

Increased Sorting and Wage Inequality in the Czech Republic: New Evidence Using Linked Employer-Employee Dataset

Tor Eriksson, Mariola Pytlikova and Frederic Warzynski

Aarhus School of Business, Aarhus University

NASMES, June 4-7, 2009

- Huge literature on rising wage inequality, mostly focusing on the US labor market
 - ① Bound and Johnson (1992), Katz and Murphy (1992) and Katz and Autor (1999) for early evidence; Acemoglu (2002), Card and DiNardo (2002) and Lemieux (2008) for recent surveys; and Lemieux (2006) and Autor et al. (2008), for new developments.
- Some studies for the UK (e.g. see Goos and Manning)
- Linked to the rise of the college premium
- Various theories to explain it: the most likely candidate, skill biased technical change (SBTC)

- Consensus that wage inequality did not rise so much in the rest of Europe (although Denmark also experienced an important increase)
- Few/no recent studies for new EU members like Poland, Hungary or the Czech Republic for recent periods
- A few studies in the past looking at change in wage determination immediately after transition, but not much since
 - ① Flanagan (1995); Filer, Jurajda and Planovsky (1999), Svejnar (1999); Jurajda and Terell (2003); Munich, Svejnar and Terrell (2005)

Key factors affecting the labor market

- successive waves of reforms
- increased FDI
- decentralization of the bargaining process
- entry into the EU
- SBTC - probably

Our question

- which factors are behind the rise in wage inequality?
- is it mostly within firms or between firms?
- can it be explained by increased sorting?
- we have measures of decentralization, FDI, firm productivity, trade and workforce composition

Two key references

- **Lemieux, AER2006**: part of the increase in wage inequality in the U.S. can be explained by a mechanical relationship with the share of college-educated workers.
- In our analysis we control for the changing educational composition at the firm level.
- See also the recent REStat paper by Autor et al. that revisits that revisionist explanation
- **Kremer-Maskin, NBER1996**: a change in the skill distribution is followed by increased sorting.
- plausible explanation for the Czech Republic, where there was an increase in supply of university graduates over the studied period

- Source: TRESIMA. Private firm, provider of data to Czech Ministry of Labour, CZSO
- Linked employer-employee data set 1998-2006. Note: panel in firms, not in employees
- Size restriction: private sector and min 10 employees:
 - ① 2000 firms (unbalanced)=around 1 million obs yearly
- High quality information on wages, detailed employee characteristics and some firm characteristics
- Employee characteristics: hourly wage, total compensation, bonus, age, education, tenure (since 2002), occupational code,
- Firm level characteristics: 2-digit NACE (also 3-digit but confidential), profit, sales, bargaining regime

Table 1: Summary statistics**A. The unbalanced panel of firms**

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of individuals	790,386	822,280	863,399	928,893	1,013,771	1,082,701	1,168,270	1,273,828	1,475,725
Number of firms	1,489	1,838	2,151	2,402	2,372	2,445	2,853	3,156	3,040
Average employment	531	448	401	387	427	443	410	404	485
Average hourly wages in CZK	78.64	83.33	91.24	100.18	106.30	114.75	120.30	126.01	136.58
Average yearly wages in CZK	142974.8	157736.2	169095	178599.7	187337.8	203812.2	213309.1	219120.2	215995.3

B. The balanced panel of firms

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of individuals	406,810	385,351	388,387	381,227	417,393	393,551	395,504	399,683	422,811
Number of firms	481	481	481	481	481	481	481	481	481
Average employment	846	801	808	793	868	818	822	831	879
Average hourly wages in CZK	80.65	86.90	95.35	105.78	109.57	117.43	122.11	128.96	139.21

Table 2: Evolution of the share of workers with university education

	1998	1999	2000	2001	2002	2003	2004	2005	2006
% of ind. with university education	9.52%	9.46%	9.66%	9.46%	9.77%	10.56%	10.70%	10.70%	10.81%

- Added industry level variables to capture competition (from the Czech Statistical Office):
 - 1 Imports
 - 2 Exports
 - 3 Production
- We compute the import penetration ratio and the export intensity
- Also compute average profit margin at the industry level from our data

- Inequality has risen
 - ① p90/p10 ratio has increased
 - ② mostly driven by the increase in the p90/p50 ratio
- Wage distribution has changed

Figure 1: Changes in real hourly wage inequality as measured by P90/P10 percentile ratio, years 1998-2006

