

Hidden in Plain Sight: Occupational Structure and the Gender Wage Gap

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Motivation

- **Firm-specific wage premia** are a central explanatory factor in earnings inequality (Abowd et al., 1999; Card et al., 2013; Song et al., 2018).
- They are an important channel through which the gender wage gap is sustained:
 - Within the same firm, women receive lower wage premia than men.
 - Women are disproportionately employed in lower-paying firms.
- Card et al. (2015) conceptualize these mechanisms as:
 - **Bargaining effect**: gender differences in wage premia within firms
 - **Sorting effect**: unequal allocation of men and women across firms

→ This paper: **Sorting**

Motivation (ctd.)

Do women sort into lower-paying firms?

- Firm premia are identified via the AKM framework (Abowd, Kramarz, and Margolis, 1999).
 - $\text{Wages} = \text{worker fixed effects (portable productivity)} + \text{firm fixed effects (wage premia)}$
 - Occupations are not the primary focus
 - But they matter: firm effects are identified via worker mobility, often linked to occupation changes
- We identify **occupational segregation as an important mechanism of gendered firm-sorting patterns**
 - Women cluster in low-paying, “female” occupations
 - Men dominate high-paying occupations
 - Helps explain why women are concentrated in lower-paying firms with high female shares [▶ literature](#)

Literature

The AKM framework has inspired extensive and influential research on wage setting.

- **Growing body has begun to incorporate occupation:**
 - Card et al. (2015) and Targa (2025) estimate gender-specific FE and find distinct patterns across occupational groups.
 - Boza (2021), Lhuillier (2025), and Torres et al. (2018) include occupation FE and Cardoso et al. (2016) job-title FE, but estimate FE on a pooled sample. They find that occ. differences account for substantial source of wage variation.
 - Handwerker (2023) show that employer occ. homogeneity is strongly related with rising wage inequality in the US.
- **We extend this work by:**
 - formalizing how omitted occupation effects are allocated between estimated worker and firm effects.
 - arguing for a gender-specific three-way fixed-effects specification.

AKM Framework

Wages decomposed into worker and firm components:

$$w = X\beta^G + D\alpha^G + F\psi^G + \varepsilon, \quad (1)$$

- $D\alpha$: worker fixed effects, capturing time-invariant worker heterogeneity
- $F\psi$: firm fixed effects, interpreted as **firm-specific wage premia**
- G : each term is defined on the gender-specific sample

Gender differences in firm premia can be split into:

$$\begin{aligned} \mathbb{E}[F_i\psi^M \mid \text{male}] - \mathbb{E}[F_i\psi^F \mid \text{female}] &= \underbrace{\mathbb{E}[F_i(\psi^M - \psi^F) \mid \text{male}]}_{\text{bargaining}} \\ &\quad + \underbrace{\mathbb{E}[F_i\psi^F \mid \text{male}] - \mathbb{E}[F_i\psi^F \mid \text{female}]}_{\text{sorting}} \end{aligned}$$

- Bargaining effect: the average difference in firm pay premia between women and men within firms.
- **Sorting effect**: differences arising from women and men working in firms with different average pay premia

Occupational Effects in Firm Fixed Effects

- Standard AKM models attribute wage differences to workers and firms.
- But occupations also carry systematic wage premia.
- If occupational assignment co-moves with firm assignment, omitted occupation premia can be absorbed into estimated firm (and person) effects.

Include gender-specific occupation wage premia, $O\gamma^G$:

$$w = X\beta^G + D\alpha^G + F\psi^G + O\gamma^G + \varepsilon.$$

If occupations are omitted, the estimated firm FE also includes an employment-duration weighted average of the occupation effect:

$$\hat{\psi}^G = \psi^G + (F'F)^{-1}F'O\gamma^G.$$

Simulation Setup

- Workers: $N = 10,000$ (50% female), Firms: $J = 200$, $T = 7$
- Worker fixed effects: $\alpha_i \sim \mathcal{N}(0, 0.2)$
- **No firm fixed effects:** $\psi_j = 0$
- Two occupations: low-pay ($o = 0$) and high-pay ($o = 1$)
 - Firms differ in their high-pay share: $z_j \sim \mathcal{U}(0, 1)$
 - **Gender segregation** parameter $s \in \{0, 1\}$: difference in women's and men's shares in low-pay jobs
- **Mobility:** each year 10% of workers switch firms; movers keep occupation with probability κ
- Wage setting rule:

$$w_{it} = 100 \cdot \gamma^{o_{i(t)}} \exp(\alpha_i + \varepsilon_{it}), \quad \gamma = 1.5, \quad \varepsilon_{it} \sim \mathcal{N}(0, 0.1)$$

