

# The Impact of Multinationals Along the Job Ladder

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April 2022

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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.

# Motivation

## Our question

- ▶ Multinational affiliates are **more productive** than domestic firms
- ▶ What is their impact on host country through **labor market**?
- ▶ Is impact **uniform** across workers and local firms?
  
- ▶ Literature to date instruments for multinational presence to deal with endogeneity
  - ▶ e.g. Alfaro-Ureña et al (2021), Setzler & Tintelnot (2021)
- ▶ We take model-based approach
- ▶ **Calibrate a job ladder model** of the labor market
- ▶ Use model to perform **counterfactual** of changing entry cost for multinationals

# What we do & what we find

1. Matched employer-employee data for Norway
  - ▶ Document facts consistent with a **job ladder**
  - ▶ (New) Multinationals **high up** on this job ladder
2. General equilibrium job ladder model of labor market with multinationals
  - ▶ Helpman-Melitz-Yeaple (2004) meets Cahuc-Postel-Vinay-Robin (2006) + DMP matching
3. Calibration: target transitions, unemp rate, labor share, firm size x ownership
4. Counterfactual: set cost of multinational entry to infinity
  - ▶ On average, **workers lose**, **local firms gain** from this policy
  - ▶ But **heterogeneous** effects across workers and local firms

## Data

- ▶ Matched employer-employee data for Norway 1996-2007
- 1. Population Register: for each individual, annual earnings (all sources) & plant identifier for main employer in November
- 2. Income tax files: match plants to firms
- 3. SIFON registry of foreign ownership: ownership at firm level
  - ▶ Code as multinational if share of largest foreign owner >50%
- ▶ Baseline: plant as unit of analysis (robustness with firms)
- ▶ Restrict attention to private sector plants & linked individuals

### Summary statistics

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

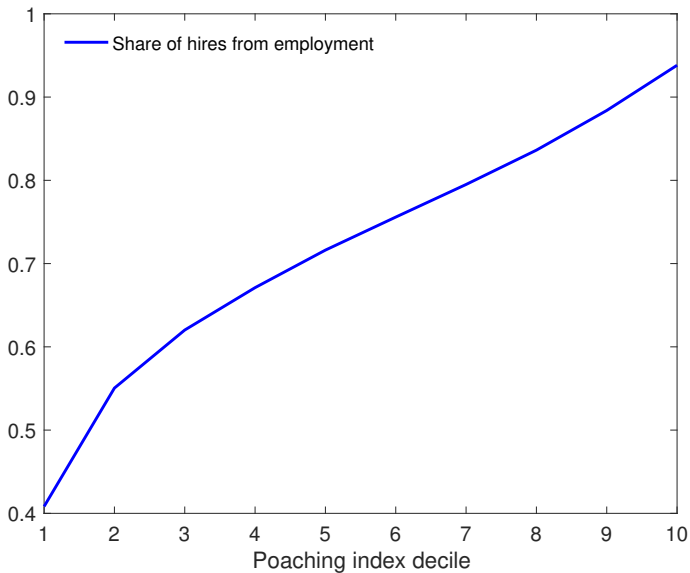
## Measurement of transitions & wages

- ▶ Use November cross sections to code transitions
  - ▶ Stayer: same employer at  $t$  and  $t+1$
  - ▶ EE transition: different employers at  $t$  and  $t+1$
  - ▶ NE transition: not employed at  $t$ , employed at  $t+1$
- ▶ Attribute individual's total earnings in year  $t$  to plant of employment in November of year  $t$
- ▶ Don't observe plant-level revenue or productivity
- ▶ Rank plants by their share of hires from employment ("poaching index"):