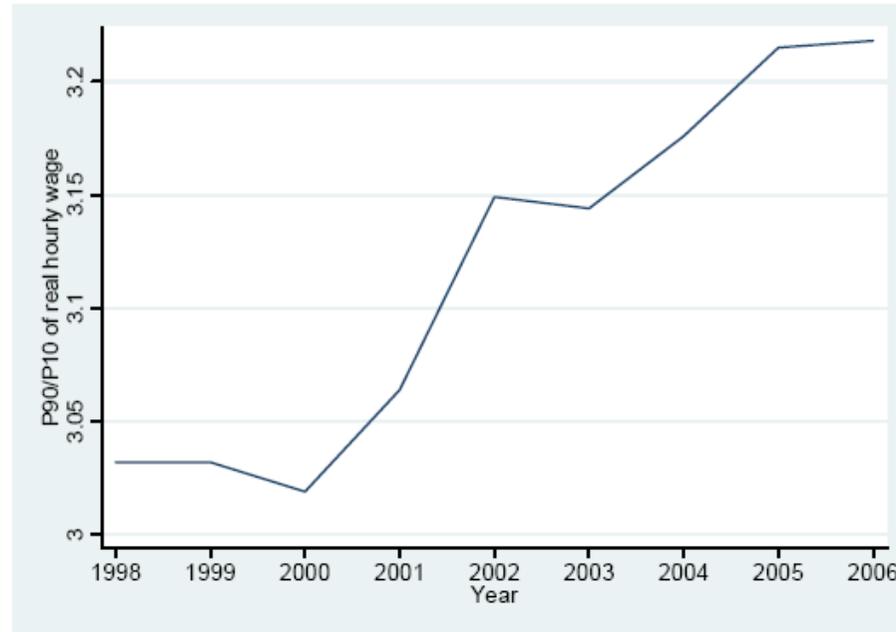
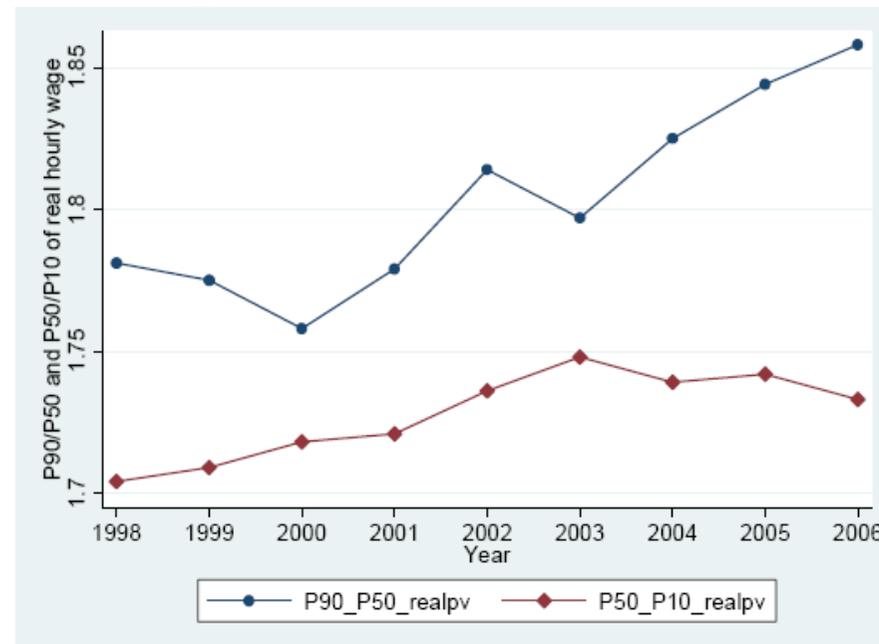
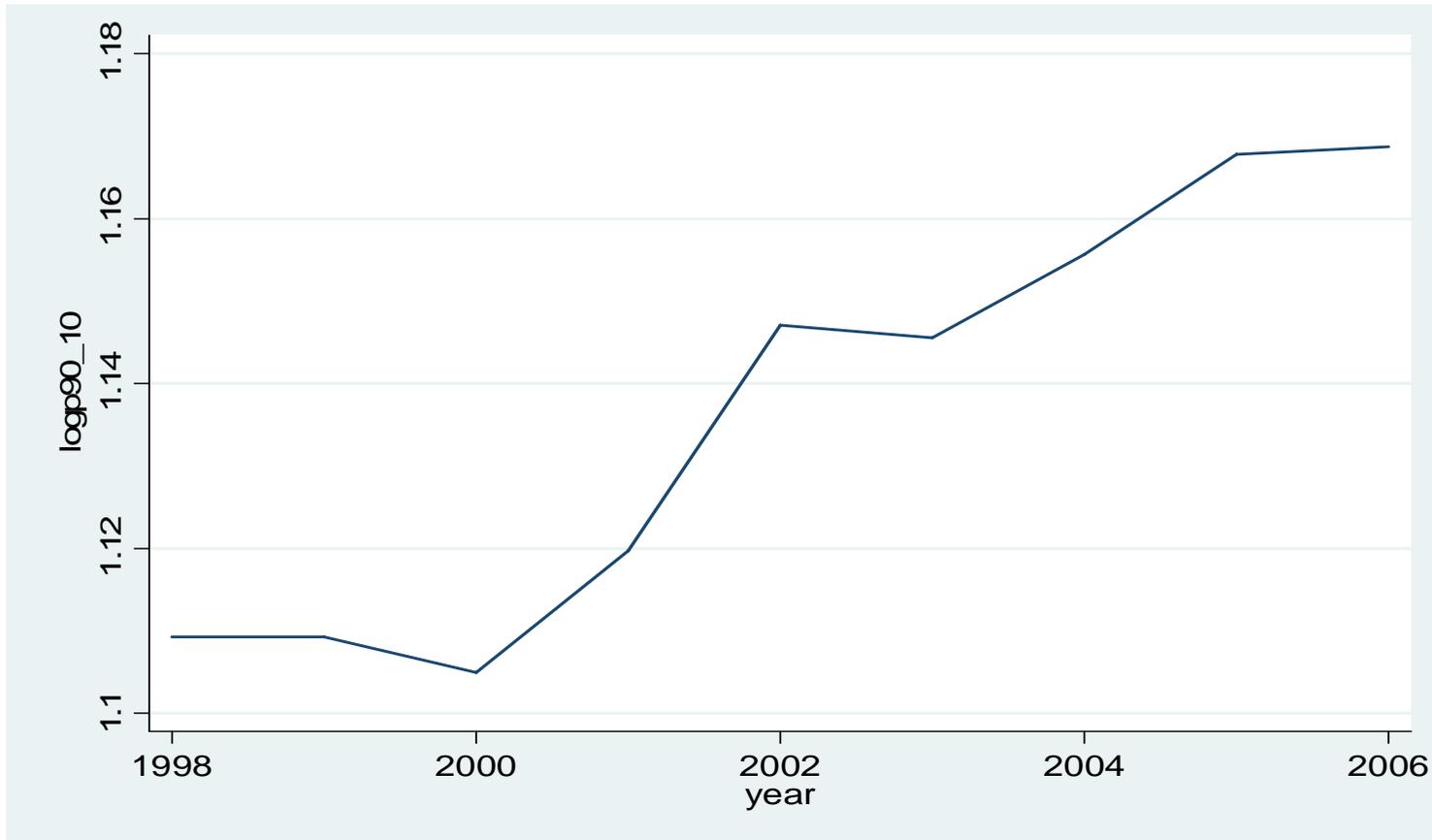