- AKM: $\ln w_{it} = \hat{\alpha}_i + \hat{\psi}_{j(i,t)}$

Firm Fixed Effects are positively associated with High-Pay Share and negatively with the Female Share

	(i)	(ii)	(iii)	(iv)
	without occupation controls			with occupation
Intercept	-0.132*** (0.000)	0.291*** (0.000)	0.141*** (0.023)	-0.000 (0.006)
High-pay share	0.252*** (0.000)		0.090*** (0.014)	0.000 (0.004)
Female share		-0.582*** (0.001)	-0.375*** (0.032)	0.000 (0.008)

Note: Estimates are from regressing the deviation ($(\hat{\psi}_j) = E[\psi_j] - \psi_j$) in firm fixed effects on High-Pay Share and Female Share of the firm. Estimates are based on averages from 1,000 Monte Carlo replications. Standard errors in parentheses. All regressions use weighted least squares (WLS). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Decomposition of Firm Contribution to the Simulated Gender Wage Gap

Specification	Raw gap	Sorting	Bargaining	Firm effect	% of gap
Overstated FE	0.1462	0.0348	0.0003	0.0351	24.0%
Pure FE	0.1462	0.0000	0.0000	0.0000	0.0%

Notes: "Overstated FE" refers to AKM estimation without occupation controls.
"Pure FE" includes occupation controls.

- s determines size of raw GWG [▶ details](#)
 - Larger s (more segregation), larger raw GWG
- κ governs whether the occupation effect is absorbed more into the worker FE or firm FE. [▶ details](#)
 - Larger κ (more occu mobility), more in firm FE

Data

- Universe of firms and employees in DK with detailed (hourly) wage records and rich covariates
- Worker information: age, gender, education, tenure, sector, occupation
- Firm information: workforce size, industry (3-digit DB/NACE), occupation (DISCO, 1–4 digit)
- Sample: workers aged 25–60 in firms with at least 10 employees – outliers trimmed at the bottom and top 1
- Final dataset: more than 12 million worker-year observations (2.2 million workers, 84,000 firms)

▸ occu mobility (κ)▸ segregation (s)

Decomposition of the Gender Wage Gap: with female firm fixed effects as reference

Specification	DISCO	Raw GWG	Sorting	Bargain- ing	Firm	Firm/ GWG	Sort/ GWG
Panel: 2013–2018							
W/o occu	–	0.1402	0.0116	0.0009	0.0125	8.9%	8.3%
W/ occu	1-digit	0.1402	0.0109	0.0010	0.0119	8.5%	7.8%
W/ occu	2-digit	0.1402	0.0092	–0.0028	0.0065	4.6%	6.6%
W/ occu	3-digit	0.1402	0.0091	–0.0005	0.0086	6.1%	6.5%
W/ occu	4-digit	0.1402	0.0082	0.0015	0.0096	6.9%	5.8%

► density

► destination

► assumptions

► occup. sorting

- The sorting component of the raw GWG declines steadily with more detailed occupational effects.
- On the 4-digit level, the sorting effect declines by around 30%.

Industry Pay Premia

- Men and women are segregated across industries as well as occupations
- We measure industry wage premia as employment-weighted averages of firm fixed effects

Industry wage premia:

$$\Sigma_s^F = \frac{\sum_{j \in s} n_j \psi_j^F}{\sum_{j \in s} n_j}$$

Decomposition of sorting:

$$\underbrace{E[F_i \psi^F | m] - E[F_i \psi^F | f]}_{\text{sorting (between-firm gap)}} = \underbrace{E[S_i \Sigma^F | m] - E[S_i \Sigma^F | f]}_{\text{between-industry}} + \underbrace{E[F_i \psi^F - S_i \Sigma^F | m] - E[F_i \psi^F - S_i \Sigma^F | f]}_{\text{within-industry}},$$

where S maps firms to industries.

Between- and Within-Industry Sorting

Specification	DISCO	Raw GWG	Sorting	Between ind.	Within ind.	Share btw.	Share within
Panel: 2013–2018							
w/o occu	-	0.1402	0.0116	0.0105	0.0011	90.3%	9.7%
w/ occu	1-digit	0.1402	0.0109	0.0099	0.0010	90.6%	9.4%
w/ occu	2-digit	0.1402	0.0092	0.0083	0.0010	89.6%	10.4%
w/ occu	3-digit	0.1402	0.0091	0.0081	0.0009	89.5%	10.5%
w/ occu	4-digit	0.1402	0.0082	0.0072	0.0010	87.8%	12.2%

► destination ► occu ind distr

Roughly 90% of the sorting component is accounted for by between-industry sorting.