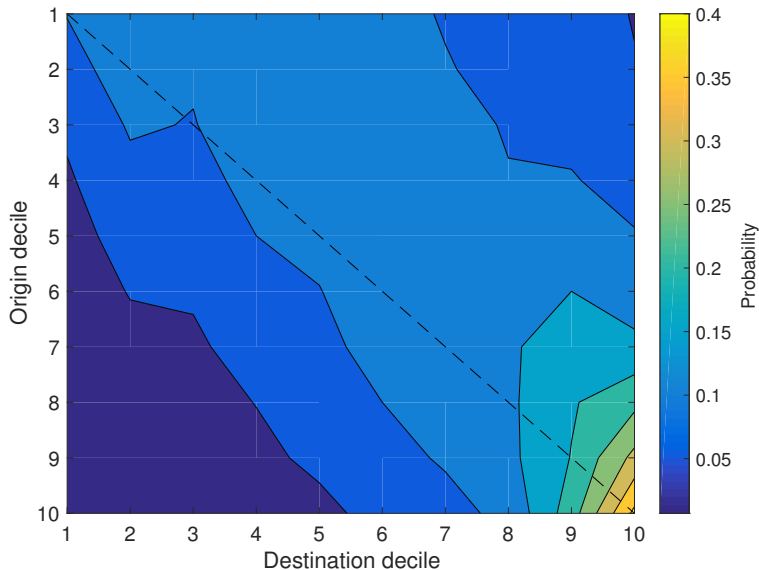
$$poach_i = \frac{\sum_{t=1998}^{2007} hire_{it}^{EE}}{\sum_{t=1998}^{2007} hire_{it}^{EE} + \sum_{t=1998}^{2007} hire_{it}^{NE}}$$

- ▶ Require  $\sum_t hire_{it}^{EE} + \sum_t hire_{it}^{NE} \geq 10$  and  $\sum_t hire_{it}^{NE} > 0$

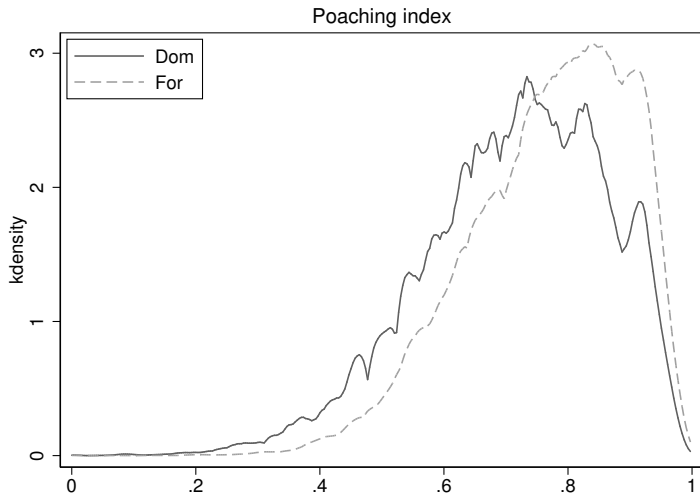
## Job-to-job transitions are frequent



## Job-to-job transitions are not random (job ladder)



## Multinationals are high up on the job ladder





## Model overview

- ▶ Cahuc, Postel-Vinay & Robin (2006) on-the-job search + DMP matching
- ▶ Discrete time
- ▶ Firms have **heterogeneous productivity**
- ▶ Firms face **convex cost** of posting vacancies (finite firm size)
- ▶ Firm **free entry condition**: multinationals pay higher cost to draw from productivity distribution with higher mean
- ▶ **Homogeneous workers** with linear utility
- ▶ **On-the-job** search and **random** matching
- ▶ Wages determined by **bargaining**
  - ▶ Workers get outside option plus fraction of match surplus
- ▶ Look for stationary equilibrium

## Why this model?

- ▶ Large empirical literature documenting job ladder:
  - ▶ e.g. Haltiwanger, Hyatt, Kahn & McEntarfer (2018), Moscarini & Postel-Vinay (2018)
- ▶ Frictional labor market with unemployment
- ▶ Nonrandom job-to-job transitions
- ▶ Wage gains on the job and conditional on transitions
- ▶ Outside options matter
  - ▶ See Alfaro-Ureña et al (2021), Setzler & Tintelnot (2021)

## Model assumptions 1/5: Workers

- ▶ Continuum of infinitely-lived workers on  $[0, 1]$
- ▶ Linear utility, discount future at rate  $\beta$
- ▶ Flow income for employed is wage  $w$
- ▶ Flow income in unemployment is  $b$
- ▶ Match with employer broken with probability  $\delta$  each period
  - ▶ Pass through one period of unemployment before searching
- ▶ Unemployed search for jobs with probability 1
- ▶ Employed search with probability  $s < 1$

## Model assumptions 2/5: Firms

- ▶ A firm is draw of productivity  $p$  from cdf  $\tilde{\Gamma}^i(p)$ ,  $i \in \{D, F\}$
- ▶ Output per worker employed at firm of type  $p$  is  $p$
- ▶ Each firm pays  $c(v)$  to post  $v$  vacancies with