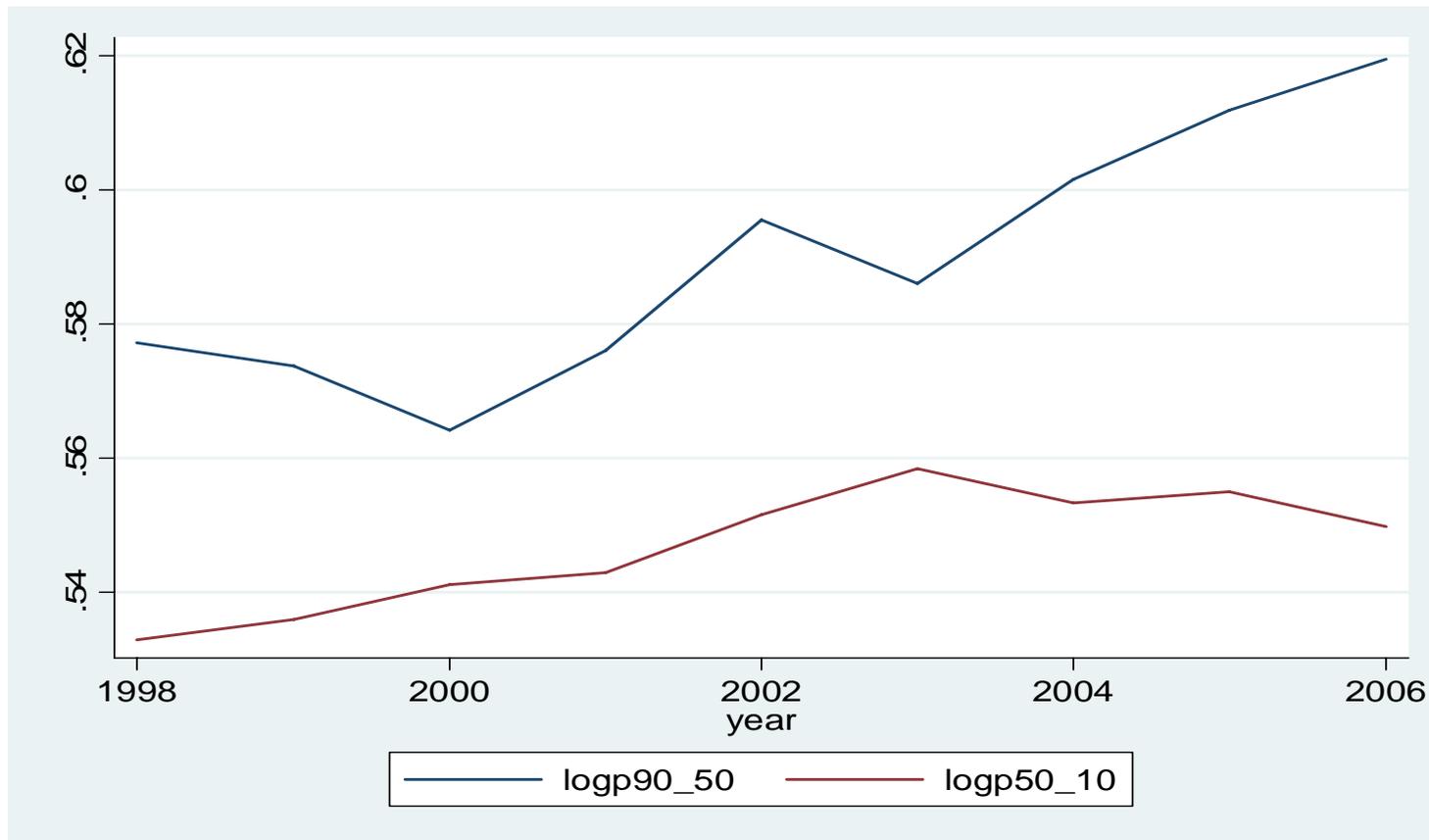
Figure 2: Changes in real hourly wage inequality as measured by P90/P50 and P50/P10 percentile ratios, years 1998-2006



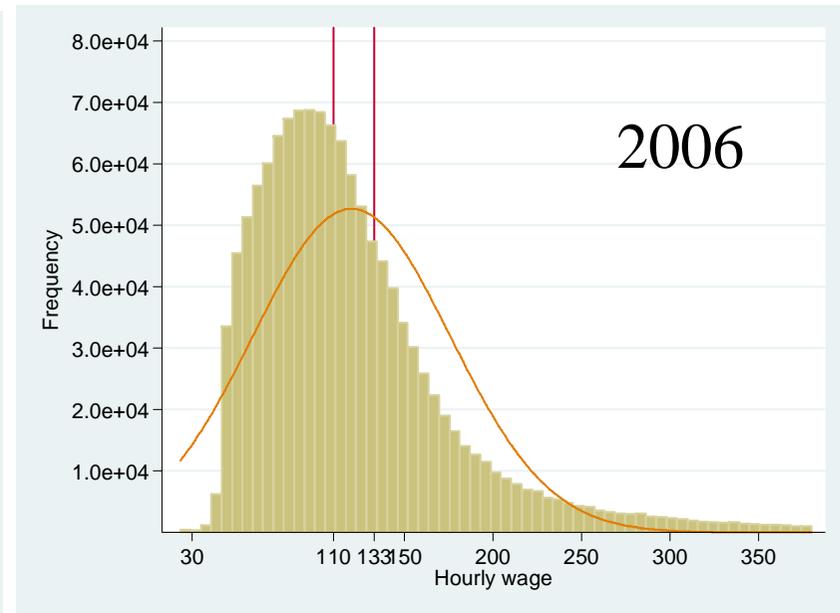
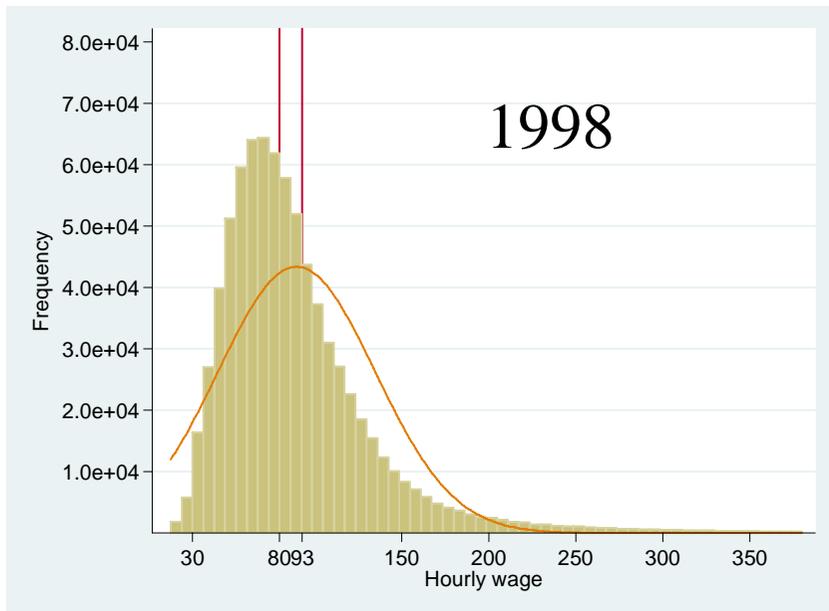
Changes in real hourly wage inequality P90/10-ratio, 1998-2006