Conclusion

- Occupational sorting is a key mechanism behind women's concentration in lower-paying firms
 - In the AKM framework, firm fixed effects partly absorb occupation effects; this overstates gendered firm sorting
 - Danish register data show that 20–30% of estimated firm sorting is in fact due to occupational sorting
 - About 90% of sorting is explained by between-industry differences, reflecting women's concentration in lower-paying sectors
 - Overall: **much of what appears as gendered firm sorting reflects occupational and industry segregation** rather than firm-specific wage setting
- Three-way fixed-effects specification in which both firm and occupation effects are estimated separately by gender.

Thank you

Questions, comments, and suggestions are welcome

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Working Paper:



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References IV

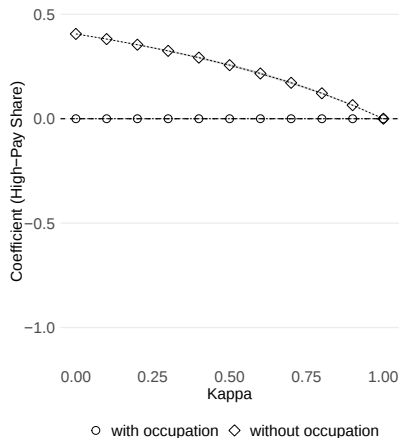
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Why do women sort into lower-paying firms?

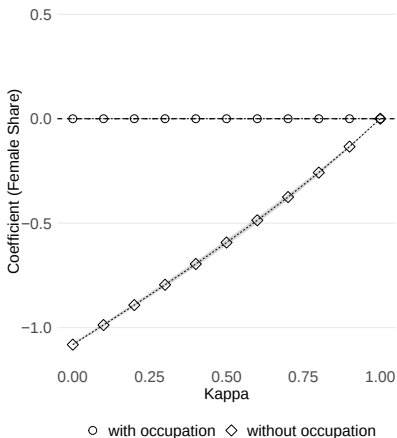
- **Workplace Culture:** Gender segregation linked to harassment risks in male-dominated high-paying firms (Folke and Rickne, 2022).
- **Mobility Differences:** Women less likely to switch to high-paying firms (Casarico and Lattanzio, 2024).
- **Childbirth Effects:** Sorting intensifies after childbirth; preference for family-friendly and flexible firms with lower firm fixed effects (Casarico and Lattanzio, 2023; Coudin et al., 2018).
- **Union Coverage:** Lower coverage provides greater scope for firm-level discretion in wage setting, thereby reinforcing heterogeneity in wage premia.(Bruns, 2019).

Simulation Results: Varying Mobility Parameter κ

$\hat{\psi}_j \sim$ high-pay share and female share of firm j . Avgs. shown.