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

- ▶ Firms discount future at rate  $\beta$
- ▶ Choose: optimal  $v(p)$  given wage setting
- ▶ Free entry condition:

$$C^i = \int_b^{\bar{p}} 0 \tilde{\gamma}^i(p) dp + \int_{\underline{p}}^{\bar{p}} H(p) \tilde{\gamma}^i(p) dp$$

- ▶  $H(p)$  value to entrant of draw  $p$
  - ▶  $\underline{p} > 0$ : endogenous cutoff below which no firm operates
- ▶  $\tilde{\Gamma}(p)$ ,  $\tilde{\gamma}(p)$ : cdf & pdf of productivity,  $M$ : Mass of firms

## Model assumptions 3/5: Matching

- ▶ Total measure of vacancies is  $V$ :

$$V = M \int_{\underline{p}}^{\bar{p}} v(p) \gamma(p) dp$$

- ▶ 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 a vacancy:

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

## Model assumptions 4/5: Wage setting I

- ▶ Wage setting as in Cahuc-Postel-Vinay-Robin (2006):
- ▶ Worker gets outside option plus fraction  $\phi$  of match surplus
- ▶ Wage is constant until worker's outside option increases

## Model assumptions 5/5: Wage setting II

- ▶  $U$ : value of unemployment
- ▶  $W(w, p)$ : value to worker of wage  $w$  at firm  $p$
- ▶  $w(q, p)$ : wage of worker at firm  $p$  with outside option of firm  $q$
- ▶ Unemployed worker meeting firm  $p$  accepts offer  $w_0(p)$  s.t.

$$W(w_0(p), p) = U + \phi(W(p, p) - U)$$

- ▶ Employee at firm  $p$  with outside option  $q$  meets firm  $p'$ :
  1.  $p' \leq q \leq p$ : nothing happens
  2.  $q < p' \leq p$ : worker stays, gets wage  $w(p', p)$  s.t.

$$W(w(p', p), p) = W(p', p') + \phi(W(p, p) - W(p', p'))$$

3.  $p < p'$ : worker moves to  $p'$ , gets wage  $w(p, p')$  s.t.

$$W(w(p, p'), p') = W(p, p) + \phi(W(p', p') - W(p, p))$$

## Model results 1/4: Worker transitions

### Separations to unemployment

- ▶ Matched workers & firms separate w/ prob  $\delta$  each period

### Hires from unemployment

- ▶ Unemployed searchers meet a firm with probability  $\lambda$  each period; accept all offers

### Job-to-job transitions

- ▶ Worker employed at firm  $p$  meets new firm with probability  $\lambda s$  each period
  - ▶ If new firm has productivity  $p' > p$ , worker moves to new firm
  - ▶ Otherwise stays at original firm
- ▶ Surplus split does not affect transitions given vacancies,  $\lambda$
- ▶ Split *does* affect firms' incentives to post vacancies,  $\lambda$



## Model results 2/4: 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)
- ▶  $f(x)$ : pdf of job offer distribution

$$f(x) = \frac{v(x) \gamma(x)}{\int_{\underline{p}}^{\bar{p}} v(y) \gamma(y) dy}$$

- ▶ Note: productivity distribution affects  $F(x)$ ,  $\lambda$ , and therefore wages conditional on  $\{p, q\}$
- ▶ Productivity distribution also affects joint distribution of  $\{p, q\}$

## Model results 3/4: Profits

- ▶ Per period profit of firm  $p$  is

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

- ▶  $g(x|p)$ : pdf of outside options for workers at firm of type  $p$
- ▶  $e(p)$ : employment at firm of type  $p$
- ▶  $v(p)$ : vacancies at firm of type  $p$
  
- ▶ Note: productivity distribution affects  $w(x, p)$ ,  $g(x|p)$  and therefore average wage conditional on  $p$
- ▶ Productivity dist also affects profits through  $e(p)$ ,  $v(p)$

## Model results 4/4: Note on ranking firms

- ▶ Average wage at the firm level need not be monotonic in  $p$ 
  - ▶ Value of option to move up; distribution of outside options
- ▶ Share of hires from employment *is* increasing in  $p$
- ▶ Why? Higher  $p$  firms more likely to attract employed workers

$$poach(p) = \frac{(1-u)(1-\delta)\delta s \int_{\underline{p}}^p \frac{\delta+(1-\delta)s\lambda f(x)}{(\delta+(1-\delta)s\lambda(1-F(x)))^2} dx}{u+(1-u)(1-\delta)\delta s \int_{\underline{p}}^p \frac{\delta+(1-\delta)s\lambda f(x)}{(\delta+(1-\delta)s\lambda(1-F(x)))^2} dx}$$