Changes in real hourly wage inequality P90/P50- and P50/P10-ratios, 1998-2006



Wage distribution in 1998 and 2006



First step: Standard Mincerian equations estimated for each year

- Simple specification:

$$\begin{aligned} \log W_{ijt} = & \beta_0 + \beta_1 \text{Age}_{it} + \beta_2 \text{Age}_{it}^2 + \beta_3 \text{Tenure}_{ijt} + \beta_4 \text{Tenure}_{ijt}^2 \\ & + \beta_5 \text{Gender}_{it} + \gamma \text{EducationDummies}_{it} + \delta \text{FirmCharacteristics}_{jt} \\ & + \text{RegionDummies} + \text{YearDummies} + \text{IndustryDummies} + \epsilon_{ijt} \end{aligned}$$

- Firm characteristics: size, labor productivity, bargaining regime
- Focus on the evolution of the returns to experience, tenure, education and the gender wage gap
- Also the firm characteristics
- We also check robustness when we add firm fixed effects

Table 3: Individual wage regressions

A. Unbalanced sample, no tenure (1998-2006)

	1998	1999	2000	2001	2002	2003	2004	2005	2006
	<i>Dep. Var.: Log Hourly Wage</i>								
Age	0.035 [0.000]***	0.042 [0.000]***	0.039 [0.000]***	0.036 [0.000]***	0.036 [0.000]***	0.036 [0.000]***	0.038 [0.000]***	0.039 [0.000]***	0.039 [0.000]***
Age-sq/100	-0.038 [0.000]***	-0.048 [0.000]***	-0.044 [0.000]***	-0.04 [0.000]***	-0.041 [0.000]***	-0.04 [0.000]***	-0.042 [0.000]***	-0.043 [0.000]***	-0.043 [0.000]***
Female	-0.245 [0.001]***	-0.24 [0.001]***	-0.228 [0.001]***	-0.23 [0.001]***	-0.232 [0.001]***	-0.227 [0.001]***	-0.223 [0.001]***	-0.217 [0.001]***	-0.222 [0.001]***
No or primary	-0.271 [0.006]***	-0.391 [0.006]***	-0.255 [0.006]***	-0.249 [0.006]***	-0.299 [0.007]***	-0.372 [0.007]***	-0.267 [0.006]***	-0.305 [0.006]***	-0.236 [0.006]***
Lower secondary	-0.206 [0.001]***	-0.185 [0.001]***	-0.162 [0.001]***	-0.179 [0.001]***	-0.177 [0.001]***	-0.176 [0.001]***	-0.182 [0.001]***	-0.192 [0.001]***	-0.188 [0.001]***
University	0.578 [0.002]***	0.564 [0.002]***	0.591 [0.001]***	0.606 [0.001]***	0.634 [0.001]***	0.625 [0.001]***	0.607 [0.001]***	0.618 [0.001]***	0.615 [0.001]***
Foreign	0.053 [0.001]***	0.133 [0.001]***	0.095 [0.001]***	0.091 [0.001]***	0.08 [0.001]***	0.075 [0.001]***	0.119 [0.001]***	0.121 [0.001]***	0.119 [0.001]***
Firm Size	0.044 [0.000]***	0.038 [0.000]***	0.041 [0.000]***	0.034 [0.000]***	0.023 [0.000]***	0.026 [0.000]***	0.018 [0.000]***	0.02 [0.000]***	0.019 [0.000]***
Region dummies	YES								
Industry dummies	YES								
Observations	601922	687321	783587	857366	905251	977137	1111814	1214734	1253130
R-squared	0.44	0.43	0.43	0.44	0.44	0.44	0.43	0.45	0.44

Notes: 10, 5 and 1 % levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses.

