Wage differentials, rent sharing, and worker allocation between firms

Arttu Kahelin

Aalto University

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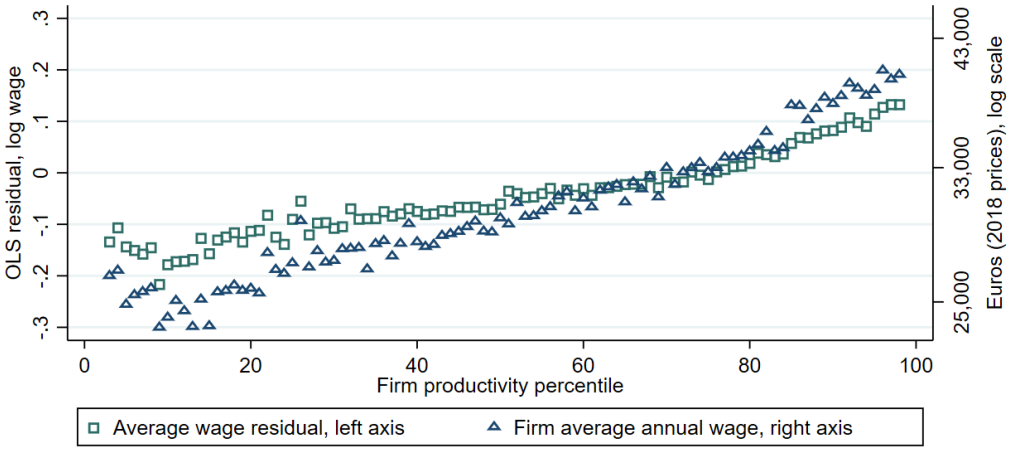
More productive firms pay higher wages



9,248,697 total worker-year observations. Data points are averages of all observations allocated each year to a specific percentile.
Wage residuals are calculated from an OLS model that controls for year-education-gender dummies and dummies for expected experience.
All measures deflated by CPI.

This paper

How has firm productivity contributed to between-firms wage differentials in Finland?

- Pass-through vs. worker sorting

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- Pass-through vs. worker sorting

What drives worker sorting on firm productivity?

- Initial allocation and subsequent reallocation of workers.
- Employment margin responses by firms.

Main findings

- Pass-through from value-added shocks to wages is small compared to between-firms wage differentials.
- Using firm-switchers for identification, the differentials mostly reflect worker sorting.
- The differentials exist already among labor market entrants.
- Workers more likely to stay, less likely to become unemployed in productive firms.
- Regarding firm level pass-through, firms increase average wages through new hires.

Rent sharing and threats to identification in OLS

Following discussion by Card et al. (2018).

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- Measurement error and fluctuations in value-added ($\gamma \downarrow$)
- Endogeneity between wages and productivity ($\gamma \uparrow\downarrow$)

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What can be done?

- Differences for firm-stayers.
- Instrumenting productivity shocks.
- Firm and worker fixed effects (AKM).

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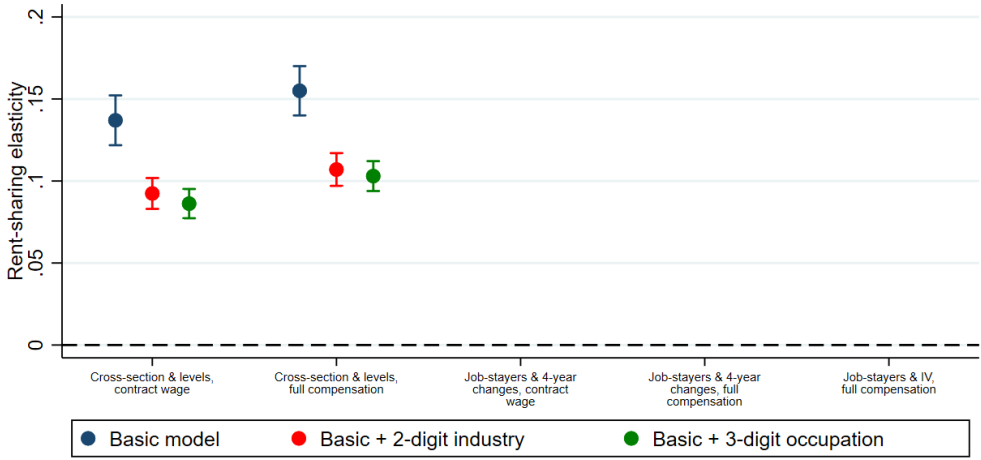
Ideal experiments

