

# The Impact of Multinationals Along the Job Ladder

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<sup>1</sup>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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- ▶ Due to **search frictions**, firms pay **less than marginal product**
- ▶ 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**
    - ▶ **High productivity** firms: **better outside options** bid up **wages**
- ▶ Overall **workers gain**, local **firms lose** from multinationals
  - ▶ 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**
  - ▶ Competition increases high up on job ladder, decreases lower down

Data

# Data

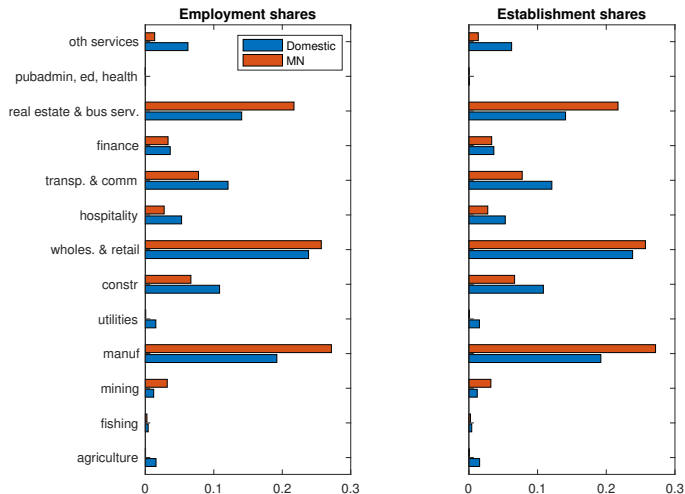
- ▶ Matched employer-employee data for Norway 1996-2007
- 1. For each individual, **annual earnings** (all sources) & **establishment identifier** for main employer each November
- 2. **Ownership** of establishments (MN vs domestic)
- ▶ Focus on private sector establishments & linked individuals

## 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	

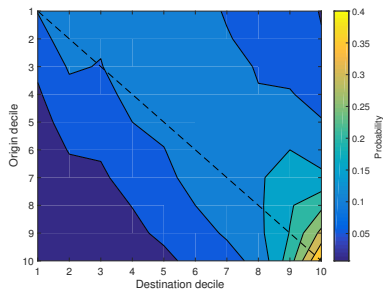
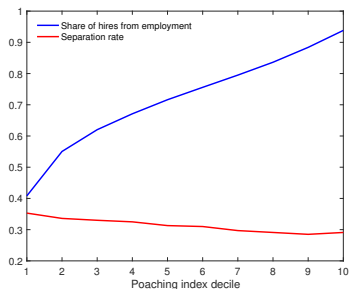


# Industries: Domestic vs MN

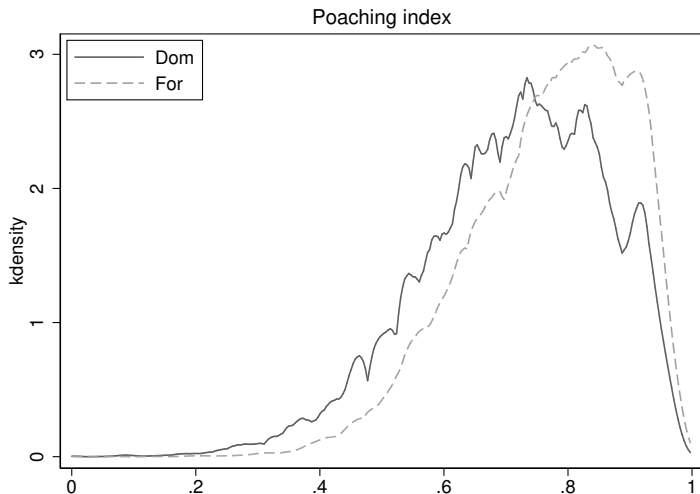


# Job-to-job transitions are not random: job ladder

- ▶ 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



Model

## Model overview

- ▶ Discrete time
- ▶ Homogeneous workers, firms with heterogeneous 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  $\beta$
- ▶ Flow utility in unemployment is  $b$
- ▶ Flow income for employed is endogenous wage  $w$
- ▶ Match with employer breaks with probability  $\delta$  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  $\tilde{f}^i(p)$ ,  $i \in \{D, F\}$
- ▶ Output per worker employed by firm of type  $p$  is  $p$
- ▶ Firms discount future at rate  $\beta$ , die at rate  $\delta_f$
- ▶ Surviving firms lose workers exogenously at rate  $\delta_m$