B. Unbalanced sample, with tenure (2002-2006)

	2002	2003	2004	2005	2006
	<i>Dep. Var.: Log Hourly Wage</i>				
Age	0.022 [0.000]***	0.022 [0.000]***	0.022 [0.000]***	0.022 [0.000]***	0.022 [0.000]***
Age-sq/100	-0.028 [0.000]***	-0.027 [0.000]***	-0.027 [0.000]***	-0.027 [0.000]***	-0.027 [0.000]***
Tenure	0.019 [0.000]***	0.02 [0.000]***	0.023 [0.000]***	0.024 [0.000]***	0.025 [0.000]***
Tenure-sq/100	-0.035 [0.000]***	-0.037 [0.000]***	-0.043 [0.000]***	-0.046 [0.000]***	-0.047 [0.000]***
Female	-0.224 [0.001]***	-0.217 [0.001]***	-0.214 [0.001]***	-0.208 [0.001]***	-0.212 [0.001]***
No or primary	-0.284 [0.007]***	-0.353 [0.007]***	-0.237 [0.005]***	-0.272 [0.005]***	-0.199 [0.006]***
Lower secondary	-0.166 [0.001]***	-0.167 [0.001]***	-0.172 [0.001]***	-0.182 [0.001]***	-0.177 [0.001]***
University	0.64 [0.001]***	0.634 [0.001]***	0.619 [0.001]***	0.628 [0.001]***	0.626 [0.001]***
Foreign	0.093 [0.001]***	0.091 [0.001]***	0.134 [0.001]***	0.139 [0.001]***	0.139 [0.001]***
Firm Size	0.016 [0.000]***	0.017 [0.000]***	0.008 [0.000]***	0.011 [0.000]***	0.006 [0.000]***
Region dummies	YES				
Industry dummies	YES				
Observations	880131	977005	1111717	1214667	1222194
R-squared	0.47	0.47	0.46	0.48	0.47

Notes: 10, 5 and 1 % levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses.

Table 4: Individual wage regressions - with firm fixed effect**A. Unbalanced sample, no tenure (1998-2006)**

	1998	1999	2000	2001	2002	2003	2004	2005	2006
	<i>Dep.Var.: Log Hourly Wage</i>								
Age	0.032 [0.000]***	0.039 [0.000]***	0.035 [0.000]***	0.032 [0.000]***	0.032 [0.000]***	0.032 [0.000]***	0.034 [0.000]***	0.034 [0.000]***	0.033 [0.000]***
Age-sq/100	-0.034 [0.000]***	-0.042 [0.000]***	-0.039 [0.000]***	-0.035 [0.000]***	-0.035 [0.000]***	-0.035 [0.000]***	-0.036 [0.000]***	-0.037 [0.000]***	-0.036 [0.000]***
Female	-0.209 [0.001]***	-0.205 [0.001]***	-0.192 [0.001]***	-0.194 [0.001]***	-0.185 [0.001]***	-0.185 [0.001]***	-0.184 [0.001]***	-0.18 [0.001]***	-0.182 [0.001]***
No or primary	-0.288 [0.005]***	-0.414 [0.006]***	-0.263 [0.006]***	-0.251 [0.006]***	-0.282 [0.006]***	-0.288 [0.007]***	-0.227 [0.005]***	-0.23 [0.005]***	-0.186 [0.006]***
Lower secondary	-0.182 [0.001]***	-0.176 [0.001]***	-0.16 [0.001]***	-0.158 [0.001]***	-0.156 [0.001]***	-0.155 [0.001]***	-0.159 [0.001]***	-0.162 [0.001]***	-0.152 [0.001]***
University	0.527 [0.001]***	0.506 [0.001]***	0.534 [0.001]***	0.544 [0.001]***	0.56 [0.001]***	0.545 [0.001]***	0.526 [0.001]***	0.542 [0.001]***	0.54 [0.001]***
Constant	3.602 [0.005]***	3.532 [0.004]***	3.677 [0.004]***	3.835 [0.004]***	3.883 [0.004]***	3.94 [0.004]***	3.961 [0.004]***	3.996 [0.003]***	4.092 [0.003]***
Observations	601922	687321	783587	857366	905251	977137	1111814	1214734	1253130
R-squared	0.6	0.58	0.58	0.6	0.6	0.6	0.59	0.59	0.58

Notes: 10, 5 and 1 % levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses.

B. Unbalanced sample, with tenure (2002-2006)

	2002	2003	2004	2005	2006
	<i>Dep.Var.: Log Hourly Wage</i>				
Age	0.021 [0.000]***	0.021 [0.000]***	0.021 [0.000]***	0.021 [0.000]***	0.02 [0.000]***
Age-sq/100	-0.025 [0.000]***	-0.024 [0.000]***	-0.024 [0.000]***	-0.024 [0.000]***	-0.023 [0.000]***
Tenure	0.018 [0.000]***	0.019 [0.000]***	0.02 [0.000]***	0.021 [0.000]***	0.022 [0.000]***
Tenure-sq/100	-0.032 [0.000]***	-0.033 [0.000]***	-0.036 [0.000]***	-0.04 [0.000]***	-0.042 [0.000]***
Female	-0.183 [0.001]***	-0.182 [0.001]***	-0.181 [0.001]***	-0.177 [0.001]***	-0.18 [0.001]***
No or primary	-0.264 [0.006]***	-0.276 [0.007]***	-0.202 [0.005]***	-0.2 [0.005]***	-0.162 [0.006]***
Lower secondary	-0.15 [0.001]***	-0.15 [0.001]***	-0.154 [0.001]***	-0.157 [0.001]***	-0.147 [0.001]***
University	0.573 [0.001]***	0.56 [0.001]***	0.542 [0.001]***	0.558 [0.001]***	0.555 [0.001]***
Constant	4.026 [0.004]***	4.081 [0.004]***	4.121 [0.004]***	4.17 [0.004]***	4.272 [0.004]***
Observations	880131	977005	1111717	1214667	1222194
R-squared	0.62	0.62	0.61	0.61	0.6

Notes: 10, 5 and 1 % levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses.