# Calibration

- ▶ Functional forms:

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

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

$$p \sim LN(\mu^i, \sigma^i)$$

- ▶ Solve in terms of mass of firms  $M$  and share of foreign firms  $\omega$
- ▶  $\rightarrow$  recover  $C^d, C^f$

## Parameters and targets

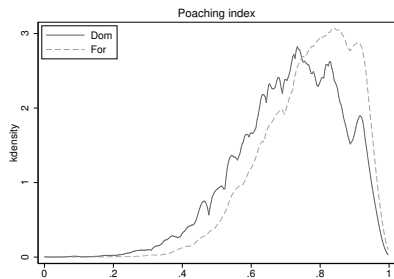
- ▶ Preset parameters:  $\beta = 0.95^{1/4}$ ,  $b = 1$ ,  $\theta = 0.5$ ,  $\delta = 0.01$

$s$	$\phi$	$A$	$\alpha$	$\mu^d$	$\sigma^d$	$\mu^f$	$\sigma^f$	$M$	$\omega$
0.27	0.78	0.54	0.01	2.40	0.80	3.10	0.64	0.094	0.058

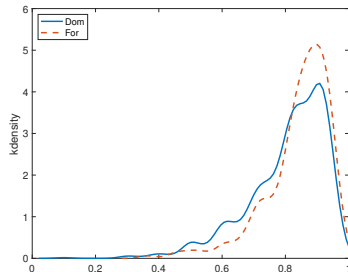
### Targets

Description	Data	Model
Average plant size	10.29	10.28
Unemployment rate 25-54 (Statistics Norway)	0.030	0.031
Labor share (Statistics Norway)	0.60	0.61
EE quarterly transition rate (Eurostat)	0.030	0.014
Average log employment, domestic	1.39	1.48
Average log employment, multinational	2.35	2.41
Std dev log employment, domestic	1.09	1.29
Std dev log employment, foreign	1.32	1.35
90-10 ratio for log employment	2.94	3.11
Share of plants that are domestic	0.94	0.94

# Nontargeted moment: poaching index distribution

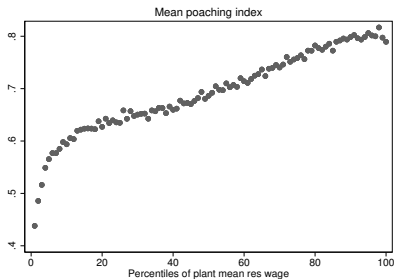


Data

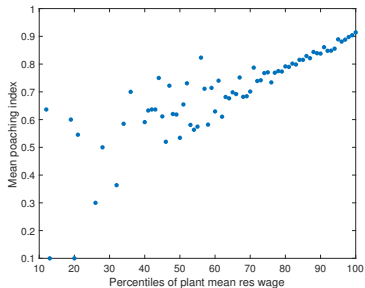


Model

# Nontargeted moment: joint dist of poaching index & wages



Data

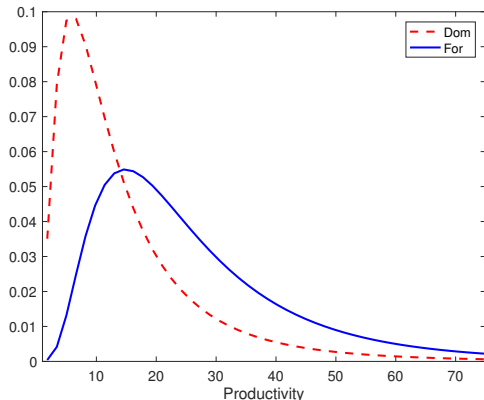


Model

## Counterfactual: No multinationals

- ▶ Productivity drawn from **domestic** productivity distribution
- ▶ Free entry condition: solve for counterfactual mass of firms  $M'$ :

$$C^d = \int_b^{\underline{p}(M')} 0 \tilde{\gamma}^d(p) dp + \int_{\underline{p}(M')}^{\bar{p}} H(p, M') \tilde{\gamma}^d(p) dp$$