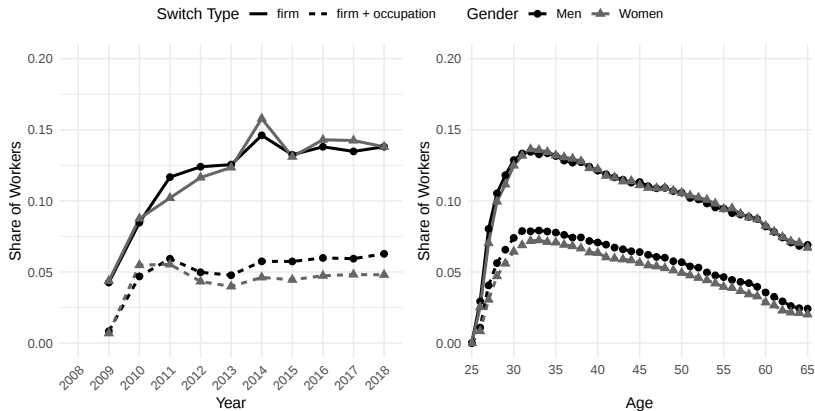


(a) Correlation with high-pay share



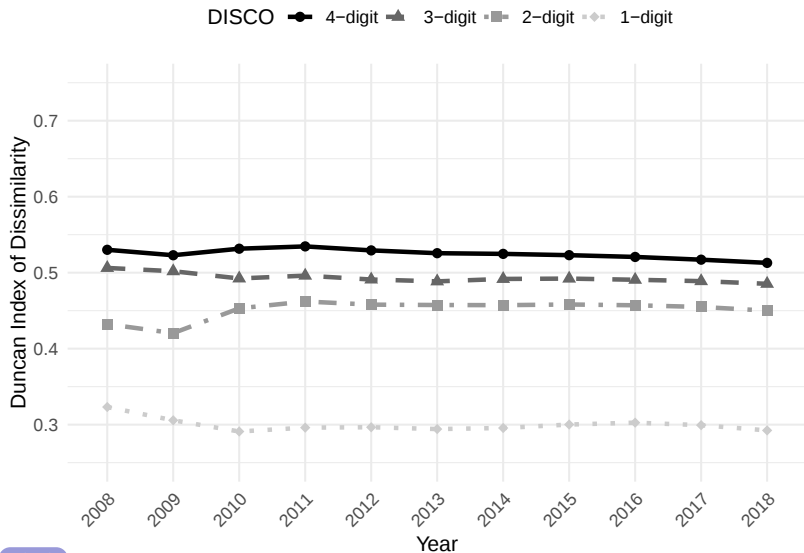
(b) Correlation with female share

Worker Mobility over Time and by Age

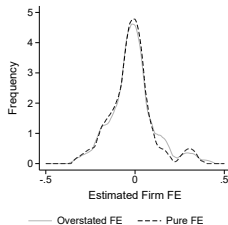
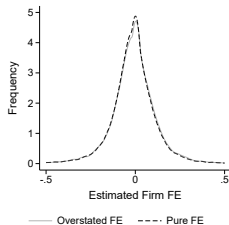


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Duncan Index of Segregation over Time

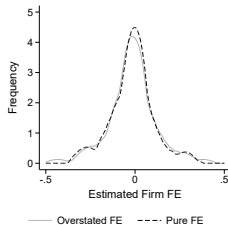
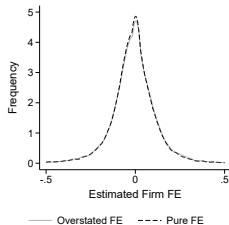


Kernel Densities of Firm Fixed Effects (2013–2018)