Results 1

- No dramatic change in returns to observables
- Slight increase in the returns to schooling (were increasing until 2002 then declined slightly before rising again)
- Slight increase in the returns to age (tenure when we control for tenure)
- Slight decrease in the gender wage gap
- Results robust when we introduce firm fixed effects

Second step

- Better understand the effect of firm characteristics (purged from differences in human capital)
- Extract the firm effect from table 4 and relate it to firm characteristics
- Better understand within-firm and between-firm wage inequality
- Compute both measures and relate it to firm and sector characteristics

Table 6: Evolution of the standard deviation of the fixed effect

Year	Standard deviation of the fixed effect from the log real yearly earnings	Standard deviation of the fixed effect from the log real hourly wage	Adjusted R ² s from wage regressions with firm fixed effects only
1998	0.402	0.31	0.400
1999	0.409	0.289	0.392
2000	0.374	0.279	0.399
2001	0.364	0.276	0.416
2002	0.409	0.28	0.423
2003	0.404	0.291	0.432
2004	0.406	0.29	0.422
2005	0.4	0.285	0.420
2006	0.429	0.298	0.414

Note: The Adj R² from wage regressions with firm effects are run on the same number of observations as wage regressions with human capital variables shown in Table 3 in order to be comparable.

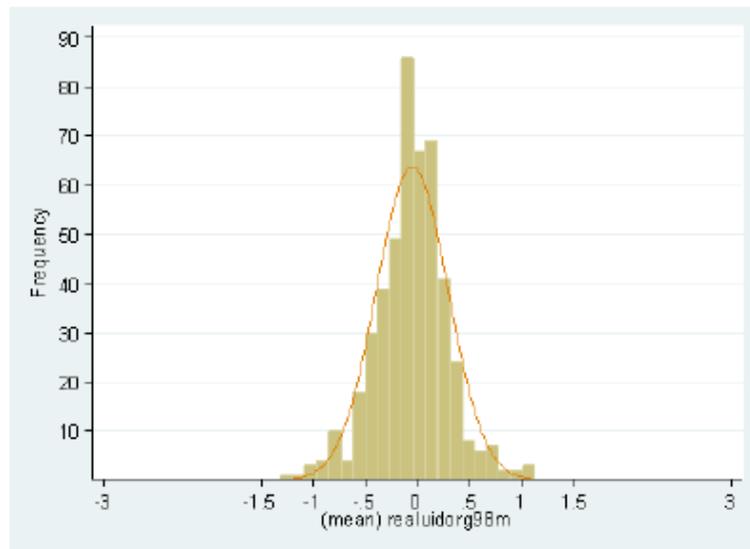
Table 5: the evolution of within-firm and between-firms real hourly wage inequality

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Within-Firm Wage Inequality	48.38	49.24	48.91	52.33	55.84	62.29	63.14	65.26	74.35
Between- firm Wage Inequality	48.75	43.33	41.01	43.78	47.91	55.86	54.13	55.35	63.45

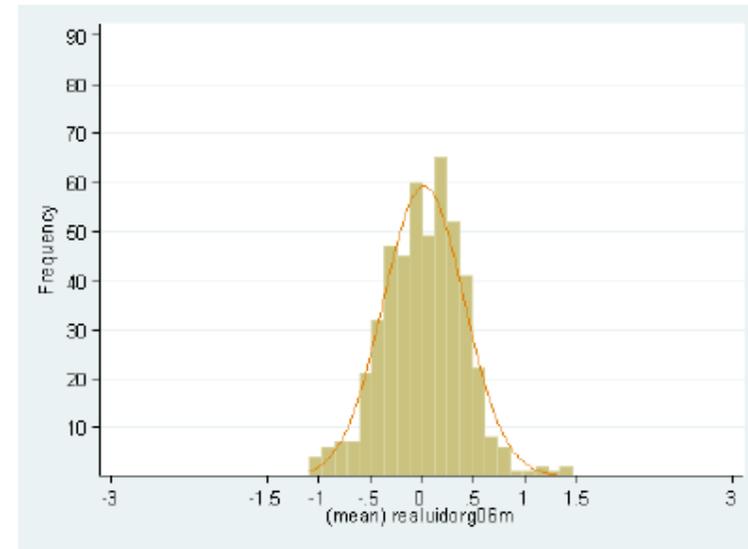
Note: Within-firm wage inequality is equal to the average standard deviation of real hourly wage within firms. Between- firm wage Inequality is defined as the standard deviation of the average real hourly wage between firms in our sample.

Evolution of the Distribution of the Firm Fixed Effect

1998



2006



- Within-firm real wage inequality has increased
- And so did between-firm inequality although not as much as within-firm inequality
- Small increase in variance of firm fixed effects as from 2001
- Change in the distribution

Table 7: Explaining the Firm-Fixed Effect in the Wage Regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>Dep. Var.: Firm-Fixed Effects</i>						
Export Intensity	-0.006 [0.021]	- -	- -	- -	0.028 [0.021]	- -	- -
Import Penetratio Ratio	- -	0.001 [0.003]	- -	- -	-0.002 [0.003]	- -	- -
Average Industry Profit Margin	- -	- -	0.121 [0.036]***	- -	0.014 [0.061]	- -	- -
Log Labor Productivity	- -	- -	- -	0.102 [0.002]***	0.111 [0.003]***	- -	- -
Foreign	0.144 [0.006]***	0.144 [0.006]***	0.133 [0.005]***	0.080 [0.005]***	0.091 [0.006]***	0.136 [0.006]***	0.146 [0.011]***
Log Size	0.035 [0.002]***	0.035 [0.002]***	0.021 [0.001]***	0.014 [0.002]***	0.021 [0.002]***	0.018 [0.002]***	0.018 [0.004]***
Coll. Agreement (Y/N)	- -	- -	- -	- -	- -	0.015 [0.005]***	- -
Firm Level Coll. Agr.	- -	- -	- -	- -	- -	- -	0.026 [0.011]**
Industry Level Coll. Agr.	- -	- -	- -	- -	- -	- -	0.037 [0.016]**
Year dummies	YES						
Region dummies	YES						
Industry dummies	YES						
Constant	-0.795 [0.193]***	-0.798 [0.193]***	-0.428 [0.020]***	-1.036 [0.026]***	-1.359 [0.155]***	-0.429 [0.278]	-0.212 [0.210]
Observations	7626	7626	20692	12312	4923	10922	2737
R-squared	0.39	0.39	0.45	0.57	0.57	0.51	0.54

Notes: 10, 5 and 1 % levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses. Firm fixed effects are calculated from hourly real wage regressions with HC controls.