- Randomized permanent cash windfalls (RCT)
- Firm grant cutoffs (RDD)
- Firm-specific TFP shocks (IV)

Data

- Matched employer-employee data for 1995-2017 (Statistics Finland)
- **Sample:** $\sim 500,000$ wage observations per year.
  - Private sector **full-time** workers in firms with ≥ 10 workers.
  - Does not include top managers, owners or selected industries (eg. finance).
  - Only firms with positive value added per worker.
- **Productivity:**
  Gross value added per worker
- **Wages:**
  Full hourly compensation incl. overtime & bonuses (& without them)

OLS rent-sharing elasticity: $ln(w_{it}) = \gamma\ ln\left(\frac{VA_{jt}}{N_{jt}}\right) + X'_{it}\beta + \epsilon_{it}$



Full compensation = Contract-based wage + Overtime payments + Bonuses. Basic model controls for years-of-education-year dummies and a quadratic of estimated work experience. Occupations are defined at 3-digit occupation level following the Isco5 standard and industries are defined at the 2-digit level following the TOL2008 classification by Statistics Finland. Sample size varies with model depending on data availability. N = 8,339,218 for cross-section, N = 3,975,080 for stayers, N = 3,694,045 for IV model.

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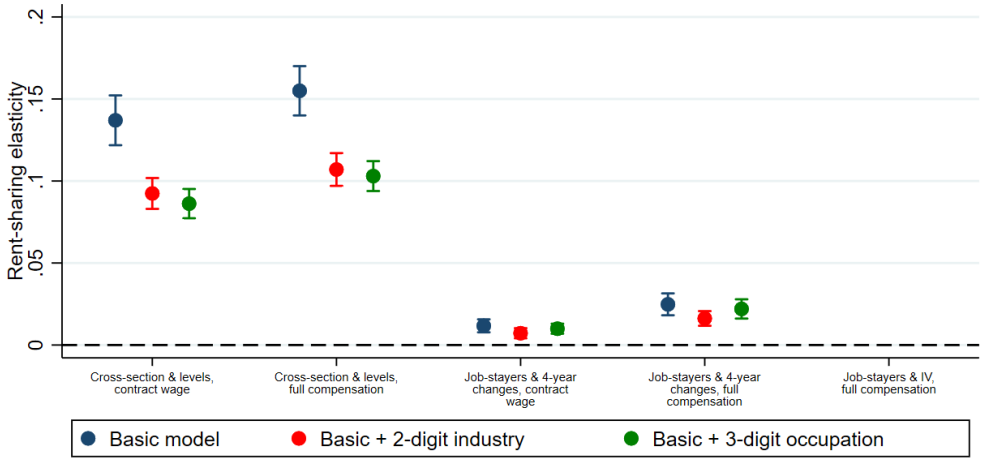

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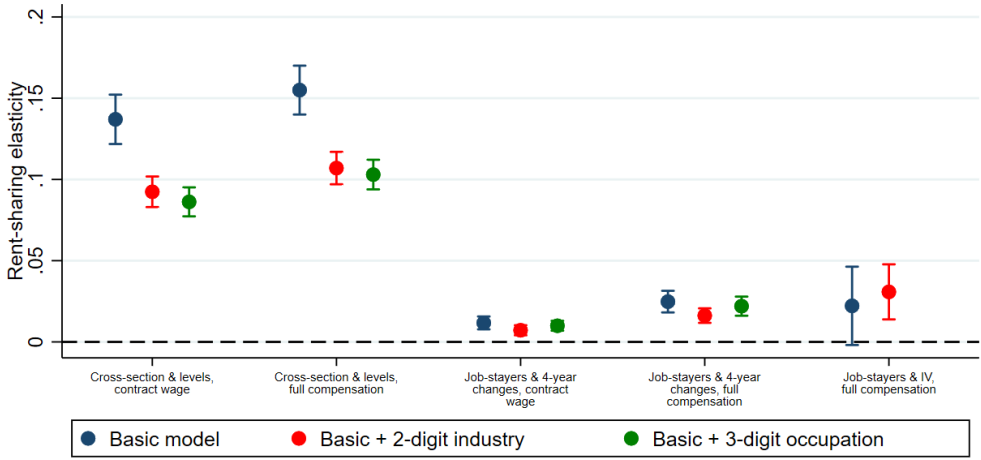