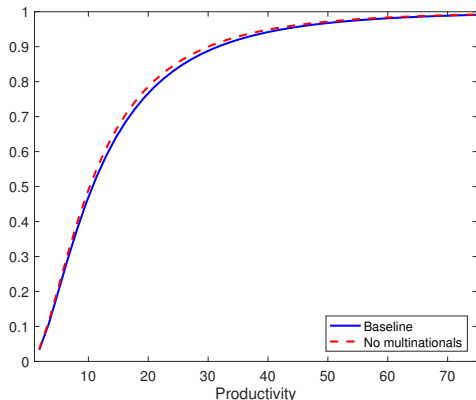
Pdf of domestic and foreign productivity



## Counterfactual: No multinationals

- ▶ Productivity drawn from **domestic** productivity distribution
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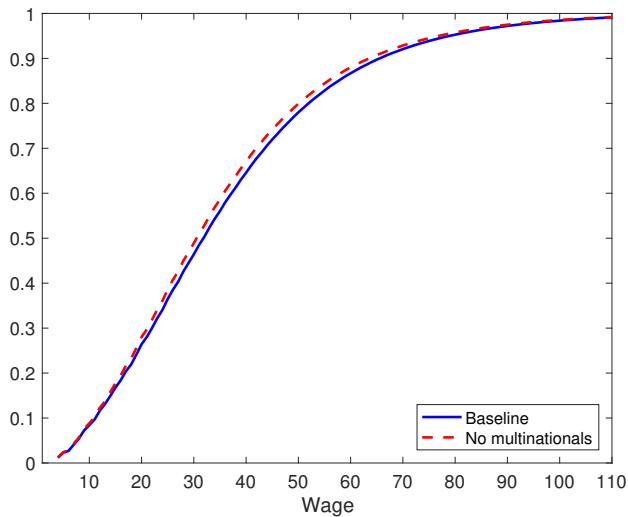
Shift in aggregate cdf of productivity under counterfactual

## Aggregate impact of removing multinationals

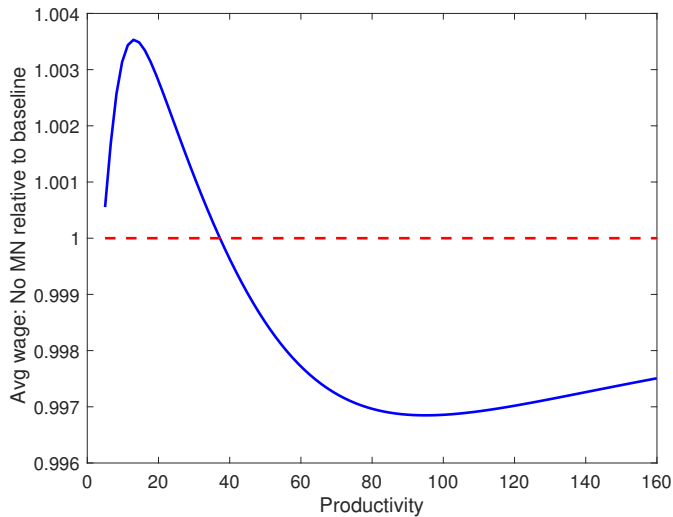
Ratio of no MN to baseline				
Output	Wages	Domestic profit	Foreign profit	Hiring cost
0.97	0.97	1.14	0	0.97

- ▶ Multinational presence benefits workers, hurts domestic firms
- ▶ Note: benefit of multinationals to workers more than offsets reduction in domestic firm profit
- ▶ Also: distributional consequences within workers and firms

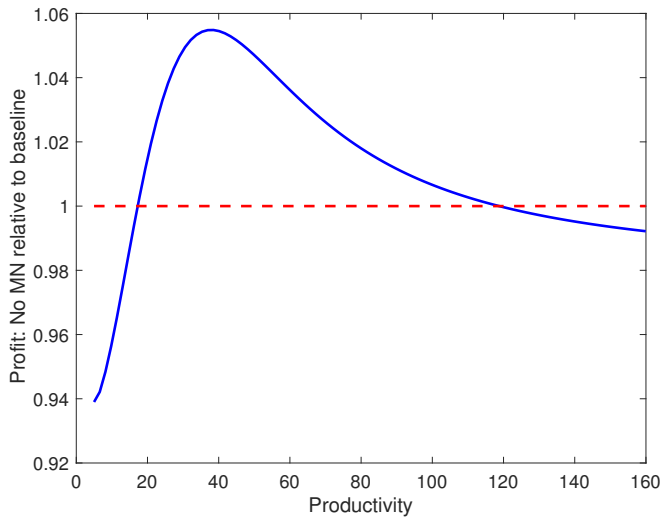
## Impact on worker-level wage distribution