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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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- ▶ Free entry condition:

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

- ▶  $C^i(\tilde{m}^i)$  entry cost, convex in mass of entrants  $\tilde{m}^i$
  - ▶  $B(p)$  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:  $\lambda$
  - ▶ Prob vacancy meets worker:  $\chi$

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

## 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  $\phi$  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**

## 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  $F(x)$ ,  $\lambda$ , 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:

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

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  $p$

## Model extension: Worker heterogeneity and sorting

- ▶  $H$  observable labor types,  $h \in \{1, \dots, H\}$
- ▶ Firms can post vacancies in each skill market
- ▶ Random matching within each skill market
- ▶ Marginal product of skill type  $h$  at firm of productivity  $p$  is

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

with

$$1 = \eta_1 \leq \dots \leq \eta_H$$

and

$$1 = v_1 \leq \dots \leq v_H$$

- ▶ If  $v_h > 1$  for some  $h \rightarrow$  sorting

# Calibration



## Calibration

- ▶ Functional forms:

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

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

$$\tilde{\Gamma}^D \sim \text{Pareto}(b, \sigma^D) \text{ and } \tilde{\Gamma}^F \sim \text{LN}(\mu^F, \sigma^F)$$

$\bar{p}$ : bounded above at 99.5th pctile of more dispersed dist.

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

## Parameters and targets

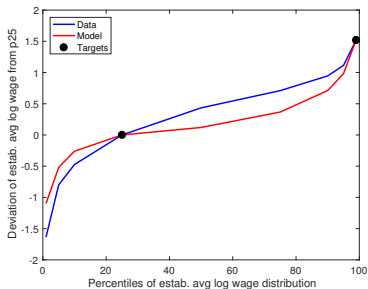
- ▶ Preset:  $\beta = 0.95^{1/4}$ ,  $\kappa = 0.25$ ,  $b = 1$  (normalize),  $\theta = 0.5$  (literature),  $\delta = 0.038$  (Eurostat),  $\delta_f = 0.01$  (Balsvik & Haller)

### Parameters and Targets

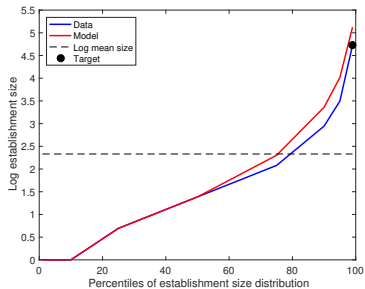
Target description	Data	Model		Value
Outside data				
EE quarterly transition rate (Eurostat)	0.03	0.03	$s$	0.56
Labor share (Statistics Norway)	0.60	0.60	$\phi$	0.58
Nonemp rate 25-54 (Statistics Norway)	0.155	0.157	$A$	0.32
Our data				
p99 log estab. employment	4.73	4.90	$\alpha$	0.52
Average establishment size	10.29	10.26	$M$	0.08
Share active estabs that are domestic	0.94	0.94	$\omega$	0.0008
p99-p25 estab. avg log wage	1.52	1.52	$\sigma_D$	2.57
Average establishment size, MN	29.89	29.01	$\mu_F$	0.48
p99 log estab. employment, MN	5.78	5.56	$\sigma_F$	1.64

# Nontargeted moment: firm size & wage distribution

- ▶ Simulate quarterly model for 10 years with 1.2 million workers, calculate poaching index, wages as in data



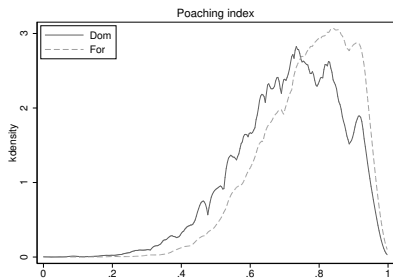
Wage



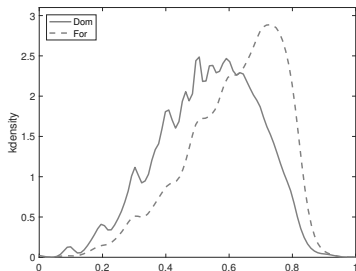
Log size

## Nontargeted moment: poaching index distribution

- ▶ Simulate quarterly model for 10 years with 1.2 million workers, calculate poaching index as in data