Table 8: Explaining Within-Firm Wage Inequality

Part A: Effect of trade, domestic competition and productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>Dep. Var.: Within Firm Standard deviation of Hourly Real Wage</i>												
Export Intensity	-10.787 [1.290]***	-	-	-	-0.513 [4.286]	-	-	-	-1.23 [2.768]	-	-	-
Import Penetration Ratio	-	-2.33 [0.611]***	-	-	-	-0.534 [0.690]	-	-	-	-0.163 [0.508]	-	-
Average Industry Profit Margin	-	-	47.713 [6.286]***	-	-	-	7.025 [7.266]	-	-	-	8.568 [5.236]	-
Log Labor Productivity	-	-	-	13.121 [0.385]***	-	-	-	12.218 [0.465]***	-	-	-	5.845 [0.727]***
Log Size	5.182 [0.379]***	4.957 [0.379]***	4.331 [0.232]***	2.324 [0.302]***	4.79 [0.413]***	4.788 [0.413]***	4.894 [0.254]***	3.184 [0.339]***	-2.514 [1.381]*	-2.507 [1.381]*	-2.918 [0.692]***	-1.309 [0.991]
Foreign	18.198 [1.209]***	17.837 [1.212]***	23.335 [0.920]***	14.277 [1.069]***	17.023 [1.219]***	17.033 [1.219]***	19.26 [0.914]***	11.699 [1.074]***	1.583 [1.823]	1.603 [1.822]	4.235 [1.268]***	2.786 [1.577]*
Share of University Edu	108.405 [4.382]***	115.008 [4.306]***	167.74 [2.801]***	160.187 [3.825]***	150.845 [6.061]***	150.833 [6.061]***	174.076 [3.585]***	175.12 [4.965]***	127.093 [12.316]***	127.14 [12.316]***	110.998 [5.774]***	120.779 [7.882]***
Industry dummies	NO	NO	NO	NO	YES	YES	YES	YES	-	-	-	-
Firm dummies	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES
Constant	34.55 [5.025]***	29.508 [4.997]***	34.341 [2.901]***	-51.79 [4.864]***	22.258 [5.639]***	22.289 [5.082]***	21.327 [2.917]***	-54.688 [5.259]***	98.419 [10.151]***	97.666 [9.954]***	55.649 [4.877]***	9.803 [10.033]
Number of observations	7651	7651	20819	12373	7651	7651	20819	12373	7651	7651	20819	12373
Adj. R-squared	0.23	0.23	0.31	0.36	0.30	0.30	0.41	0.45	0.74	0.74	0.78	0.80

Part B: Effect of collective agreements

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Dep. Var.: Within Firm Standard deviation of Hourly Real Wage</i>									
Coll. Agreement (Y/N)	0.181 [1.139]	2.757 [1.905]	-	-	2.534 [1.156]**	2.249 [1.967]	-	-2.083 [1.702]	-3.273 [3.796]
Firm Level Coll. Agr.	-	-	2.867 [2.873]	3.899 [4.606]	-	-	3.616 [5.129]	-	-
Industry Level Coll. Agr.	-	-	3.292 [3.376]	0.577 [5.734]	-	-	-2.454 [7.217]	-	-
Export Intensity	-	-4.243 [5.171]	-	-8.097 [15.945]	-	20.459 [11.713]*	-	-	7.627 [8.505]
Import Penetration Ratio	-	3.904 [4.656]	-	7.163 [15.507]	-	-14.558 [10.327]	-	-	-6.403 [7.329]
Average Industry Profit Margin	-	93.092 [16.315]***	-	94.912 [40.342]**	-	40.656 [20.717]**	-	-	13.805 [16.742]
Log Labor Productivity	-	13.176 [0.901]***	-	17.388 [2.507]***	-	12.603 [1.052]***	22.324 [3.115]***	-	6.191 [2.238]***
Log Size	4.22 [0.392]***	2.191 [0.686]***	5.023 [0.969]***	3.494 [1.853]*	5.031 [0.422]***	2.736 [0.764]***	4.227 [2.155]*	-6.517 [1.345]***	7.707 [3.028]**
Foreign	28.022 [1.334]***	12.443 [1.748]***	29.961 [2.794]***	15.346 [4.049]***	20.898 [1.310]***	10.888 [1.804]***	13.673 [4.520]***	0.788 [1.677]	0.942 [2.732]
Share of University Edu	177.891 [4.004]***	116.469 [8.246]***	194.905 [8.827]***	121.697 [20.770]***	211.102 [5.777]***	163.837 [11.972]***	113.308 [33.382]***	129.087 [11.897]***	219.469 [30.274]***
Industry dummies	NO	NO	NO	NO	YES	YES	YES	-	-
Firm dummies	NO	NO	NO	NO	NO	NO	NO	YES	YES
Constant	60.402 [49.561]	-47.072 [39.019]	50.135 [10.253]***	-105.063 [30.097]***	48.514 [45.235]	-45.592 [38.442]	-153.965 [34.420]***	100.768 [32.623]***	-13.247 [47.318]
Number of observations	10942	3108	2743	600	10942	3108	600	10942	3108
Adj. R-squared	0.35	0.28	0.34	0.32	0.47	0.36	0.45	0.86	0.8

Notes: 10, 5 and 1 % levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses. All regressions include region and year dummies. We also include the standard deviation of age, the share of the other education groups and the share of female workers as additional controls.

