The Impact of Multinationals Along the Job Ladder

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July 2023

[1]The views expressed here are those of the authors and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.

Introduction

- Multinational affiliates are more productive than domestic firms
- Governments often provide incentives to attract them
- How do they impact a host country through the labor market?

Our view of the labor market:

Multinationals affect labor market in two ways:

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- But workers are mobile: outside options along job ladder
- Can climb job ladder both inside and outside current firm

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Multinationals affect labor market in two ways:

1. Direct effect on workers employed at multinationals
2. Indirect effect on outside options of workers at local firms
   - Low productivity firms: workers more likely to leave
   - High productivity firms: better outside options bid up wages

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   - Low productivity firms: workers more likely to leave
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- Overall workers gain, local firms lose
- Impact heterogeneous across workers and local firms

What we do & what we find

1. Matched employer-employee data for Norway
   - Confirm existence of a job ladder
   - (New) Multinationals high up on this job ladder

2. GE job ladder model of labor market with multinationals
   - Helpman-Melitz-Yeaple (2004) meets Cahuc-Postel-Vinay-Robin (2006) + DMP

3. Calibration: match firm size dist (MN and non-MN), wage dist, labor share, unemployment, labor market transitions

4. Counterfactual: infinite entry cost for multinationals
   - Multinational presence on avg helps workers, hurts local firms
   - But heterogeneous effects across workers, local firms
   - Multinational presence increases wage inequality, unemployment

▸ Literature

Data

Data

- Matched employer-employee data for Norway 1996-2007

1. For each individual, annual earnings (all sources) & establishment identifier for main employer each November
2. Ownership of establishments (MN vs domestic)

- Focus on private sector establishments & linked individuals

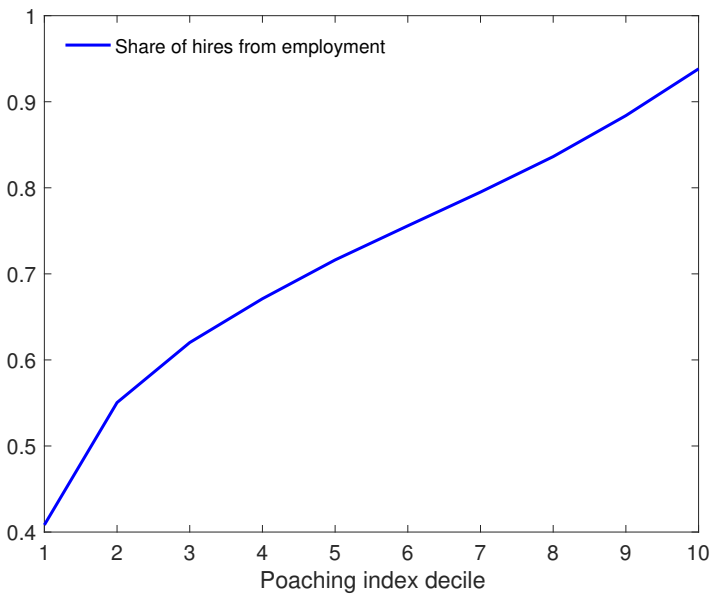
Summary statistics

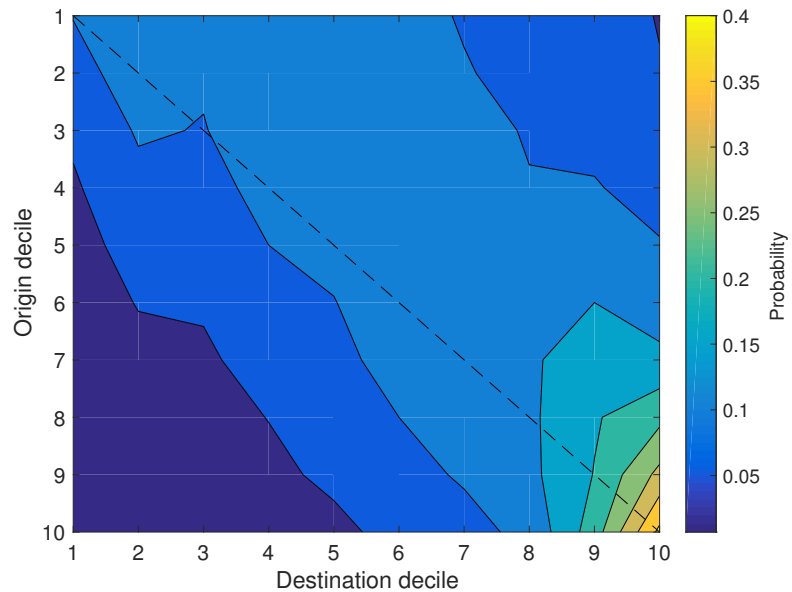
	All	Domestic	MN	MN share
Worker-years	12,001,918	9,815,230	2,186,688	0.18
Establishment-years	1,166,928	1,091,231	75,687	0.06
Avg establishment size	10.29	8.99	28.89	

▸ Industries ▸ Occupations

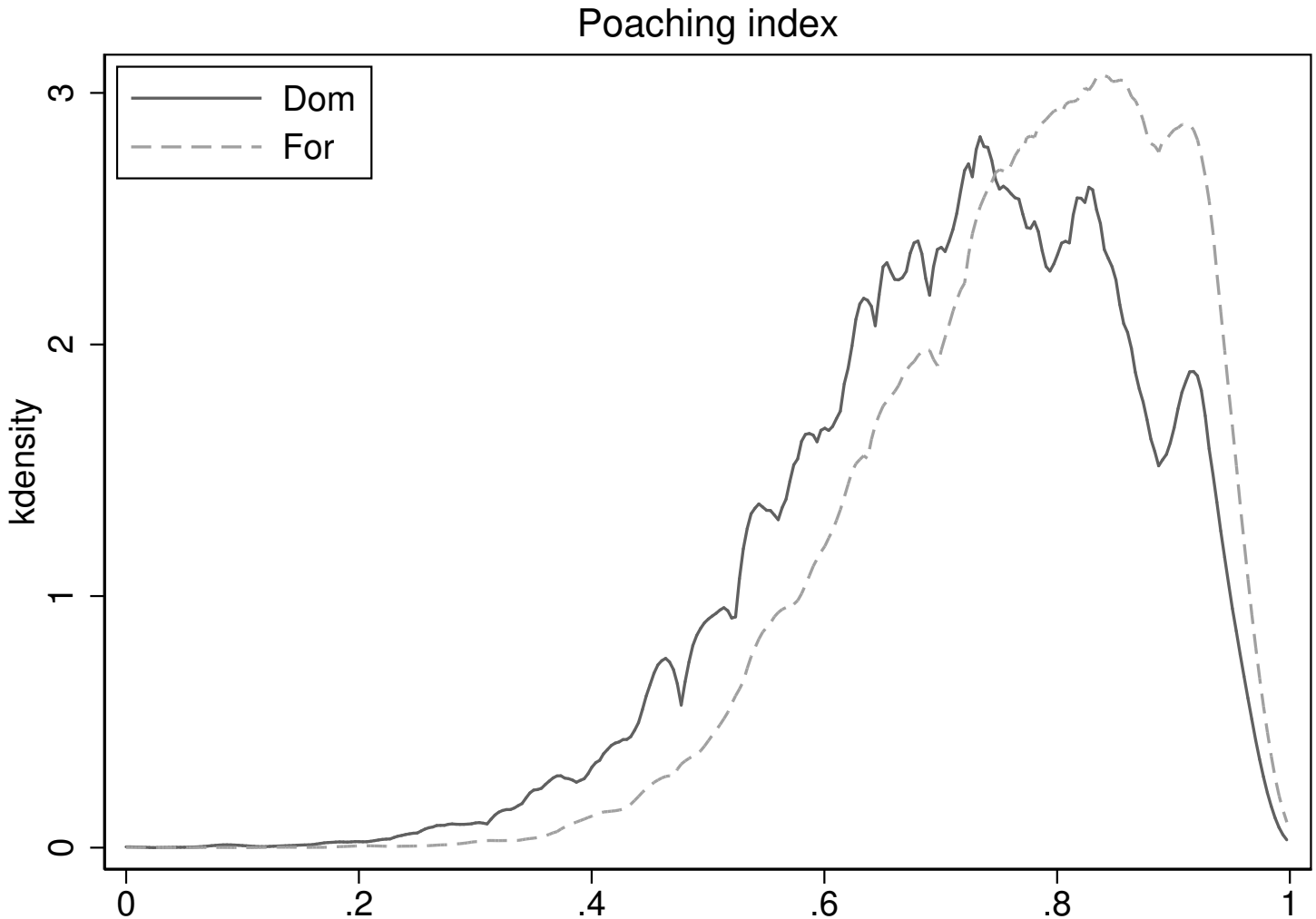
Job-to-job transitions are not random: job ladder

- Use November cross-sections to code transitions: EE, NE, EN
- Rank establishments by sample share of hires from employment: poaching index
  - Revealed preference, consistent with model





Multinationals are high up on the job ladder



▸ Firms

Model

Model overview

- Discrete time
- Homogeneous workers, firms with hetereogeneous productivity
- Convex vacancy cost pins down firm size
- On-the-job and off-the-job search, random matching
- Wages determined by bargaining
- Look for stationary equilibrium

How do multinational affiliates differ from domestic firms?