Data



Model

▶ Size

▶ Wage

Counterfactual

## Counterfactual: No multinationals

- ▶ Let  $C^F \rightarrow \infty$ , hold  $C^D$  fixed (elastic domestic entry) ▶ Prod
- ▶ 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	0.89		
Payments to labor	1	0.89	0.599	0.602
Domestic firm profit	1	1.20	0.07	0.09
Foreign firm profit	1	0.00	0.03	0.00
Payments to capital	1	0.89	0.25*	0.25*
Hiring cost	1	0.88	0.06	0.06
Labor + domestic profit	1	0.93	0.67	0.69
Labor + dom profit - dom entry cost	1	0.91	0.63	0.65

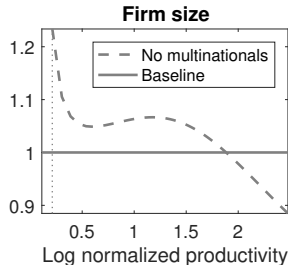
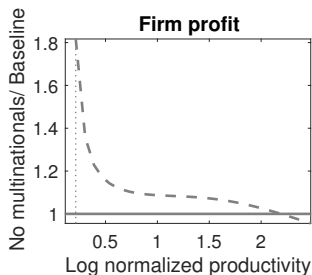
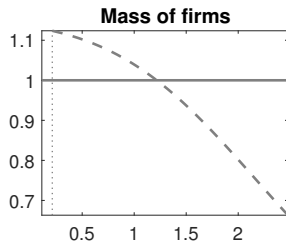
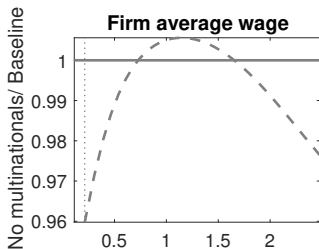
\* By assumption

## Impact of multinationals on workers & local firms

	Baseline No MN	
	Workers	
Avg worker-level wage	1	0.88
Nonemployment rate	0.157	0.144
Wage Gini	0.32	0.32
	Firms	
Measure of firms	1	1.43
Measure of local firms	1	1.52
Avg firm size	10.26	7.74
Avg local firm size	9.00	7.74

- ▶ Restricting multinational entry **hurts workers**, **helps local firms**
- ▶ But **heterogeneous** effects (next slide)

# Heterogeneous effects across firm productivity distribution



► Mobility

► Vacancies

►  $f(p)$

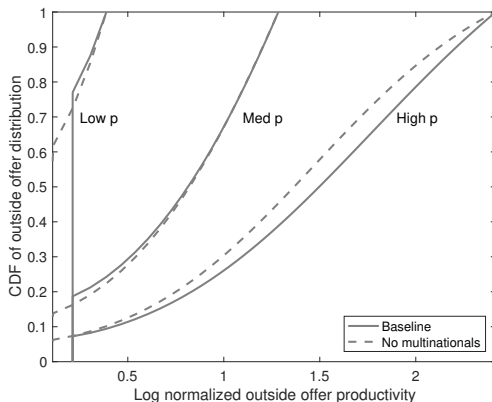
► Labsh



## Intuition: shift in outside option distribution

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

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



## Robustness: Labor heterogeneity & sorting

- ▶ Calibrate model with  $H = 3$  skill groups to match skill premia & skill shares of employment along the job ladder ▶ Sorting
- ▶ Counterfactual: infinite entry cost for multinationals
- ▶ Impact on aggregates bigger than baseline ▶ Aggregates

### Additional insights:

- ▶ Sorting  $\rightarrow$  skill premium falls in counterfactual
- ▶ Heterogeneous within-skill-group effects as in baseline
- ▶ Within-skill-group effects biggest for high skill ▶ Skillwage

## 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 & medium productivity** local firms **shrink** as workers climb the job ladder outside the firm
  - ▶ **High productivity** local firms pay **higher wages** due to more outside options high up on the 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)

