-10	2002-10
F	Below-PSG	-4.02	-31.44	-36.99	1.49	2.08	4.22	-2.53	-29.36	-32.77
	PSG	-0.85	-7.49	-8.41	0.22	4.13	4.40	-0.63	-3.36	-4.02
	HSG	2.00	5.01	6.92	-2.19	6.20	4.12	-0.19	11.21	11.04
	VHS	0.89	9.05	9.86	-2.03	3.14	1.32	-1.15	12.19	11.18
	CLG	0.10	16.85	16.93	-1.19	0.04	-0.97	-1.09	16.88	15.96
M	Below-PSG	-0.14	-6.01	-6.16	0.61	-1.79	-1.13	0.48	-7.81	-7.29
	PSG	1.00	1.81	2.79	0.51	-0.59	-0.08	1.50	1.22	2.71
	HSG	1.56	5.42	6.90	-0.50	1.63	1.14	1.06	7.06	8.05
	VHS	0.89	6.88	7.72	-0.49	0.13	-0.32	0.41	7.02	7.40
	CLG	0.21	14.77	14.95	-1.37	0.42	-0.75	-1.16	15.19	14.20

Table : Industry and occupation based demand shift measures following Katz-Murphy (1992) approach, 2002-2004-2010, as changes in log relative demand multiplied by 100, i.e. $100 \times \log(1 + \Delta E_k)$ where E_k denotes the share employment of cell k in total employment. Employment is measured in efficiency units.

Demand shifts - Std. approach

		Between industry			Within industry			Overall effect		
	Educ.	2002-04	2004-10	2002-10	2002-04	2004-10	2002-10	2002-04	2004-10	2002-10
F	Below-PSG	-5.67	-8.12	-13.10	-4.51	-0.04	-3.89	-10.19	-8.17	-16.99
	PSG	0.15	1.01	1.17	0.15	1.27	1.31	0.30	2.28	2.48
	HSG	0.08	0.37	0.54	-0.16	0.08	-0.10	-0.08	0.45	0.43
	VHS	-0.02	0.12	0.10	-0.03	0.08	0.05	-0.05	0.20	0.16
	CLG	-0.49	4.37	4.73	-0.45	2.65	2.54	-0.94	7.02	7.27
M	Below-PSG	-4.51	-180.38	-189.04	-3.74	-125.30	-131.88	-8.25	-305.67	-320.93
	PSG	0.22	0.68	0.91	0.16	0.57	0.71	0.37	1.25	1.61
	HSG	3.74	-4.94	-1.04	3.07	-6.63	-3.07	6.81	-11.57	-4.11
	VHS	-0.39	3.17	2.80	-0.37	1.96	1.45	-0.76	5.13	4.24
	CLG	0.65	10.23	11.68	0.79	4.71	6.01	1.44	14.94	17.69

Table : Between and within industry decomposition of changes in employment shares of demographic groups (multiplied by 100) using a standard shift-share approach, 2002-2004-2010. Employment is measured in efficiency units.

Changes in relative demand

- Overall demand shifts are positively correlated with education level
- Sizable between effects while within effects are low.
- Both within and between effects are stronger in 2004-10 period compared to 2002-04.
- Within-industry shifts are women biased (demand for female labor increased within each industry).
- For Below-PSG workers, both within and between effects are negative.

Outline

Decomposing wage inequality I

- Among various decomposition strategies, we have chosen to use the techniques proposed by
  1) DiNardo, Fortin and Lemieux (1996)(estimation of counterfactual wage distribution by a reweighting function obtained via probit)
  2) Juhn, Murphy and Pierce (1993) (not discussed here).
- Both techniques estimate the entire wage distributions.
- the density of wages that would have prevailed holding the 2010 wage structure same but assuming that the composition of attributes remains as in 2002.
- DFL suggests to estimate the weighting factor using a parametric approach (e.g probit model)

Decomposing wage inequality II

- Set of controls include age (grouped at five year intervals for ages between 15-64), schooling (coded in 7 education levels)4, marital status, urban residence (population over 20,000), a dummy indicating social security status and one dummy for workers having an additional job, firm size information, occupation (ISCO 88) and sectoral (NACE Rev.1) classifications
- Question of the decomposition (counterfactual) exercise : What would be the density of wages if we assume that the composition of attribute (individual controls)s remains as in 2002?
- Intuition comes from Oaxaca decomposition:

$$\begin{aligned} W_M - W_F &= X_M\beta_M - X_F\beta_F \\ &= X_M\beta_M - X_F\beta_M + X_F\beta_M - X_F\beta_F \\ &= X_F(\beta_M - \beta_F) + (X_M - X_F)\beta_M \end{aligned}$$