1. Different entry cost, draw from different productivity dist
2. Entry cost paid by foreigners, profit rebated to foreigners

Model assumptions 1/4: Workers

- Continuum of infinitely-lived workers on $[0, 1]$
- Linear utility, discount future at rate β

- Flow utility in unemployment is b
- Flow income for employed is endogenous wage w

- Match with employer breaks with probability δ each period
  - Pass through one period of unemployment before searching
- Unemployed search for jobs with probability 1
- Employed search with probability $s \leq 1$

Model assumptions 2/4: Firms

- Firm is a draw of productivity p from cdf $\tilde{\Gamma}^i(p)$, $i \in \{D, F\}$
- Output per worker employed by firm of type p is p
- Firms discount future at rate β, die at rate δ_f
- Surviving firms lose workers exogenously at rate δ_m

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- Each firm pays $c(v)$ to post $v \in \mathbb{R}$ vacancies with

$$c(0) = 0, c'(v) > 0, c''(v) > 0$$

- Choose: optimal $v(p)$ given wage setting protocol

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$$c(0) = 0, c'(v) > 0, c''(v) > 0$$

- Choose: optimal $v(p)$ given wage setting protocol
- Free entry condition:

$$C^i = \int_b^{\underline{p}} 0 d\tilde{\Gamma}^i(p) + \int_{\underline{p}}^{\bar{p}} \frac{B(p)}{1-(1-\delta_f)\beta} d\tilde{\Gamma}^i(p)$$

  - $B(p)$ value to entrant of draw p
  - $\underline{p} > 0$: endogenous cutoff below which firm attracts no workers
- $\rightarrow$ Prod dist of active firms: $\Gamma(p)$, mass of firms M

Model assumptions 3/4: Matching

- Total measure of vacancies is V:

$$V = M \int_{\underline{p}}^{\bar{p}} v(p)\, d\Gamma(p)$$

- Total measure of searching workers is S:

$$S = u + s(1-\delta)(1-u)$$

  - u: unemployment rate & number of unemployed
- CRS matching function $\mu(S,V)$
  - Probability unemployed worker meets vacancy: λ
  - Prob vacancy meets worker: χ

$$\lambda = \frac{\mu(S,V)}{S},\ \chi = \frac{\mu(S,V)}{V}$$

Model assumptions 4/4: Bargaining & wages

- Follow Cahuc-Postel-Vinay-Robin (2006)
- When worker and firm match, they split match value
  - i.e. appropriately discounted flow of p
- Worker gets value of outside option + share ϕ of match surplus (i.e. value of match less value of outside option)
- Implemented by constant wage until outside option increases
- Outside option depends on origin / best on-the-job meeting
- If outside option is better than current match, worker moves

▸ Bellman

Model results 1/2: Wages

- Wage for worker at firm p with outside option $q \leq p$ is

$$w(q,p) = \phi p + (1-\phi) q - \underbrace{\int_q^p \frac{(1-\phi)^2 \beta (1-\delta) \lambda s (1-F(x))}{1-\beta(1-\delta)(1-\phi\lambda s(1-F(x)))} dx}_{\text{discount due to value of moving up ladder in firm } p}$$

- $F(x)$: cdf of job offer distribution (endogenous)

$$dF(x) = \frac{v(x)\, d\Gamma(x)}{\int_{\underline{p}}^{\bar{p}} v(y)\, d\Gamma(y)}$$

- Note: $w(q,p)$ need not be monotonic in p

- Multinational presence affects joint distribution of $\{p,q\}$
- Multinational presence affects $F(x)$, λ, and therefore wages conditional on $\{p,q\}$

Aside: Ranking firms

- Average wage at the firm level need *not* be monotonic in p
  - Due to value of option to move up
- But share of hires from employment *is* increasing in p:

$$poach(p) = \frac{(1-u)(1-\delta)s\int_{\underline{p}}^{p} dL(x)}{u+(1-u)(1-\delta)s\int_{\underline{p}}^{p} dL(x)}$$

- Intuition: All firms hire all the unemployed workers they meet, but higher p firms hire more employed workers

Model results 2/2: Vacancy posting

- Value to firm with productivity p of posting v vacancies:

$$B(p,v) = v\chi\left[\begin{array}{c}\frac{u}{S}J\left(\underline{p},p\right)+\\ \\ \frac{(1-u)(1-\delta)s}{S}\int_{\underline{p}}^{p}J(x,p)\,dL(x)\end{array}\right]-c(v)$$

  where
  - $J(x,p)$: value to firm p of worker w/ outside option $x \leq p$
  - $dL(x)$: pdf of dist of workers by their firm's productivity
- foc implicitly defines $v(p)$, optimal vacancy posting
- Note: current employment does not enter $B(p) = B(p, v(p))$

- Multinational presence affects incentives to post vacancies through impact on $J(x,p)$, and vacancy yield
- Multinational presence therefore affects size conditional on p

Calibration

Calibration

- Functional forms:

$$\mu(S, V) = A S^{\theta} V^{1-\theta}$$

$$c(v) = \frac{v^{1+\frac{1}{\alpha}}}{1+\frac{1}{\alpha}}$$

$$\tilde{\Gamma}^{D} \sim BddPareto\left(b, \sigma^{D}, \bar{p}\right) \text{ and } \tilde{\Gamma}^{F} \sim BddPareto\left(\tau, \sigma^{F}, \bar{p}\right)$$

  $\bar{p}$: bounded above at 99th pctile of more dispersed dist.

- Production function: Cobb-Douglas in capital, labor with capital share κ, all firms face same rental price of capital
- Solve for mass of active firms M, share ω of foreign firms in potential entrants
- $\rightarrow$ recover C^{D}, C^{F}

Parameters and targets

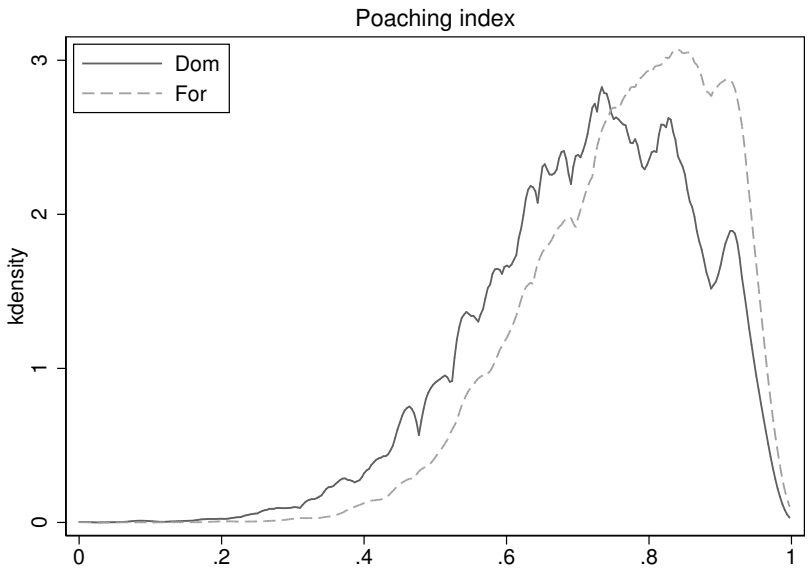
- Preset: $\beta = 0.95^{1/4}$, $\kappa = 1/3$, $b = 1$ (normalize), $\theta = 0.5$ (literature), $\delta = 0.038$ (Eurostat), $\delta_f = 0.01$ (Balsvik & Haller)