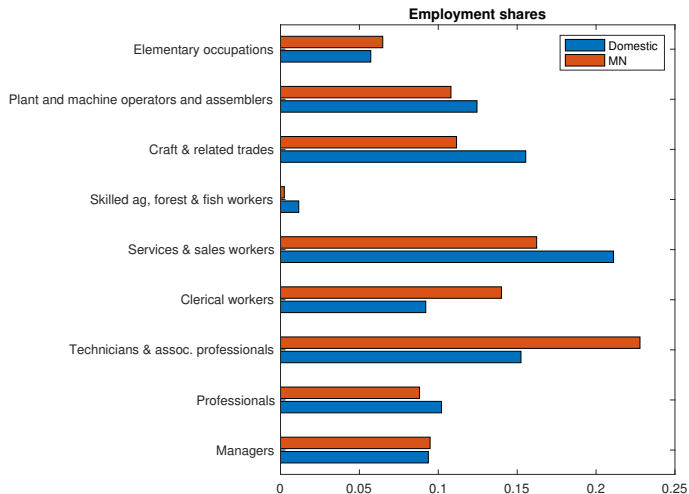
Empirical literature on job ladders

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

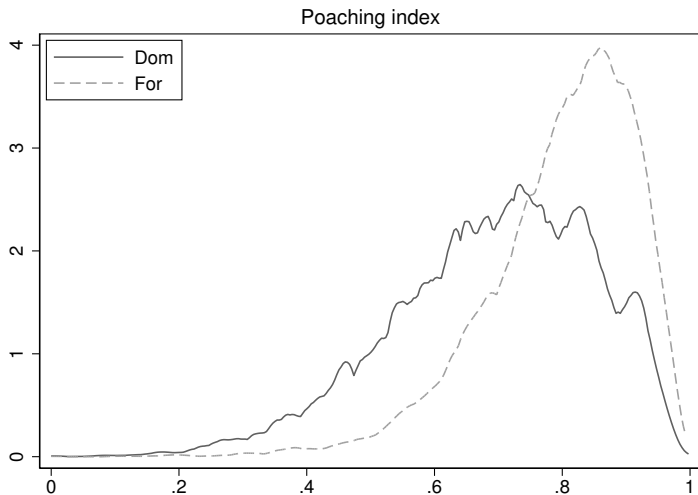
Search and matching models of distributional impact of trade

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

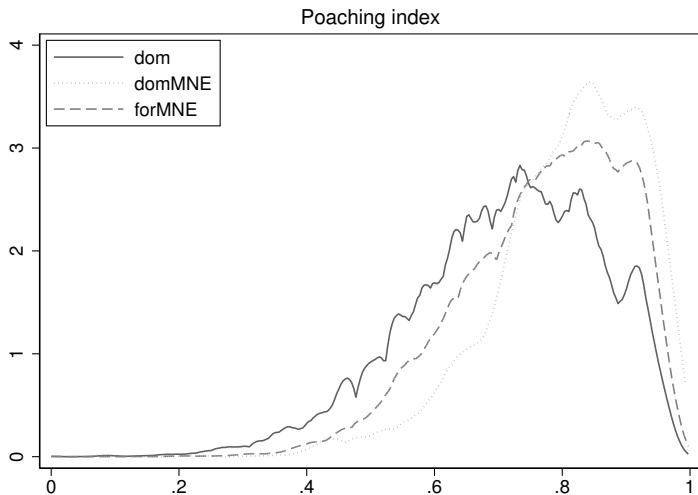
# Occupations: Domestic vs MN



## Poaching index distribution by ownership: firms



# Poaching index distribution including home MNEs





## 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

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

## 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:

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

- ▶ with

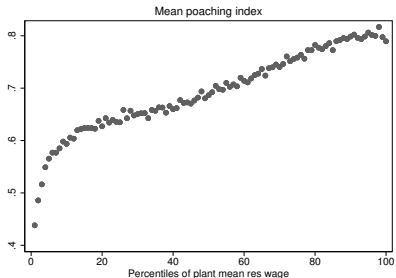
$$h(p) = v(p) \chi \left( \frac{u + (1 - u)(1 - \delta) s \int_{\underline{p}}^p dL(x)}{S} \right)$$

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

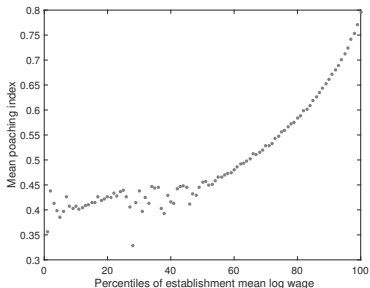
- ▶ Fraction of firms of age  $a$  is  $(1 - \delta_f)^{a-1} \delta_f$