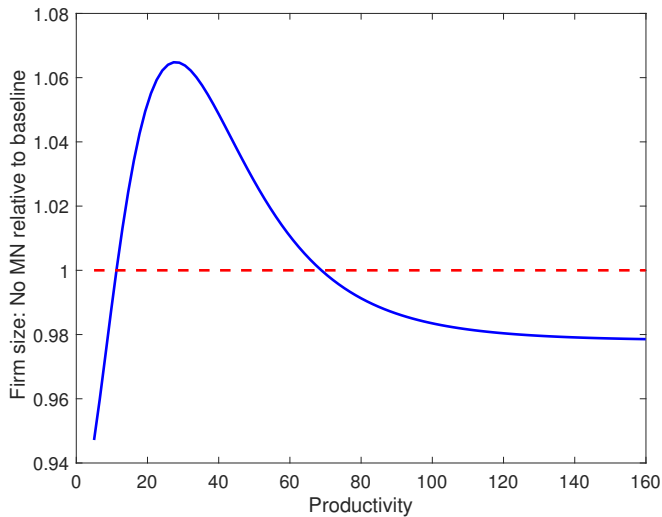
## Impact on firm-level average wages



## Impact on profits



## Impact on firm size



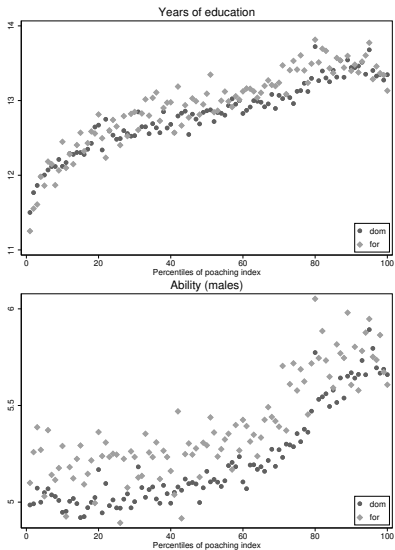
# Conclusion

- ▶ Labor market is characterized by a job ladder
- ▶ Multinationals are at the top of this ladder
- ▶ Multinational presence increases labor market competition:  
helps workers, hurts local firms
- ▶ Impact is heterogeneous across workers (where they work) and local firms (productivity)

## Extensions

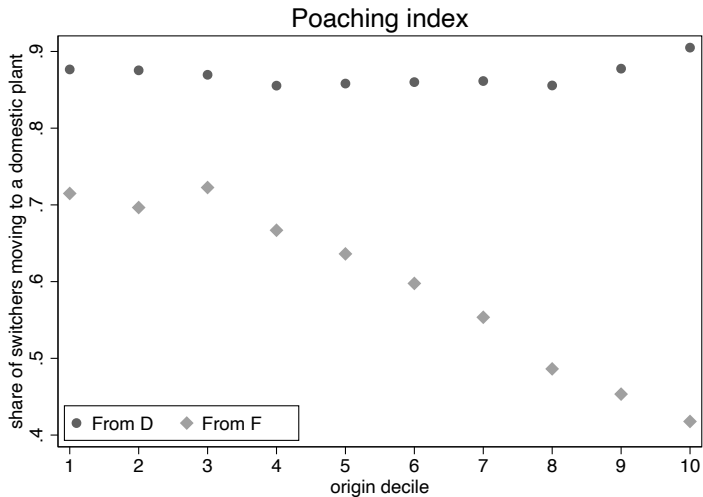
- ▶ Worker heterogeneity and assortative matching
- ▶ Are there two job ladders?