Decomposing wage inequality III

$$g(w|t_{w|x}=10,t_x=10)-g(w|t_{w|x}=02,t_x=02)=$$
$$\underbrace{(g(w|t_{w|x}=10,t_x=10)-g(w|x,t_{w|x}=10)\theta(x)dF(x|t_x=10))}_{composition\ effect}$$
$$+\underbrace{(g(w|x,t_{w|x}=10)\theta(x)dF(x|t_x=10)-g(w|t_{w|x}=02,t_x=02))}_{price\ effect} \quad (1)$$

- The first of term of the equation is the composition effect where wage schedule in 2010 is kept the same but the distribution of attributes have been re-weighted according to the distribution prevailing in 2002.
- The second term is the price effect where the distribution of attributes are similar as in 2002 but the wage schedules come from two different years.

Decomposing wage inequality IV

Table : DFL Wage Gap between Percentiles

	Years 2010-2002			Years 2004-2002			Years 2010-2004		
Men	total	composition	price	total	composition	price	total	composition	price
p90/p10	-0.3285	-0.0587	-0.2698	-0.2939	-0.0492	-0.2447	-0.0329	-0.0053	-0.0276
p50/p10	-0.2332	-0.0443	-0.1889	-0.1309	-0.0423	-0.088	-0.1023	-0.0284	-0.0739
p90/p50	-0.0953	-0.0144	-0.0809	-0.1630	-0.0069	-0.1561	0.0694	0.0231	0.0464
p75/p25	-0.2518	-0.1292	-0.1226	-0.1845	-0.0404	-0.144	-0.0677	-0.0207	-0.047
p90/p25	-0.2465	-0.0447	-0.2017	-0.2496	-0.0219	-0.2277	0.0044	-0.0058	0.0102
Variance	-0.1733	-0.0437	-0.1296	-0.1471	-0.0185	-0.1286	-0.0264	-0.0188	-0.0076
Std. Dev	-0.1263	-0.0342	-0.0922	-0.1056	-0.0142	-0.0914	-0.0209	-0.0149	-0.0059

	Years 2010-2002			Years 2004-2002			Years 2010-2004		
Women	total	composition	price	total	composition	price	total	composition	price
p90/p10	-0.3505	-0.1409	-0.2096	-0.2639	-0.0447	-0.2191	-0.0829	-0.0688	-0.0141
p50/p10	-0.3032	-0.1007	-0.2025	-0.0954	-0.0264	-0.0690	-0.2041	-0.0584	-0.1458
p90/p50	-0.0473	-0.0402	-0.0070	-0.1685	-0.0183	-0.1501	0.1212	-0.0105	0.1316
p75/p25	-0.2052	-0.1272	-0.0780	-0.1996	-0.0538	-0.1458	-0.0063	-0.0645	0.0583
p90/p25	-0.2210	-0.1000	-0.1209	-0.2858	-0.0622	-0.2236	0.0641	-0.0670	0.1312
Variance	-0.1993	-0.0624	-0.1368	-0.1688	-0.0288	-0.1400	-0.0320	-0.0275	-0.0045
Std. Dev	-0.1326	-0.0441	-0.0884	-0.1105	-0.0200	-0.0905	-0.0230	-0.0198	-0.0032

Decomposing wage inequality V

- wage gap 90/10 declines throughout the period. The price effect dominates the composition effect in 2002-2004 but not in 2004-2010.
- wage gap 50/10 declines throughout the period. The price effect still dominates the composition effect in both periods. When comparing 50/10 with 90/10: weaker for men, almost equal for women (stronger for in 2004-2010 for women).
- wage gap 90/50 declines in 2002-2004 and the price effect dominates the composition effect.
- wage gap 90/50 has increased between 2004-2010 (stronger for women).
- This result is quite intuitive since the real minimum wage increases might have also affected the wages of those workers around the median of the distribution.
- Lower female wage earners have benefited more than male earners

Outline

Conclusion

- Two regimes: 2002-2004 and 2004-2010
- The 2002-2004 period is characterized by a decline in wage inequality. The minimum wage increase in 2004 seems to be the main driver of this fact.
- The 2004-2010 period is compatible with SBTC and "polarization" hypothesis.

Share of Formal Contracts 2002-2010

Years	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	71.0	70.8	68.4	69.8	70.9	73.3	76.6	77.6	78.1
Private Sector	58.2	58.5	57.6	59.9	62.1	66.1	70.7	72.0	73.0