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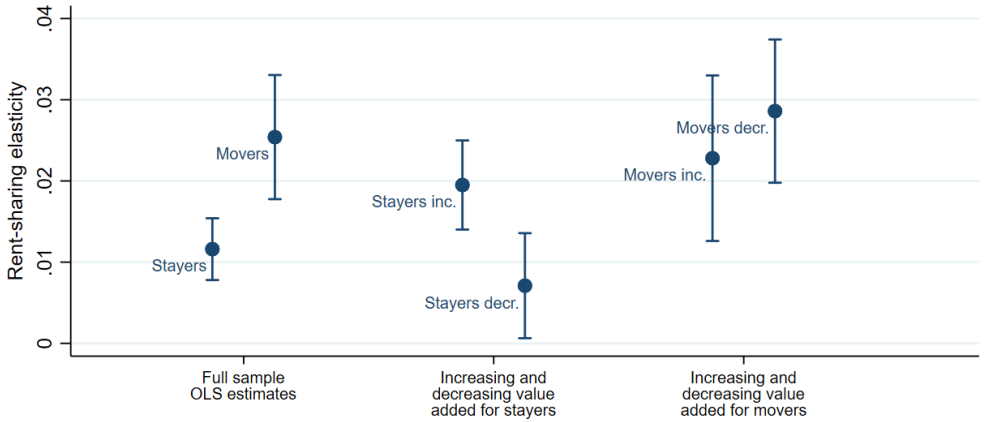
Wages of firm-switchers more sensitive to productivity differences



4-year changes in full compensation and value added per worker. Regression model controls for a quadratic in experience and gender-education-year dummies. Movers: N = 1,484,032, Stayers: N = 3,975,080

Controlling for unobserved sorting using AKM fixed effects

$$\begin{cases} \text{Cross-sectional OLS:} & \ln\ w_{it} = X_{it}'\beta + \gamma\ \ln\ \frac{VA_{jt}}{N_{jt}} + \epsilon_{it} \\ \text{AKM:} & \ln\ w_{it} = \alpha_i + \psi_{J(i,t)} + X_{it}'\theta + \nu_{it} \end{cases}$$

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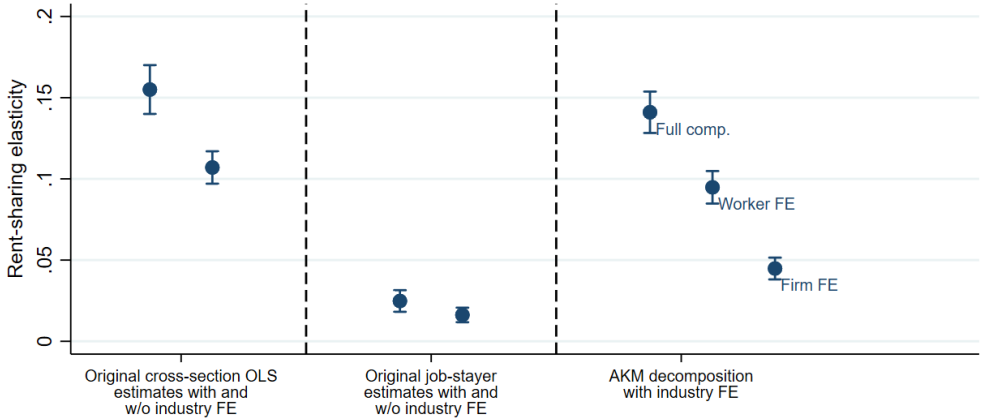
$$\Rightarrow \alpha_i + \psi_{J(i,t)} + X_{it}'\theta = (\gamma_\alpha + \gamma_\psi + \gamma_{X\theta})\ ln\ \frac{VA_{jt}}{N_{jt}} + X_{it}'\beta + (\epsilon_{it} - \nu_{it})$$

where $\gamma_\alpha + \gamma_\psi + \gamma_{X\theta} \approx \gamma$

Rent-sharing elasticity is 0.04 wrt. AKM firm effects



Full compensation as wage measure. X-axis label specifies the dependent variables used in rent-sharing estimation.
Marker labels distinguish between industry-level and firm-level estimates.
Regression model controls for a quadratic in experience, gender, and level-of-education-year dummies. N = 11,183,347