Parameters and Targets

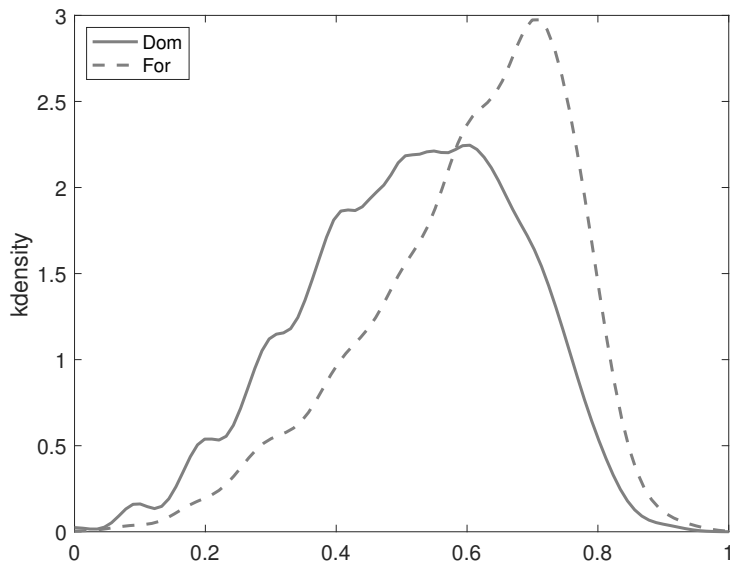
Target description	Data	Model		Value
Outside data				
EE quarterly transition rate (Eurostat)	0.03	0.03	s	0.54
Labor share (Statistics Norway)	0.60	0.60	ϕ	0.84
Nonemp rate 25-54 (Statistics Norway)	0.155	0.155	A	0.43
Our data				
Std dev ln estab. employment	1.13	1.12	α	0.22
Average establishment size	10.29	10.29	M	0.08
Share active estabs that are domestic	0.94	0.94	ω	0.005
Std dev ln estab. wage	0.63	0.63	σ_D	1.57
Std dev ln estab. employment, MN	1.32	1.33	σ_F	0.72
Diff in ln av size betw dom & MN estabs	0.96	0.96	$\tau/\bar{p}$	0.02

Nontargeted moment: poaching index distribution

- Simulate quarterly model for 10 years with 1 million workers, calculate poaching index as in data



Data



Model

▸ Size ▸ Wage

Counterfactual

Counterfactual: No multinationals

- Let $C^F \to \infty$, hold C^D fixed ▸ Productivity
- Solve for counterfactual measure of firms, active firm productivity dist s.t. domestic free entry condition holds

Impact of multinationals on output, components

	Level		Sh. of output	
	MN	No MN	MN	No MN
Output	1	0.86		
Payments to labor	1	0.87	0.60	0.60
Domestic firm profit	1	1.13	0.04	0.05
Foreign firm profit	1	0.00	0.01	0.00
Hiring cost	1	0.84	0.01	0.01
Payments to capital	1	0.86	0.33*	0.33*
Labor + domestic profit	1	0.89	0.64	0.65
Labor + dom profit - dom entry cost	1	0.88	0.62	0.63

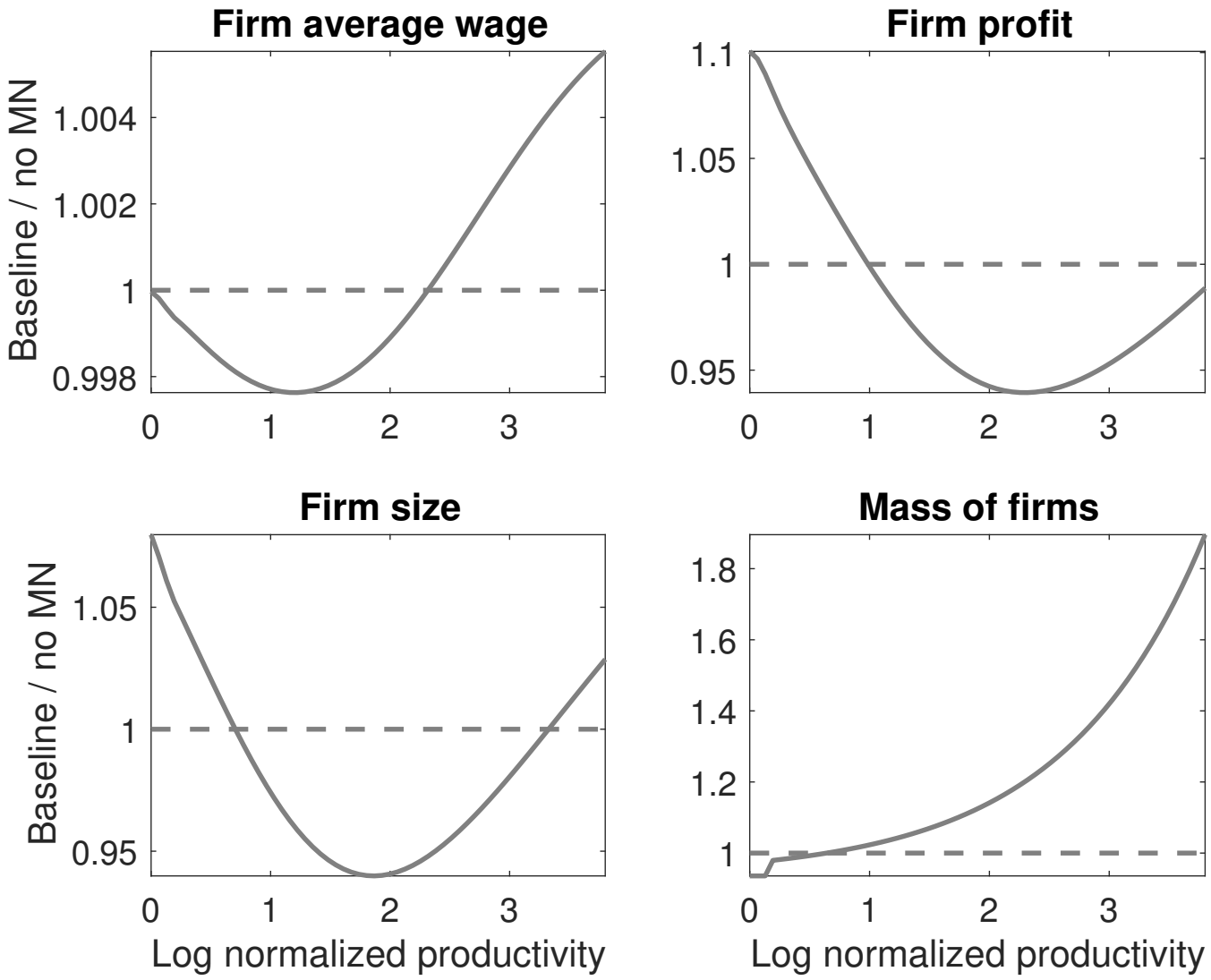
* By assumption

Impact of multinationals on workers & local firms

	Baseline	No MN
	Workers	
Payments to labor	1	0.87
Avg worker-level wage	1	0.86
Employment	1	1.004
Wage Gini	0.51	0.49
	Firms	
Measure of firms	1	1.09
Measure of local firms	1	1.16
Avg firm size	10.29	9.49
Avg local firm size	9.29	9.49

- Overall, multinationals benefit workers, hurt local firms
- But heterogeneous effects (next slide)
- Also wage inequality, unemployment increase ▸ WageDist