Table 9: Explaining Between-Firm Wage Inequality Within Industry

Part A: Effect of trade, domestic competition and productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>Dep.Var.: Between-Firm Standard deviation of Hourly Real Wage</i>							
Export Intensity	-7.272 [1.372]***	-	-	-	0.17 [2.917]	-	-	-
Import Penetration Ratio	-	-4.796 [1.087]***	-	-	-	-0.817 [1.195]	-	-
Average Industry Profit Margin	-	-	36.61 [8.782]***	-	-	-	1.488 [8.120]	-
StDev of Log Labor Productivity/100	-	-	-	0.013 [0.003]***	-	-	-	0.008 [0.002]***
Log of Average Size	1.428 [0.675]**	1.236 [0.677]*	-1.715 [0.639]***	-1.403 [0.670]**	2.167 [1.616]	2.143 [1.613]	-0.958 [1.335]	-1.06 [1.532]
Share of Foreign	5.004 [3.063]	4.385 [3.078]	19.518 [3.515]***	17.61 [3.554]***	5.388 [3.938]	5.205 [3.945]	11.179 [4.190]***	9.587 [4.357]**
StDev of Share of University Edu	237.167 [10.405]***	242.953 [10.304]***	215.262 [10.004]***	250.938 [10.994]***	215.096 [12.010]***	214.588 [11.951]***	135.03 [13.134]***	166.428 [14.870]***
Industry dummies	<i>NO</i>	<i>NO</i>	<i>NO</i>	<i>NO</i>	<i>YES</i>	<i>YES</i>	<i>YES</i>	<i>YES</i>
Constant	0.825 [4.427]	0.253 [4.454]	20.875 [4.562]***	18.936 [4.822]***	-0.369 [10.091]	-5.135 [9.981]	22.552 [8.267]***	23.636 [9.574]**
Observations	607	607	1431	1322	607	607	1431	1322
Adj. R-squared	0.56	0.55	0.32	0.37	0.80	0.80	0.67	0.68

Notes: 10, 5 and 1 % levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses. All regressions include year dummies and the standard deviation of the share of female workers.

Part B: Effect of collective agreements

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Dep.Var.: Between-Firm Standard deviation of Hourly Real Wage</i>					
Share of Firms with Coll. Agreement	-14.543 [3.130]***	-	-2.116 [2.728]	-	-6.385 [4.187]	-6.003 [3.824]
Share of Firms with Firm-level Coll. Agreement	-	-26.312 [14.320]*	-	2.495 [18.367]	-	-
Share of Firms with Industry-level Coll. Agreeen	-	-19.965 [10.840]*	-	-0.704 [11.013]	-	-
Export Intensity	-	-	-2.951 [3.670]	7.564 [21.546]	-	-1.21 [5.653]
Import Penetration Ratio	-	-	-2.56 [3.093]	-11.368 [18.769]	-	-0.555 [4.207]
Average Industry Profit Margin	-	-	16.538 [11.526]	-6.317 [37.913]	-	5.902 [10.369]
StDev of Log Labor Productivity/100	-	-	0.049 [0.010]***	0.702 [0.203]***	-	0.056 [0.009]***
Log of Average Size	1.853 [0.838]**	-0.744 [3.643]	1.35 [0.863]	-4.591 [4.737]	-0.799 [2.225]	3.403 [2.269]
Share of Foreign	14.44 [3.815]***	6.258 [9.536]	1.913 [3.302]	0.227 [10.724]	9.269 [4.588]**	3.227 [4.578]
StDev of Share of University Edu	284.791 [13.170]***	326.625 [68.287]***	240.593 [11.697]***	238.986 [98.004]**	258.445 [17.106]***	236.157 [14.425]***
Industry dummies	<i>NO</i>	<i>NO</i>	<i>NO</i>	<i>NO</i>	<i>YES</i>	<i>YES</i>
Year dummies	<i>YES</i>	<i>Cross-section</i>	<i>YES</i>	<i>Cross-section</i>	<i>YES</i>	<i>YES</i>
Constant	7.522 [5.449]	35.507 [20.867]*	10.692 [5.395]**	30.489 [25.190]	22.329 [13.391]*	-5.824 [14.415]
Observations	745	66	414	37	745	414
Adj. R-squared	0.46	0.44	0.63	0.57	0.85	0.87

Table 11: Share of college-educated workers by labor productivity decile

<i>Share of College-Educated Workers</i>	Top productivity decile	Bottom productivity decile
1998	11.05%	4.69%
1999	12.25%	5.14%
2000	11.69%	5.49%
2001	12.22%	4.72%
2002	12.40%	4.59%
2003	13.53%	4.02%
2004	14.81%	4.48%
2005	15.06%	4.23%
2006	15.63%	5.04%

Table 10: Explaining the Share of College Educated Workers

<i>Dep. Var.: Share of College-Educated Workers</i>	(1)	(2)	(2)
Log(Labor productivity)	0.027*** (0.001)	0.023*** (0.001)	0.002*** (0.001)
Log(Size)	-0.012*** (0.001)	-0.005*** (0.001)	-0.024*** (0.001)
Year dummies	YES	YES	YES
Region dummies	NO	YES	YES
Industry fixed effect	NO	YES	NO
Firm fixed effect	NO	NO	YES
Constant	-0.045*** (0.008)	-0.061*** (0.007)	0.186*** (0.012)
Adj. R ²	0.09	0.57	0.89
# obs.	12,432	12,432	12,432

- Within firm wage inequality is strongly associated with foreign ownership and shares of college educated individuals (in addition to size and productivity)
- Bargaining associated with the level of wages, not the variance
- Weak effect of trade and competition
- Between firm inequality: share of foreign ownership and std. dev. of the share of college educated important, but also share of firms with bargaining agreement and average industry margin (last two findings not robust to fixed effect though)
- Share of college educated workers more important in more productive firms and increasing

Conclusion and future work

- Changing educational composition both within and between firms within industries is an important engine driving increased inequality in the CR
- Look more deeply at the link with labor productivity dispersion to test further Syverson (2004) and link with Faggio et al. (2007)
- Analysis of bonuses and their contribution to increased wage inequality (see Lemieux, Macleod and Parent, 2006)