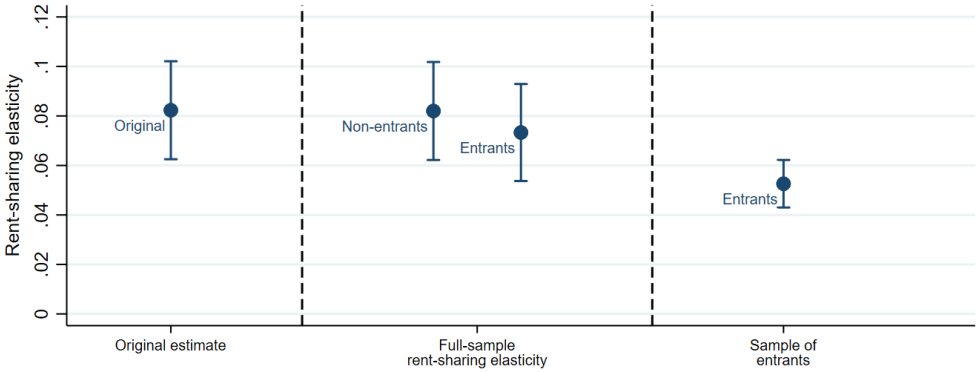
Discussion

$$ln(w_{it}) = \gamma\ ln\left(\frac{VA_{jt}}{N_{jt}}\right) + X'_{it}\beta + \epsilon_{it}$$

- Is γ a constant?
- What determines γ?
- Omitting leaving workers.

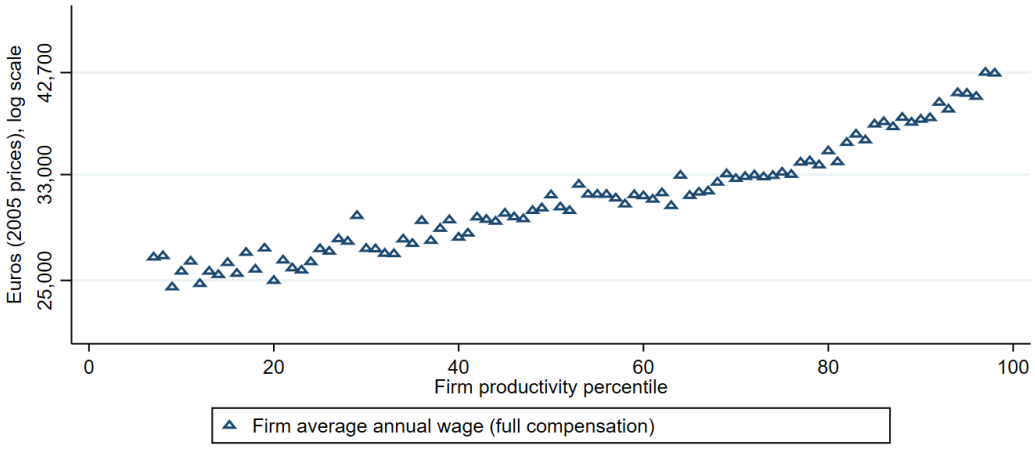
Thank you!

Clear productivity effects in entrant wages



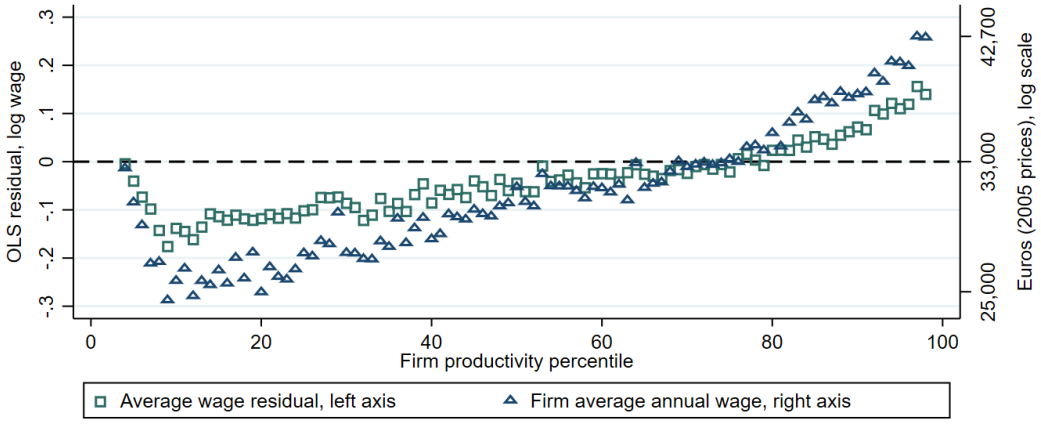
Full compensation = Contract-based wage + Overtime payments + Bonuses.
Regressions control for year-education dummies, gender, expected experience and 3-digit occupation.
Occupations are defined at 3-digit occupation level following the Isco5 standard.
N = 8,454,083; workers identified to be entering the labour force = 368,339

Firm average wages correlate with firm productivity...