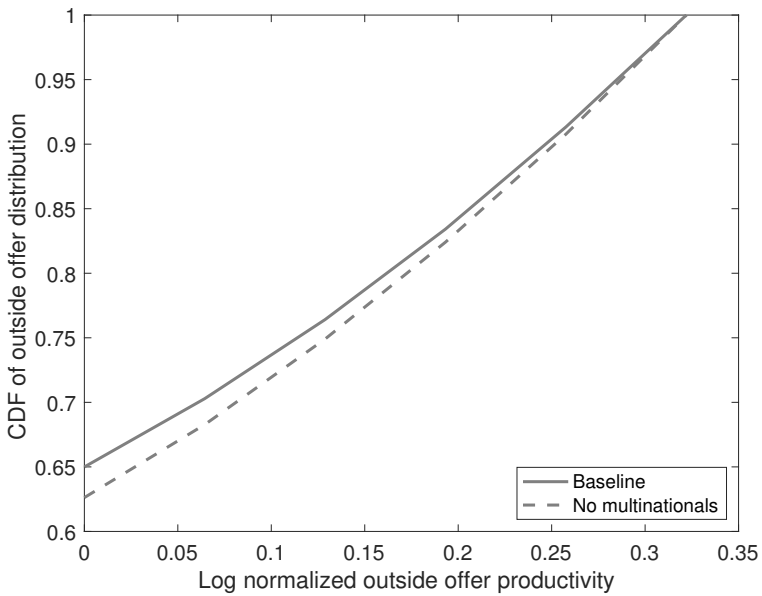
Heterogeneous effects across firm productivity distribution



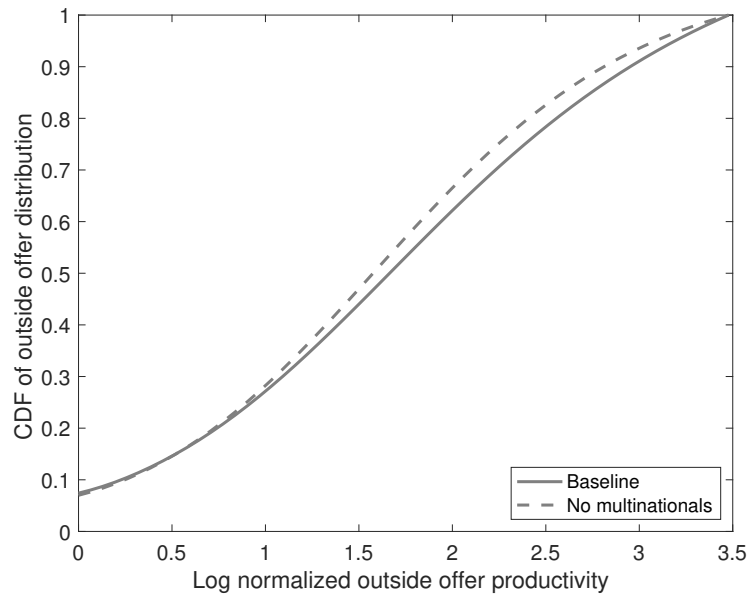
Intuition: shift in outside option distribution

- Wage for worker at firm p with outside option $q \leq p$ is

$$w(q,p) = \phi p + (1-\phi) q - \underbrace{\int_q^p \frac{(1-\phi)^2 \beta (1-\delta) \lambda s (1-F(x))}{1-\beta(1-\delta)(1-\phi\lambda s(1-F(x)))} dx}_{\text{discount due to value of moving up ladder in firm } p}$$



Low productivity firm



High productivity firm

▸ EmpDist

Relation to reduced form evidence

Alfaro-Ureña, Manelici & Vasquez (2021)

- Positive impact of (instrumented) multinational presence in local labor market on wages of employees of domestic firms
- Insufficient college workers to distinguish effects for high and low skill groups

Setzler & Tintelnot (2021)

- Positive impact of (instrumented) multinational presence in local labor market on wages of employees of domestic firms
- Increase bigger for high-paid workers (don't see education)
- Employment at domestic firms increases

We find:

- Heterogeneous effects across workers & local firms

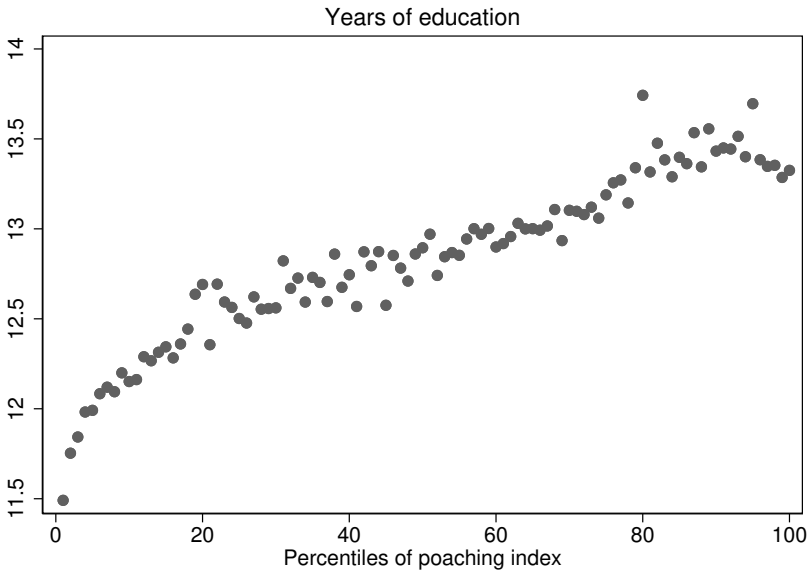
Conclusion

- Labor market is characterized by a job ladder, with multinationals at the top
- Multinational presence increases productivity and labor market competition: on average helps workers, hurts local firms
- But impact is heterogeneous:
  - Low productivity local firms lose workers, shrink, may pay lower wages due to fewer outside options low down on the job ladder
  - High productivity local firms pay higher wages due to more outside options high up on the job ladder
- Wage inequality rises

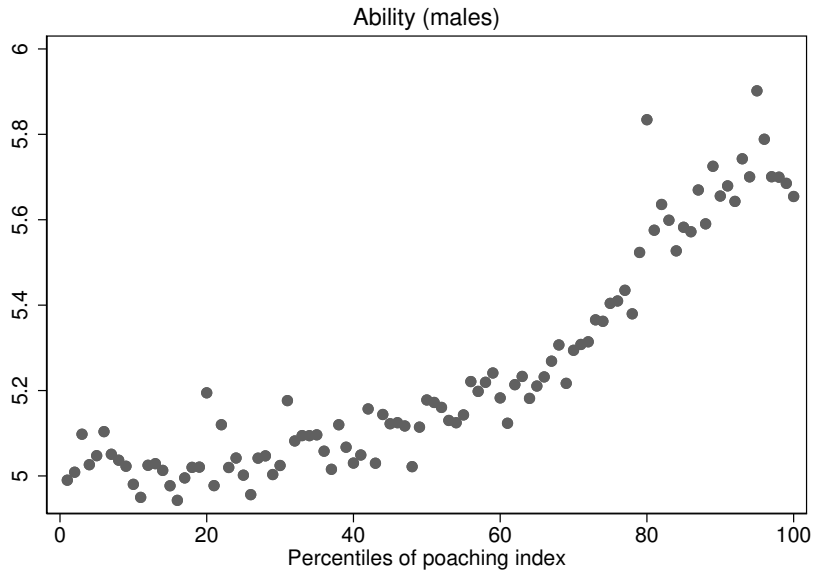
Extensions

- Worker heterogeneity and sorting: between-group inequality

Worker heterogeneity and sorting



Education & estab. rank



Ability & estab. rank

Model extension: Worker heterogeneity and sorting

- Three (observable) labor types, $h \in \{1, 2, 3\}$
- Firms can post vacancies in each skill market
- Random matching within each skill market
- Marginal product of skill type h at firm p is

$$y = \eta_h p^{\nu_h}$$

with

$$1 = \eta_1 \leq \eta_2 \leq \eta_3$$

and

$$1 = \nu_1 \leq \nu_2 \leq \nu_3$$

- $\nu_h > 1 \rightarrow$ sorting

- Identification of $\{\eta_h, \nu_h\}$: skill premium & skill group share of employment along job ladder

Related literature

Applications of general equilibrium job ladder models with firms

- Bagger & Lentz (2019), Engbom & Moser (2021), Gouin-Bonenfant (2022)

Impact of multinationals through the labor market

- Alfaro-Ureña et al (2021), Setzler & Tintelnot (2021)

Empirical literature on job ladders

- Haltiwanger, Hyatt, Kahn & McEntarfer (2018), Moscarini & Postel-Vinay (2018)

Search and matching models of distributional impact of trade

- Helpman, Itskhoki, Redding (2010), Cosar, Guner and Tybout (2016), Helpman, Itskhoki, Muendler & Redding (2017), Fajgelbaum (2020)