# Nontargeted moment: joint dist of poaching index & wages

- ▶ Simulate quarterly model for 10 years with 1.2 million workers, calculate poaching index, wages as in data [▶ Back](#)



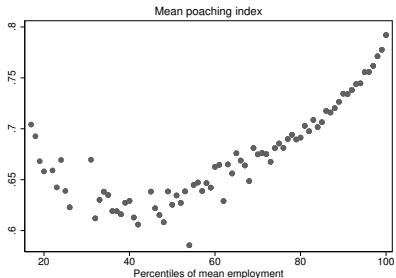
Data



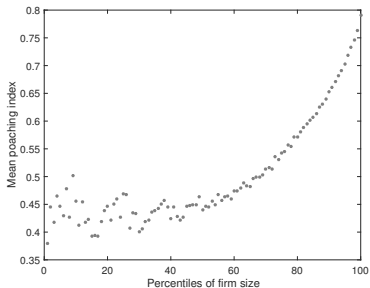
Model

# Nontargeted moment: joint dist of poaching index & size

- ▶ Simulate quarterly model for 10 years with 1.2 million workers, calculate poaching index, size as in data [▶ Back](#)



Data



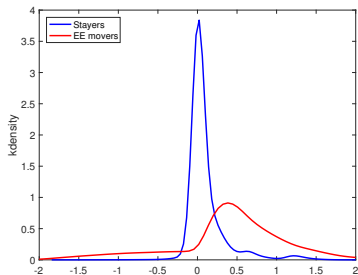
Model

## Nontargeted moment: 2-year log wage growth

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

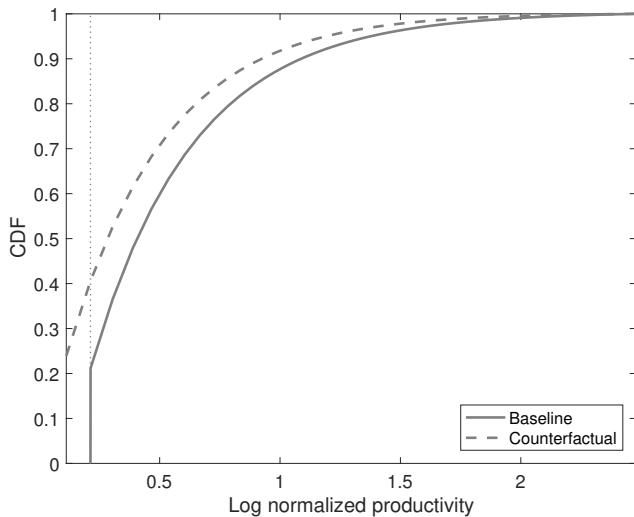


Data

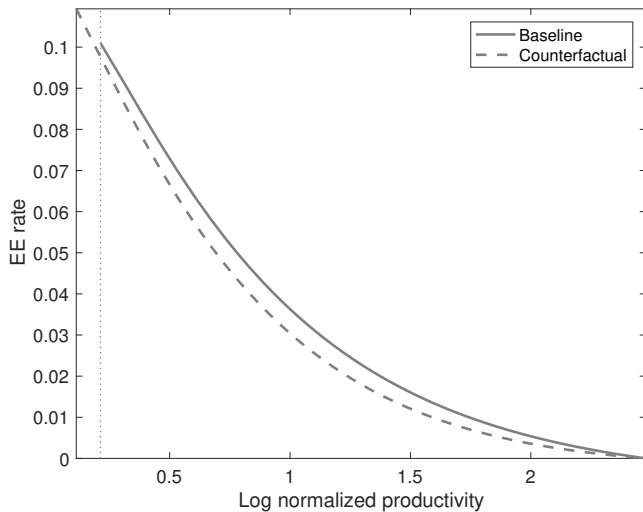


Model

## Shift in active firm productivity distribution

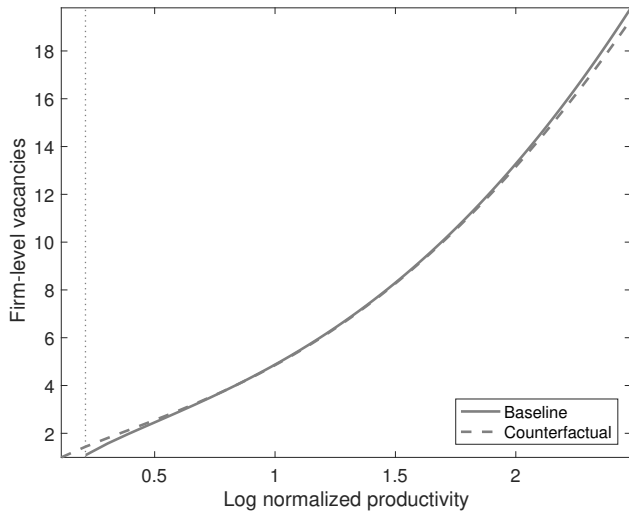


## EE rate

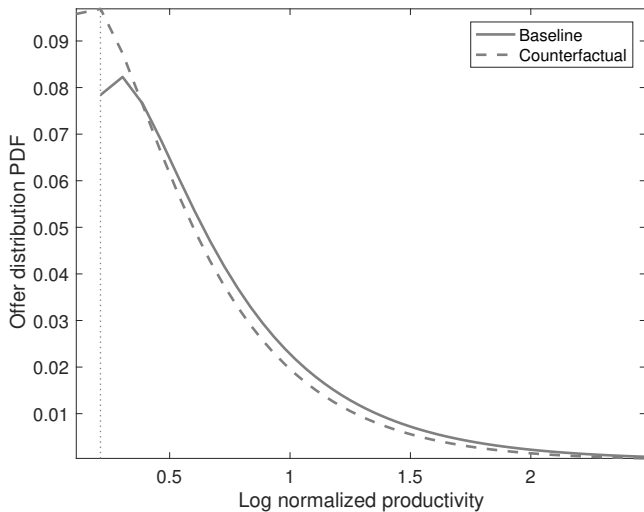