Percentiles 1-6, 99, and 100 omitted.
Each percentile holds an equal number of firms, not equal number of workers. N = 9,318,645

... and so do firm average wage *residuals*



Percentiles 1, 2, 3, 99 and 100 omitted. Wage residuals are calculated from an OLS wage regression for log total hourly wage controlling for year-education group dummies, quadratic in estimated work experience, and gender.
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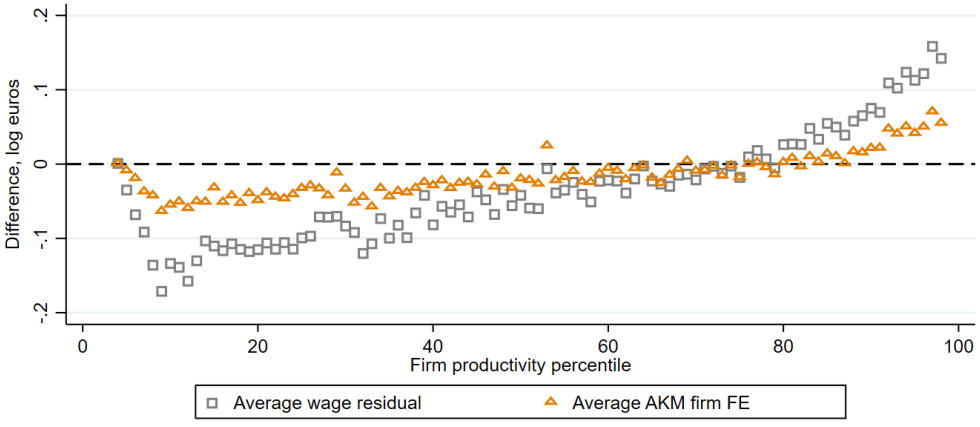
AKM firm fixed effects correlate with wage residuals



Percentiles 1, 2, 3, 99 and 100 omitted. Wage residuals are calculated from an OLS wage regression for log total hourly wage controlling for year-education group dummies, quadratic in estimated work experience, and gender.
Firm fixed effects are calculated with an AKM model with two-way fixed effects for workers and firms.
N = 9,137,090

Average wages are higher in more productive industries.

Markers symbol a 2-digit industry. The size of the marker symbolizes the total number of wage observations of workers in that industry in the final sample. N = 9,318,645

Literature

- Estimates of rent-sharing elasticity range between 0.05-0.15.
  Hildreth and Oswald (1997), Arai and Heyman (2009), Carlsson et al. (2016), Card et al. (2018), Lamadon et al. (2019)
- Worker sorting contributes substantially to between-firms wage dispersion.
  Abowd et al. (1999), Card et al. (2013), Song et al. (2019), Bonhomme et al. (2019), Simola (2020)
- Quasi-experiments find evidence of rent-sharing behaviour.
  Van Reenen (1996), Saez et al. (2019), Kline et al. (2019), Kroft et al. (2020)
- My contribution: Using a larger sample and further decomposing rent-sharing estimates.

Rent sharing in labour market theory

- Perfect competition $\Rightarrow$ Law of one wage
- Wage equations in models with imperfect competition:
  - **Ex-ante wage posting** (Manning, 2011)
    $w = \frac{\epsilon}{1+\epsilon} p + \frac{1}{1+\epsilon} b$
  - **Ex-post wage bargaining** (Manning, 2011)
    $w = \alpha p + (1 - \alpha) b$
  - **Idiosyncratic workplace preferences** (Card et al., 2018)
    $w = \frac{\beta}{1+\beta} T_j f_j \mu_j + \frac{1}{1+\beta} b$
- Rationalizing rent sharing: bargaining power, elasticity of labour supply & firm size, asymmetric information & idiosyncratic preferences.