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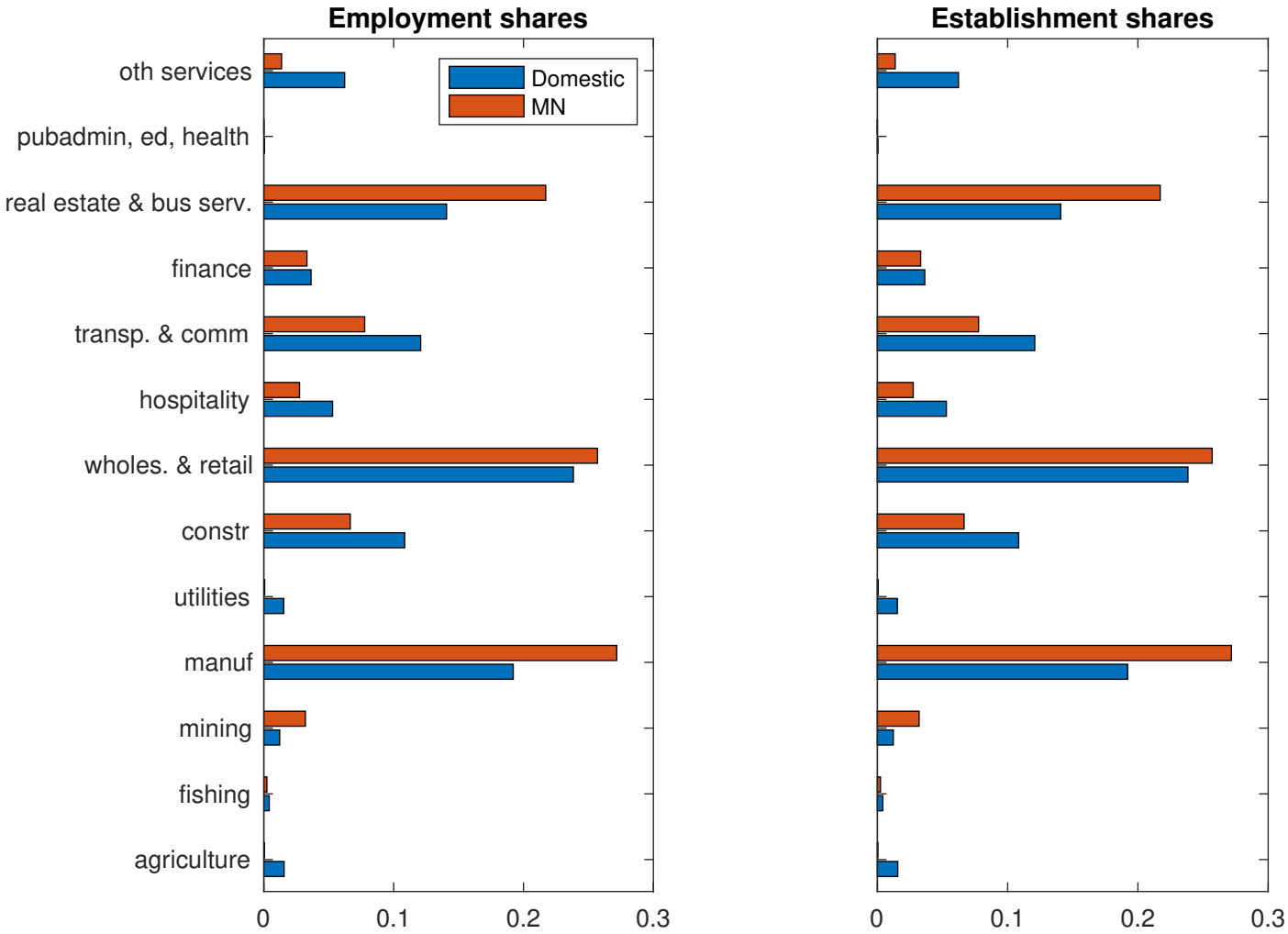
Industries: Domestic vs MN



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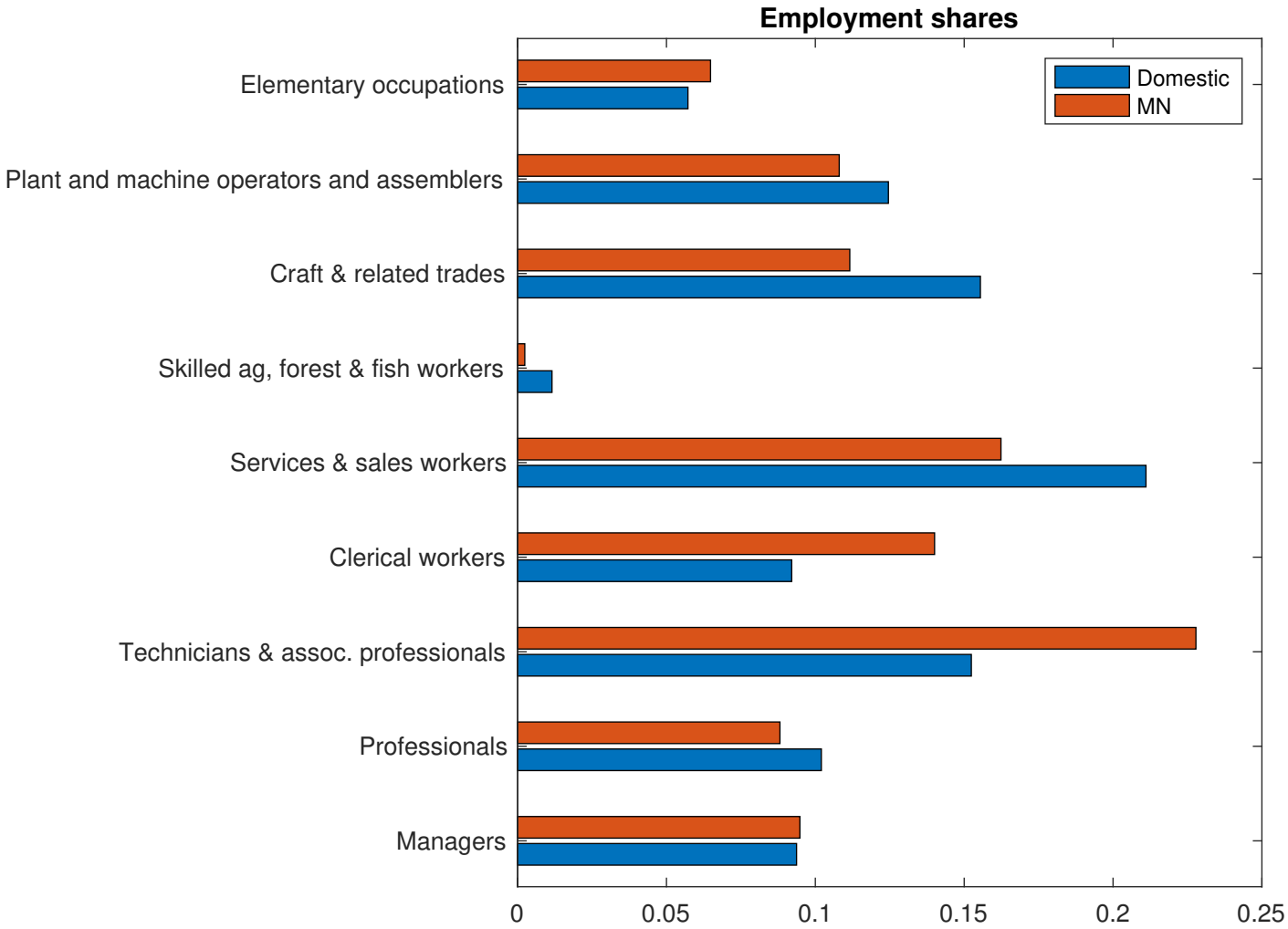
Occupations: Domestic vs MN