# Worker heterogeneity and assortative matching

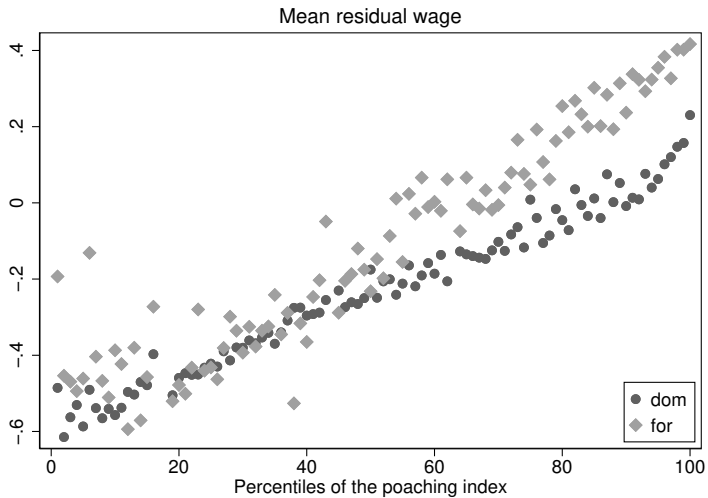




## Are there two job ladders?



## Are there two job ladders?



## Reduced form evidence

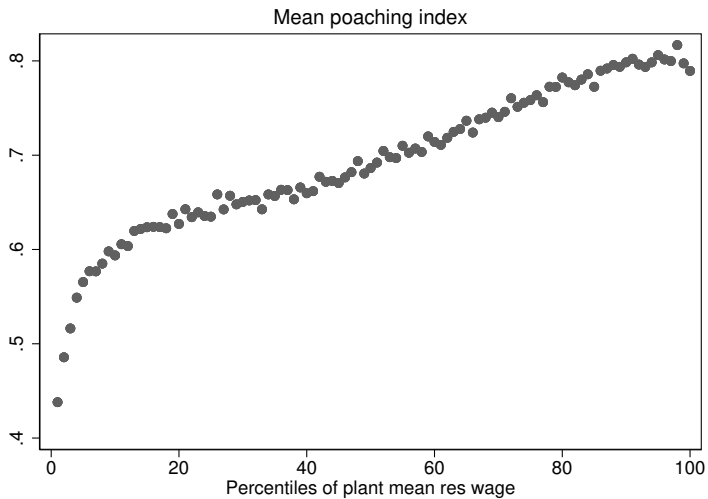
Alfaro-Ureña, Manelici & Vasquez (2021)

- ▶ Bigger wage gains for DM transitions than DD or MD
- ▶ Find positive impact of multinational presence in local labor market (instrumented) on wages of those employed at domestic firms
- ▶ Insufficient college workers to distinguish effects for high and low skill groups

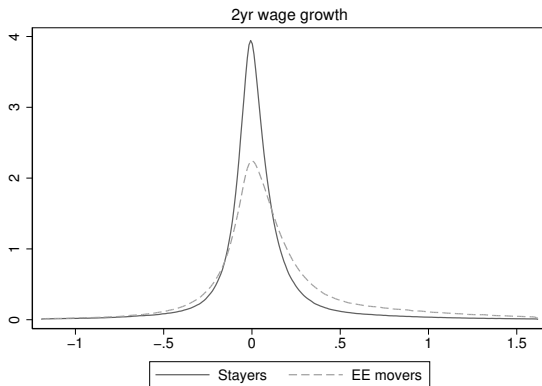
Setzler & Tintelnot (2021)

- ▶ Find multinational presence in a local labor market (instrumented) increases wages for those employed at domestic firms
- ▶ Increase is bigger for high-paid workers (do not observe education)
- ▶ Employment at domestic firms also increases

## Poaching rank and wage rank positively correlated

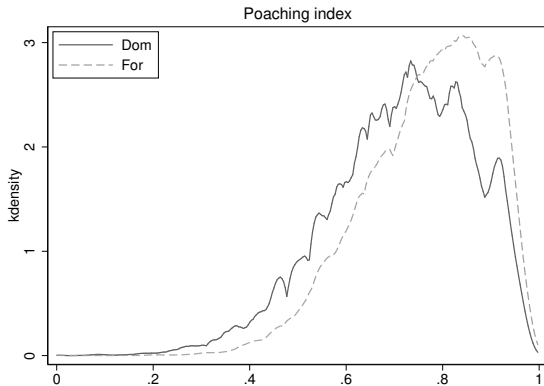


## Job-to-job transitions drive wage growth



	p25	p50	p75	Mean	sd	N
Stayers	-0.06	0.01	0.10	0.03	0.27	5,311,167
EE movers	-0.07	0.05	0.24	0.13	0.39	987,974

## Poaching index distribution by ownership



	p25	p50	p75	Mean	sd	N
Domestic	0.62	0.73	0.82	0.71	0.15	403,629
Multinational	0.68	0.79	0.87	0.77	0.13	50,977