Empirical approach

- A simple wage model: $w_i = b_i + \gamma^* \frac{Q_j}{N_j} + \epsilon_{ij}$

w_i	wage of employee i working at firm j.	b_i	outside option of the employee.
VA_j	value added of firm j	N_j	number of workers in firm j
Q_j	quasi-rent of firm j: $Q_j = VA_j - rK_j - bN_j$	γ^*	rent-sharing elasticity.

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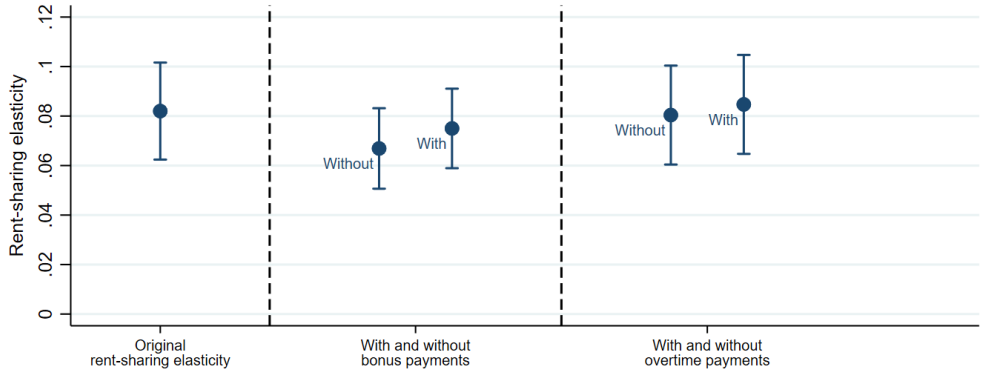
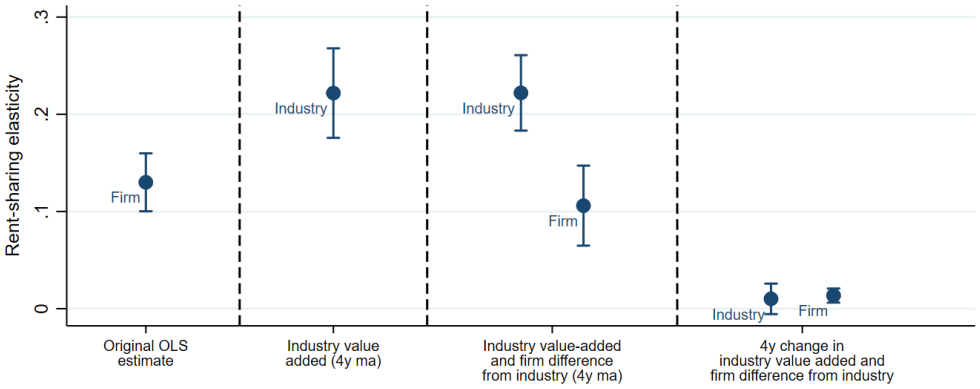
- Empirical counterpart: $ln\ w_{it} = X'_{it}\beta + \gamma\ ln\ \frac{VA_{jt}}{N_{jt}} + \epsilon_{ijt}$
- As $VA_j > Q_j$, $\gamma > \gamma^*$.

Overtime and bonus payments do not fully explain rent-sharing behaviour



Full compensation = Contract-based wage + Overtime payments + Bonuses.
Regression model controls for a quadratic in experience, gender, and level-of-education-year dummies. N = 8,454,083