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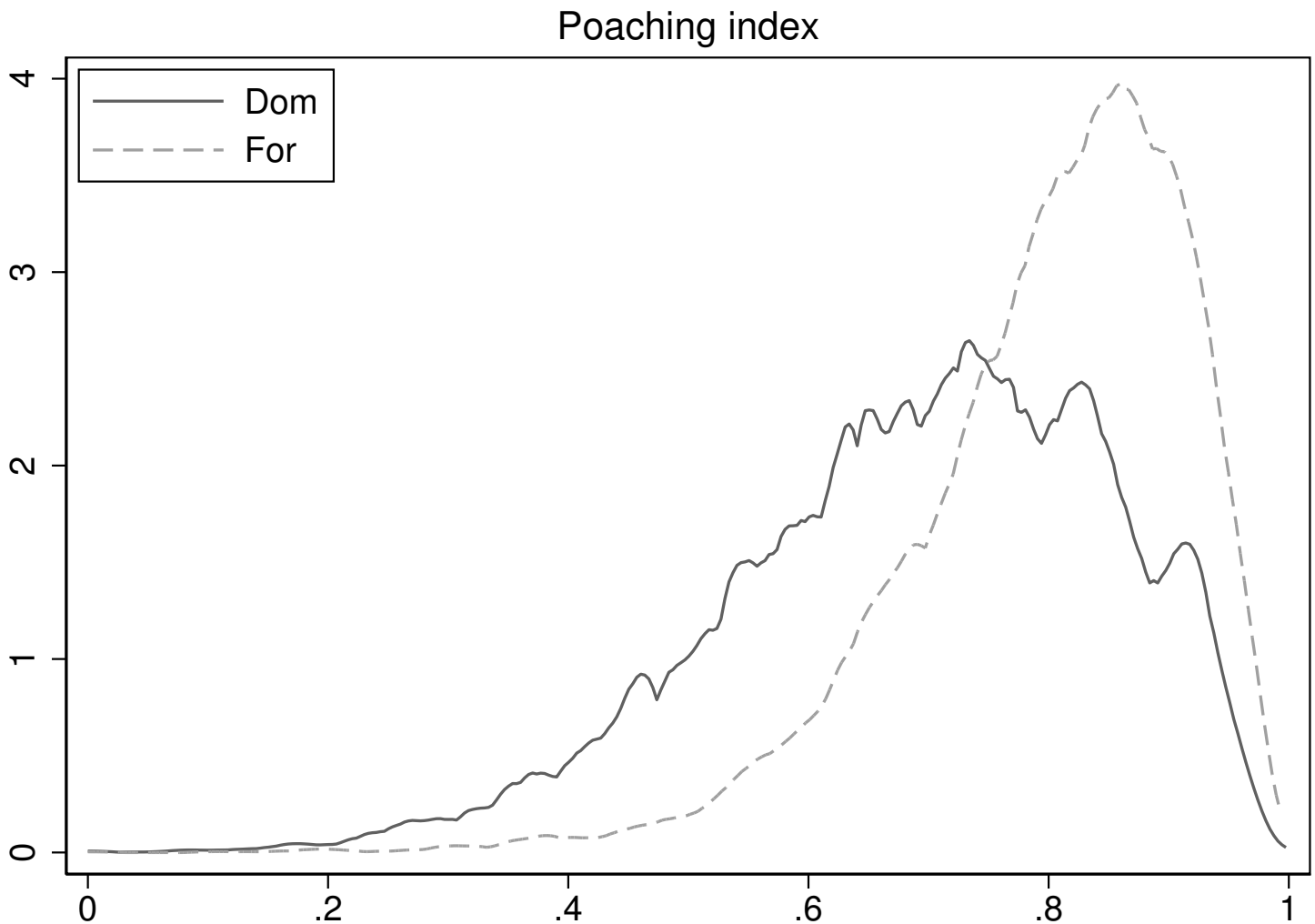
Poaching index distribution by ownership: firms



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Model assumptions: Bargaining & wages

- Worker at firm p with outside option q gets $w(q,p)$ s.t.

$$W(q,p) = \underbrace{W(q,q)}_{\text{outside option}} + \phi\underbrace{(W(p,p) - W(q,q))}_{\text{match surplus}}$$

where

$$W(q,p) = w(q,p) + \beta \left[\begin{array}{l} \underbrace{\delta U}_{\text{unemp}} + \underbrace{(1-\delta)(1-\lambda s) W(q,p)}_{\text{do not search on job or match}} + \\ (1-\delta)\lambda s \left(\begin{array}{l} \underbrace{F(q) W(q,p)}_{\text{meet } x \text{ with } x \leq q} + \\ \underbrace{\int_q^p W(x,p)\, dF(x)}_{\text{meet } x \text{ with } q < x \leq p} + \\ \underbrace{\int_p^{\bar{p}} W(p,x)\, dF(x)}_{\text{meet } x \text{ with } p < x} \end{array} \right) \end{array} \right]$$

Back

Model results: Profits

- Per period profit of firm of type p with age a is

$$\pi(p) = \left(p - \underbrace{\int_{\underline{p}}^{p} w(x,p)\, dG(x|p)}_{\text{average wage at firm } p} \right) e(p,a) - c(v(p))$$

- $dG(x|p)$: pdf of outside options for workers at firm of type p
- $e(p,a)$: employment at firm of type p with age a

- Multinational presence affects $w(x,p)$, $G(x|p)$, $\underline{p}$ and therefore average wage conditional on p
- Multinational presence also affects $e(p,a)$, $v(p)$

Model results: Firm age and size

- Firms of type p which survive to age a have employment:

$$e(p,a) = \frac{h(p)}{1-x(p)}\left(1-x(p)^a\right)$$

- with

$$h(p) = v(p)\,\chi\left(\frac{u+(1-u)(1-\delta)\,s\int_{\underline{p}}^{p} dL(x)}{S}\right)$$

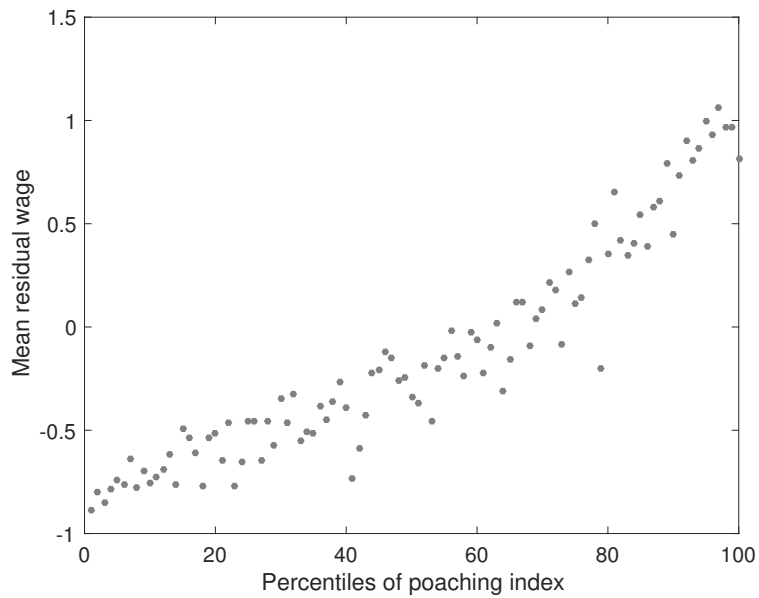
$$x(p) = \frac{(1-\delta)}{(1-\delta_f)}\left(1-\lambda s(1-F(p))\right)$$

- Fraction of firms of age a is $(1-\delta_f)^{a-1}\,\delta_f$

Nontargeted moment: joint dist of poaching index & wages

- Simulate quarterly model for 10 years with 1 million workers, calculate poaching index, wages as in data ▸ Back

Data



Model

Nontargeted moment: joint dist of poaching index & size

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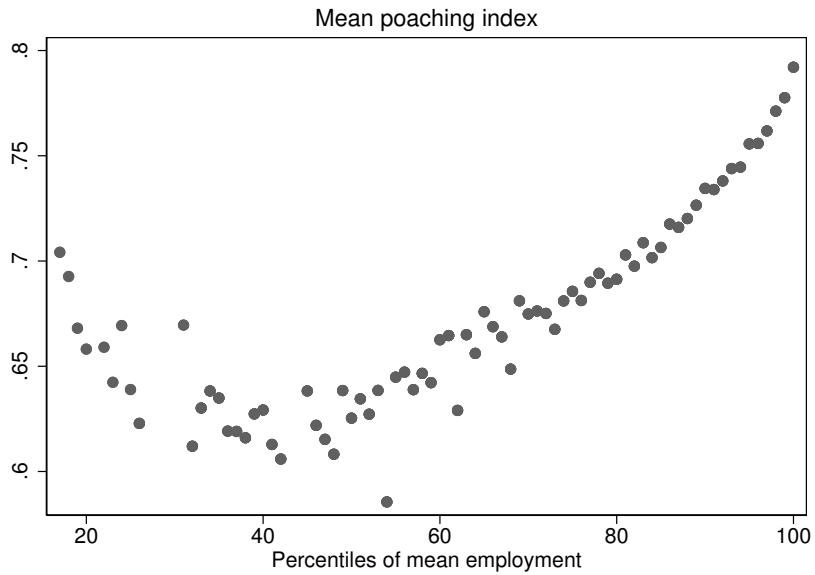