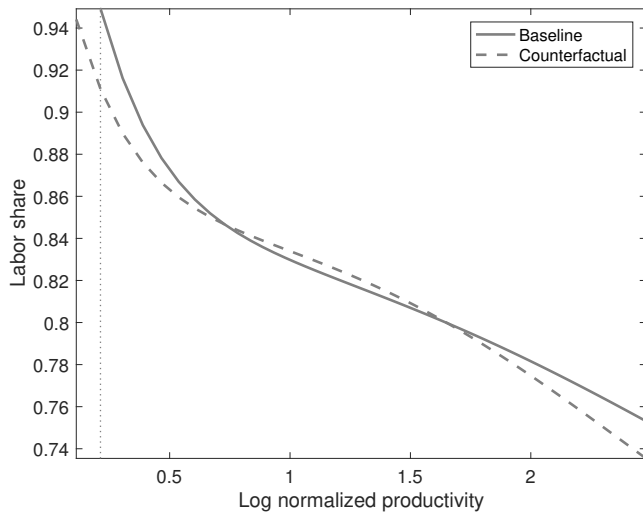
# Vacancies



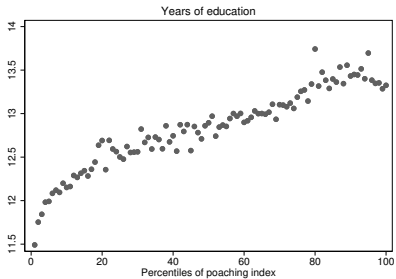
# Vacancies



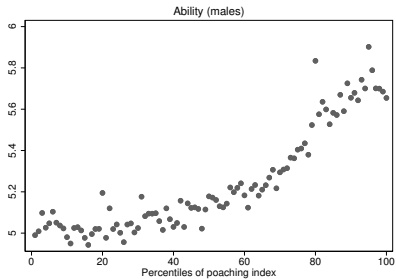
## Labor share



# Worker heterogeneity and sorting



Education & estab. rank



Ability & estab. rank

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## Counterfactual: Heterogeneous labor case

### Impact of multinationals on output, components

	Level		Sh. of output	
	MN	No MN	MN	No MN
Output	1	0.74		
Payments to labor	1	0.81	0.605	0.659
Domestic firm profit	1	1.05	0.06	0.08
Foreign firm profit	1	0.00	0.08	0.00
Payments to capital	1	0.74	0.25*	0.25*
Hiring cost	1	0.67	0.00	0.00
Labor + domestic profit	1	0.83	0.66	0.74
Labor + dom profit - dom entry cost	1	0.81	0.63	0.69

\* By assumption

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## Heterogeneous wage effects by skill type