Industry productivity drives gaps in wage levels, less changes in wages



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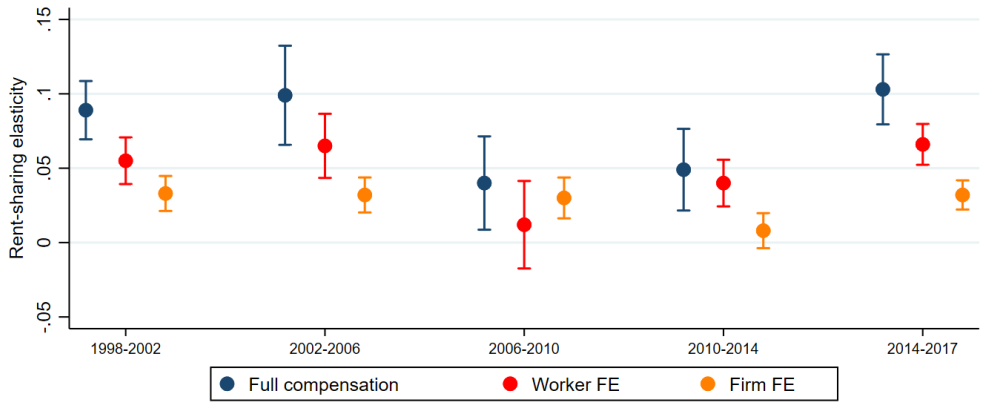
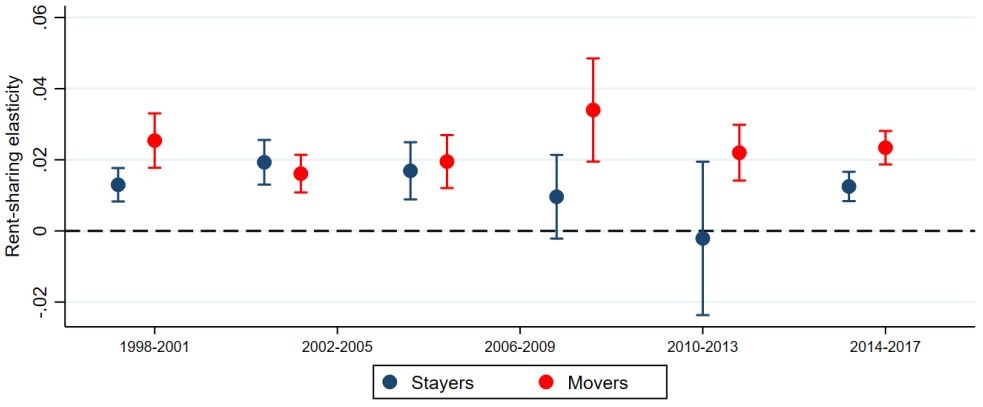
Estimates of rent-sharing elasticity using AKM fixed effects



Full compensation = Contract-based wage + Overtime payments + Bonuses.
Fixed effects are calculated using the AKM model controlling for a cubic in experience, gender, level-of-education-year dummies and 3-digit occupation. Rent-sharing models control for level-of-education-year dummies, quadratic in exprience and 2-digit industries. N = 9,137,090

Wages of firm-switchers more sensitive to productivity changes



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Estimating rent-sharing elasticity

Rent-sharing elasticity γ Indep.: log VA per worker (4y ma)		Basic model	Basic + 2-digit industry	Basic + 3-digit occupation
A.	**Cross-sectional model (levels)**			
1)	OLS: Contract-based wage	0.106	0.068	0.061
		(0.010)	(0.009)	(0.007)
2)	OLS: Full compensation	0.130	0.085	0.082
		(0.015)	(0.011)	(0.010)
B.	**Job-stayers model (changes)**			
1)	OLS: Contract-based wage	0.006	0.005	0.006
		(0.001)	(0.001)	(0.001)
2)	OLS: Full compensation	0.014	0.012	0.014
		(0.002)	(0.002)	(0.002)
3)	IV: Full compensation	0.098	0.073	
		(0.065)	(0.020)	

Wages in logarithms. Panel A controls for gender, both panels control for a quadratic in experience and education-year dummies. Standard errors clustered at firm level. Instrumental variable: 6-year change in log revenues per worker (t-4 to t+1). First-stage F-statistic for the IV model: xx,xx. Panel A: N = 8,655,006. Panel B: N = 3,919,844

Estimating rent-sharing elasticity with AKM fixed effects

Rent-sharing elasticity γ Indep.: log VA per worker (4y ma)	1998-2002	2002-2006	2006-2010	2010-2014	2014-2017
Log full compensation	0.089	0.099	0.040	0.049	0.103
	(0.010)	(0.017)	(0.016)	(0.014)	(0.012)
Log person effects	0.055	0.065	0.012	0.040	0.066
	(0.008)	(0.011)	(0.015)	(0.008)	(0.007)
Log firm effects	0.033	0.032	0.030	0.008	0.032
	(0.006)	(0.006)	(0.007)	(0.006)	(0.005)
Log covariates	0.002	0.001	0.001	0.000	0.001
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)

Figures in table are regression coefficients for the independent variable when row header is used as the dependent (LHS) variable. Fixed effects are calculated using the AKM model, controlling for age and fixed effects in level of education, 3-digit occupation, and year-dummies. The AKM model and rent-sharing estimates are calculated for each period independently. Rent-sharing estimation model controls for a quadratic in experience, education-year dummies and 2-digit industry-year dummies. Standard errors clustered at firm level. N = 9,137,090.

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