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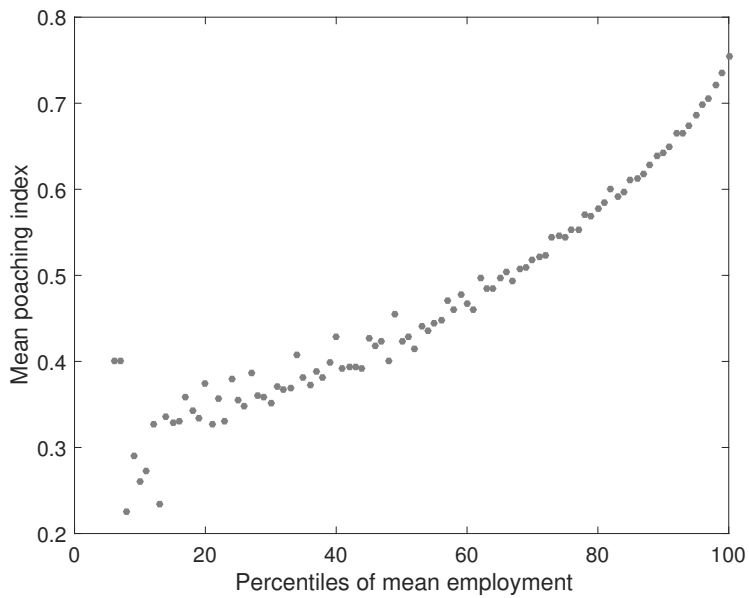
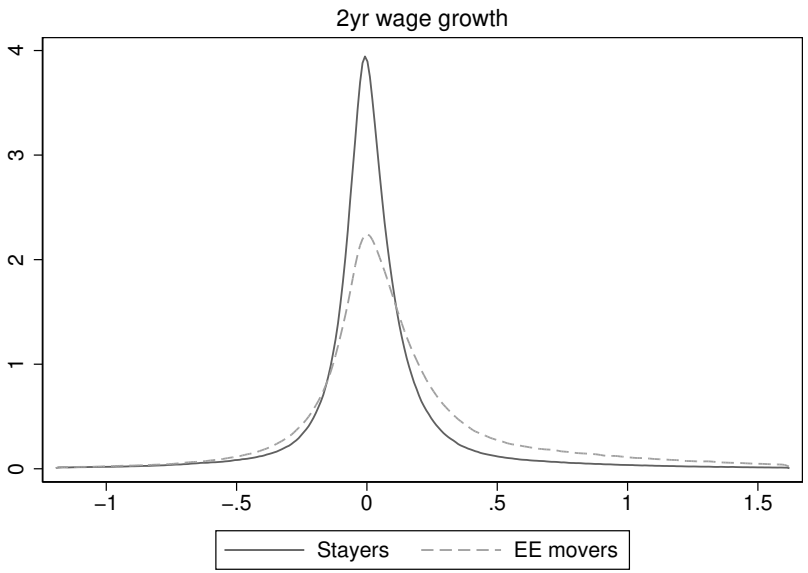


Model

Nontargeted moment: 2-year log wage growth

- Simulate quarterly model for 10 years, with 1 million workers calculate transitions, wages as in data



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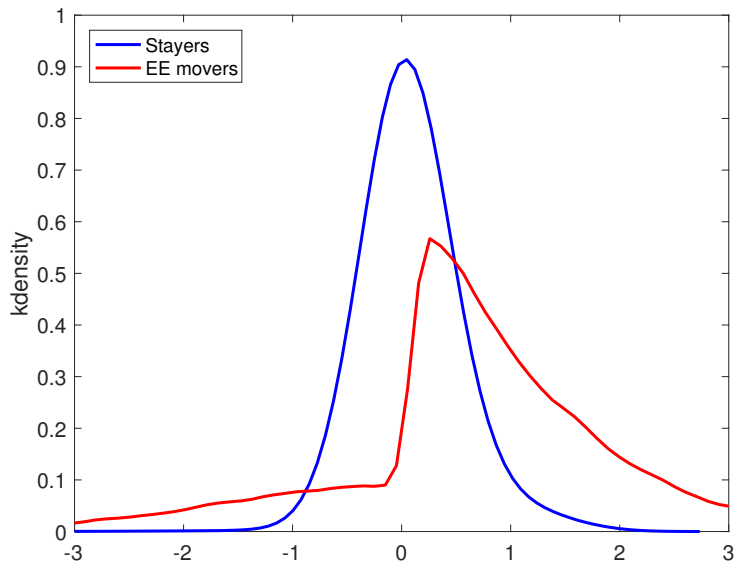
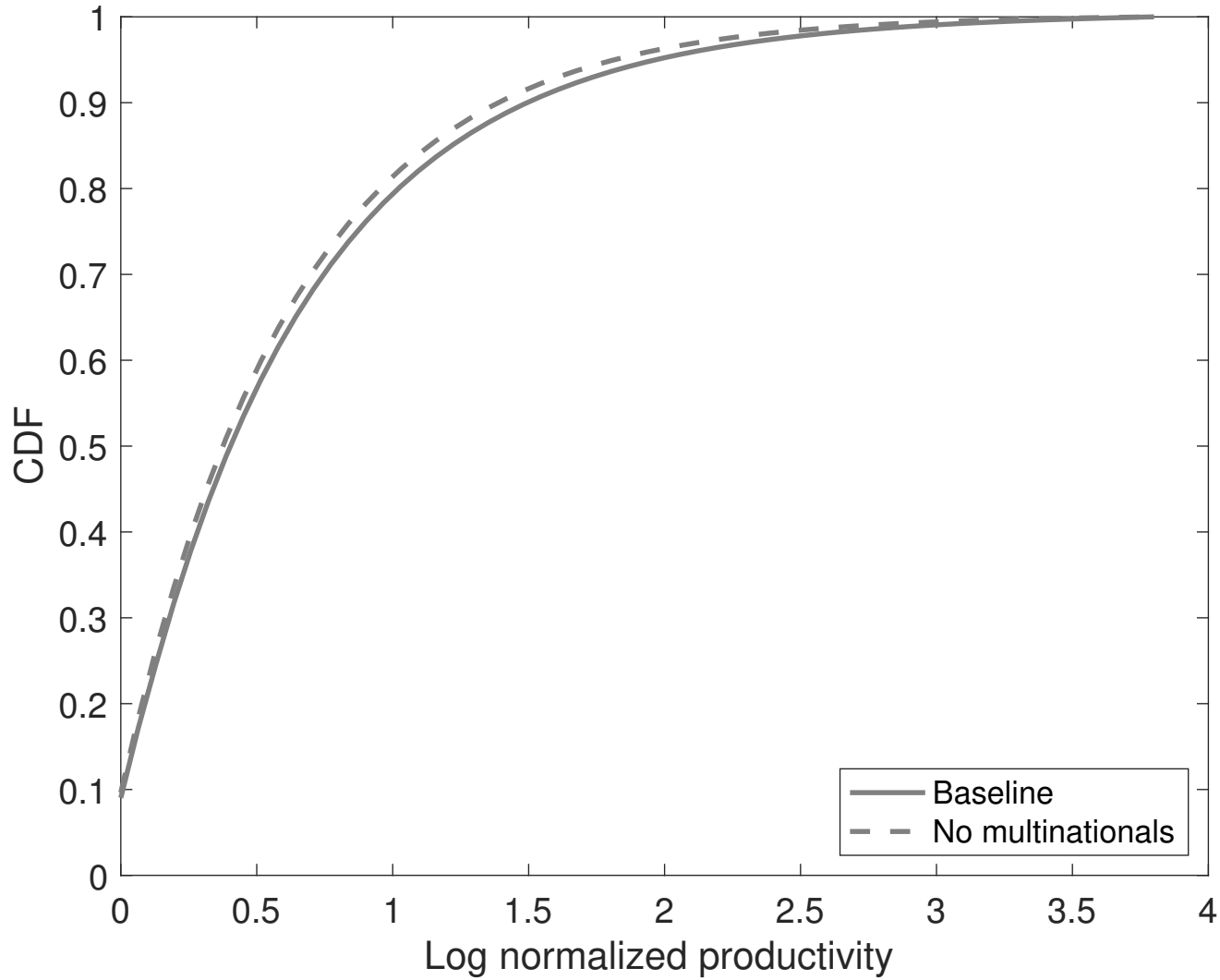