Men, 2-digit DISCO

Women, 2-digit DISCO

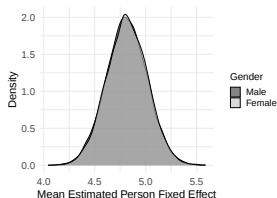


Men, 4-digit DISCO

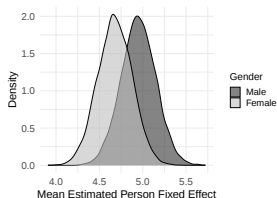
Women, 4-digit DISCO

Occupational Segregation and Firm Effects

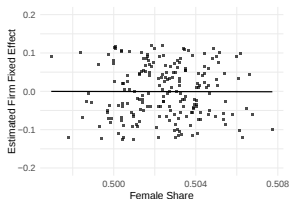
No occupational segregation



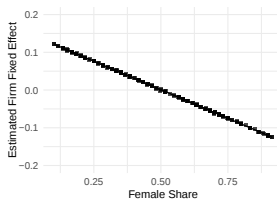
Full occupational segregation



No occupational segregation

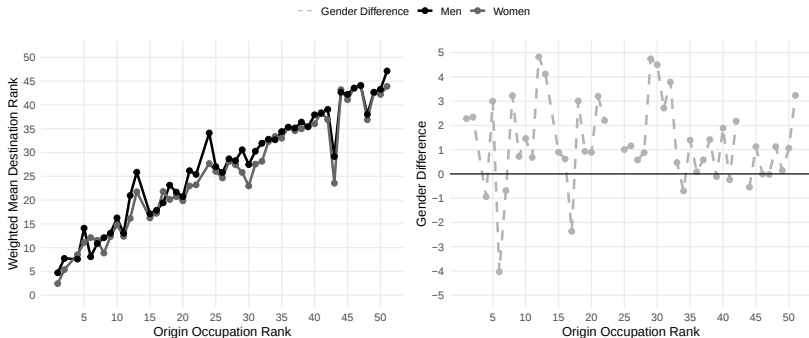


Full occupational segregation

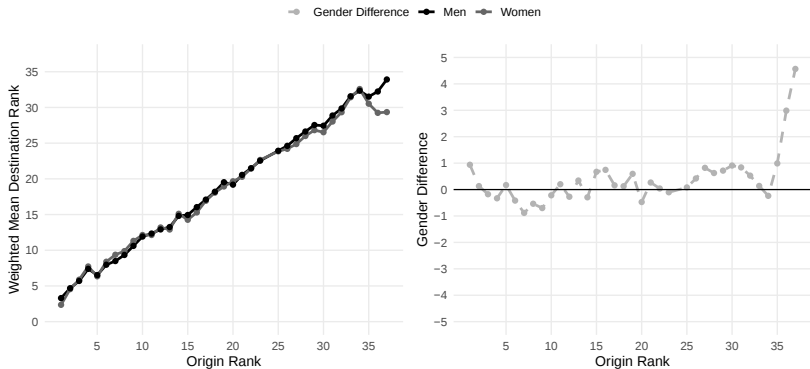


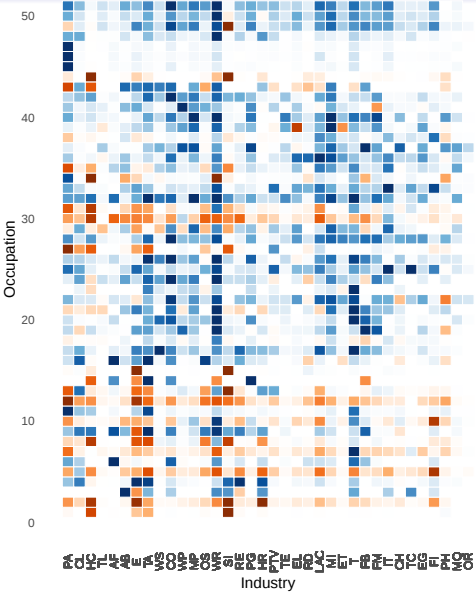
Top: distribution of mean estimated worker fixed effects by gender. Bottom: estimated firm fixed effects vs. female share of the firm. κ fixed to 0.5. [▶ back](#)

Average destination rank by origin occupation rank

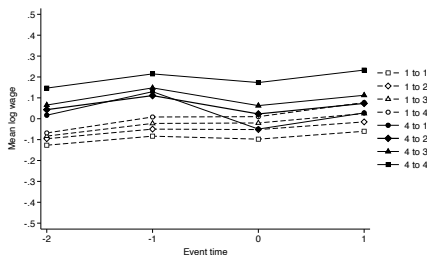
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Average destination rank by origin industry rank

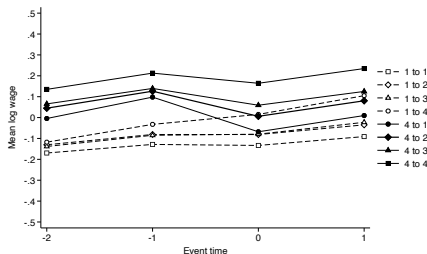
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Residualized mean log wages around firm switches



- Women: $1 \rightarrow 4$ is associated with +7.8 log points; $4 \rightarrow 1$ with -7.5 log points.



- Men: $1 \rightarrow 4$ is associated with +14.4 log points; $4 \rightarrow 1$ with -8.5 log points.

Between- and Within-Occupation Sorting

$$\begin{aligned} \mathbb{E} \left[\gamma_{o(i)}^M \mid \text{male} \right] - \mathbb{E} \left[\gamma_{o(i)}^F \mid \text{female} \right] &= \underbrace{\mathbb{E} \left[\gamma_{o(i)}^M - \gamma_{o(i)}^F \mid \text{male} \right]}_{\text{within occupation}} \\ &+ \underbrace{\mathbb{E} \left[\gamma_{o(i)}^F \mid \text{male} \right] - \mathbb{E} \left[\gamma_{o(i)}^F \mid \text{female} \right]}_{\text{between occupation}}. \end{aligned}$$

Specification	DISCO	Raw GWG	Segreg.	Within	Total Occ.	%of gap	Seg. /Occ.	Seg. /GWG
Panel B: 2013–2018								
Pure FE	1-digit	0.1402	0.0047	0.0004	0.0052	3.7%	91.3%	3.4%
Pure FE	2-digit	0.1402	0.0077	0.0014	0.0091	6.5%	84.4%	5.5%
Pure FE	3-digit	0.1402	0.0107	0.0016	0.0123	8.8%	87.3%	7.7%
Pure FE	4-digit	0.1402	0.0128	0.0019	0.0147	10.5%	87.2%	9.2%

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