Model

Shift in active firm productivity distribution



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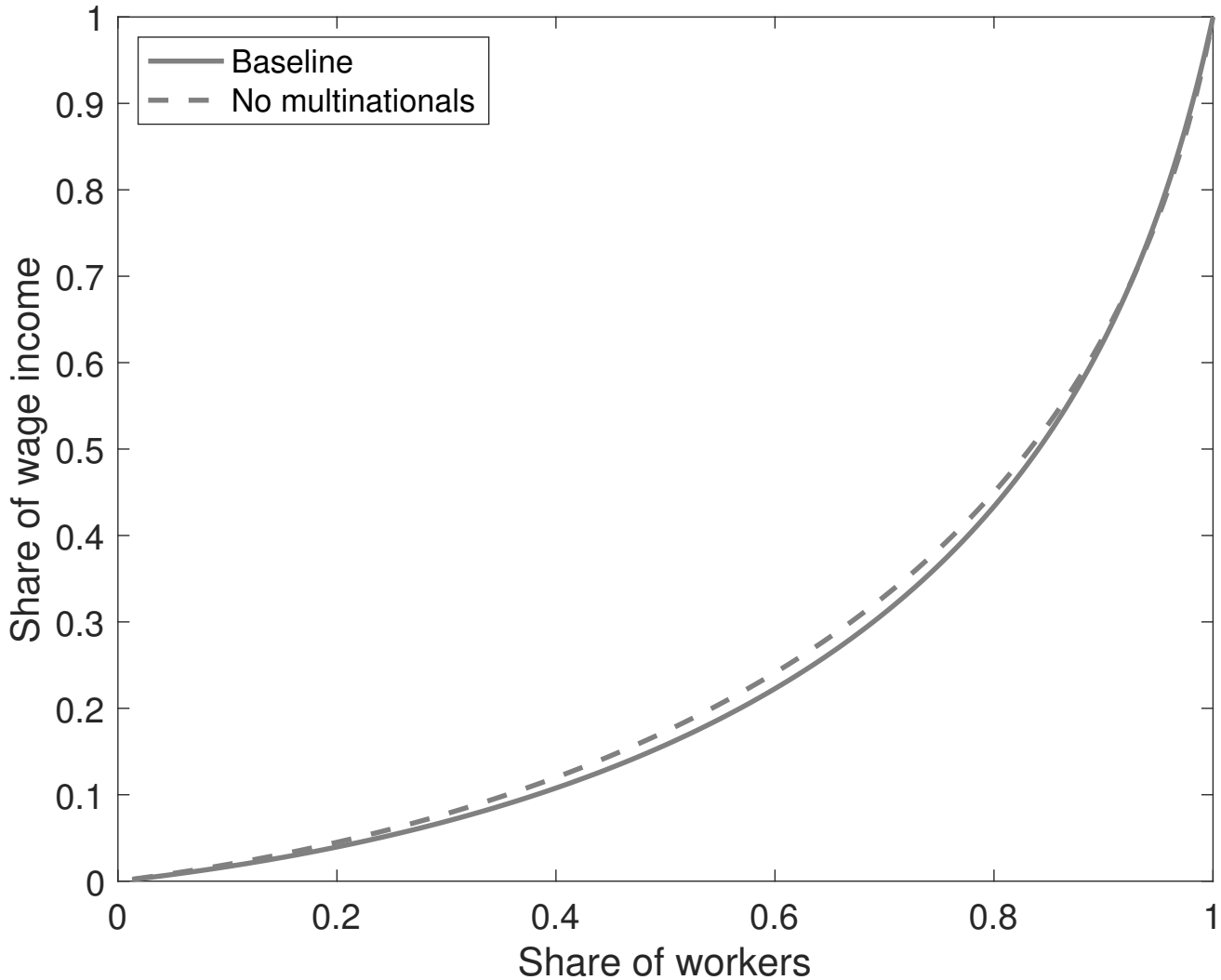
Shift in worker-level wage distribution



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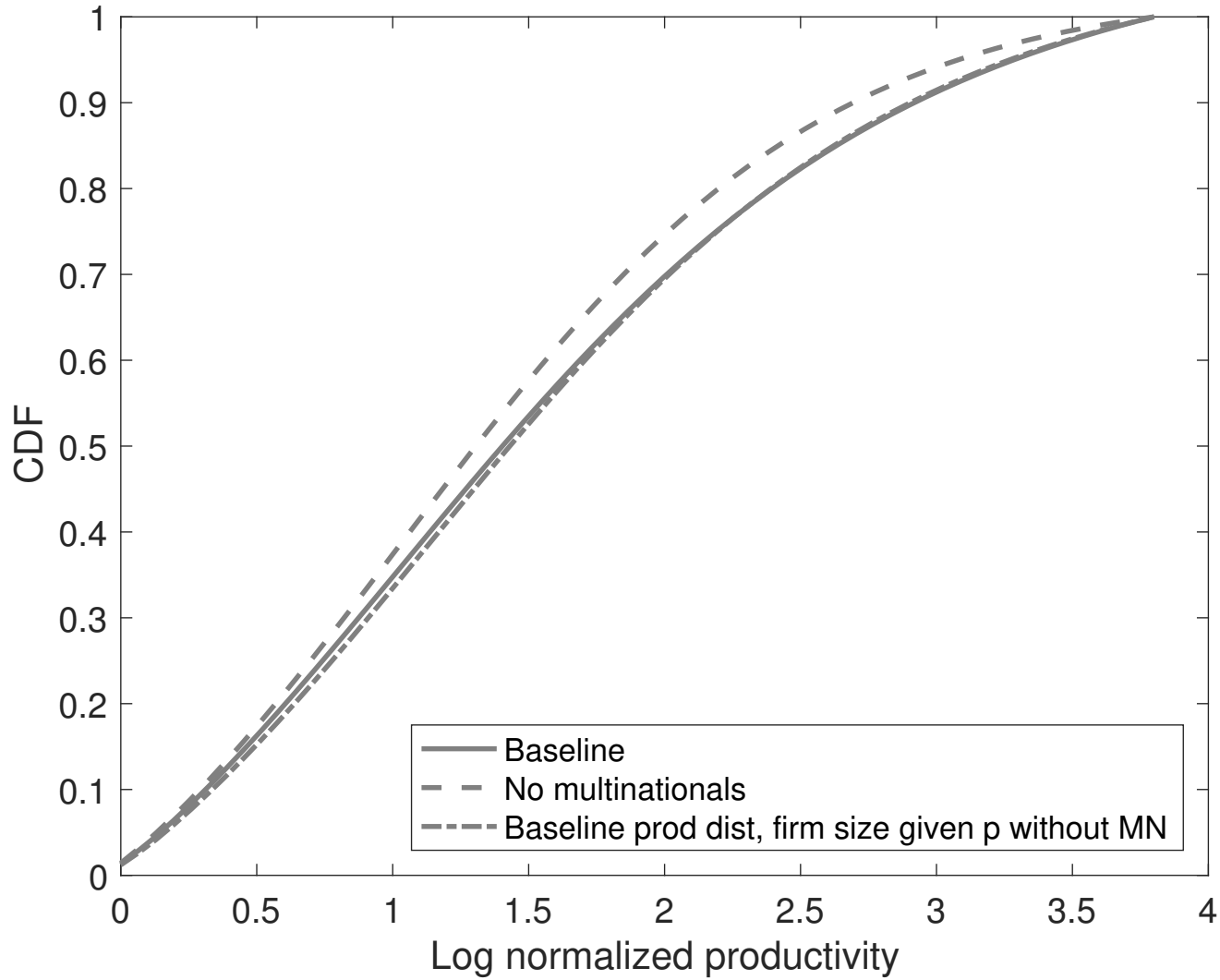
Shift in employment distribution



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