

# Domestic Networks and the Geography of Multinational Production

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## Motivation

- Follow FDI : a supplier establishes a foreign affiliate in a destination country after (or in response to) a lead firm (typically a multinational customer) setting up operations in that country → replicating the supply chain abroad.
- Anecdotal evidence but not much research.  
*“Toyota Motors Thailand (TMT), tightly controlled by the giant automaker in Japan, did not rely on non-Japanese suppliers to supply any of the critical components for vehicles it assembled there in the late 1990s.” (Hatch, 2005)*
- This paper: How domestic production networks shape the geography of multinational production.

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The extent of Japanese companies' involvement in Mexico's auto industry is visible at Ashimori Industry's factory on a vast industrial park in Guanajuato state, 400km north-west of Mexico City.

A group of mostly female workers clad in baseball caps and gloves lean over workstations at the plant, in the heartland of Mexico's auto industry. They are assembling tiny plastic and metal parts for seatbelt safety mechanisms.

Ashimori, a Japanese car-parts manufacturer, set up the factory in 2012, shortly before Mazda began production at a nearby vehicle assembly plant. The facilities are part of the Japanese auto industry's \$18bn of investment in Mexico, both in vehicle final assembly and component manufacturing. The decisions were made based on low labour costs and unfettered access to the US market. The Ashimori workers also make airbags, sun shades and other components for Honda, Mazda and other big manufacturers.

# Motivation

- **20% of affiliate sales** go to other affiliates in local market from the same source country (using Japanese data).
- Far reaching implications:
  - ▶ Suggests FDI decisions interdependent.
  - ▶ Local sales  $\neq$  horizontal FDI - challenge existing models and empirical findings.
  - ▶ Source city:
    - ★ Domestic production networks shape firms' decisions to engage in FDI.
    - ★ Entry in foreign markets depends on existence of domestic customers/suppliers.
  - ▶ Destination city:
    - ★ FDI  $\uparrow\uparrow$  if follow FDI is strong (e.g., employment effect of inward FDI promotion programs).
    - ★ Spillovers to local economy  $\downarrow$  if few interactions with local firms.

## What we do

- Novel stylized facts on follow FDI using Japanese MNE (BSOBA) and production networks data (TSR).
- Do domestic suppliers follow their multinational customers abroad?
  - ▶ Identify firms that start selling to an MNE in the domestic production network.
  - ▶ Measure the likelihood of them becoming MNEs themselves.
- Mechanisms (in progress)

## Literature

- Determinants of MNE entry: Bernard et al (2018), Helpman et al (2004), Irarrazabal et al (2013), Tintelnot (2017).
- MNEs & domestic production networks: Alfaro et al (2022), Amiti et al (2024).
- MNEs and spatial clustering: Head et al (1995), Setzler and Tintelnot (2021), Yamashita et al (2014).
- Follow FDI case studies: Hatch (2005), Moriuchi et al (2025) (International business literature).

## Data : BSOBA

Basic Survey on Overseas Business Activities (BSOBA) by METI.

- Firm-level census of Japanese MNEs and their foreign subsidiaries (1996-2022).
- Headquarters: id, name, address, industry, sales, exports, # of employees.
- Foreign subsidiaries: id, subid, country, industry, year of entry, capital, capital ratio, # of employees, total payment to employees,
  - ▶ Composition of sales and purchases (2010-2022): local (local, **Japanese**, other), Japan (parent, other), other (na, asia, euro, other))
  - ▶ Sales to local Japanese firms: transaction between Japanese foreign subsidiaries.

## Data : TSR

### TSR:

- Firm-to-firm domestic production network (binary), 2007-2021.
  - ▶ Around 1,000,000 firms are included each year.
- 99% of foreign subsidiaries in BSOBA are merged to TSR firms.

## Fact I : Few MNEs, but many firms are connected to them

Table: Descriptives

	All	Manufacturing
MNEs	0.6%	2.7%
Firms with MNE customer(s)	21.1%	37.2%
Firms with MNE supplier(s)	18.6%	22.4%
# customers (average)	4	2
# suppliers (average)	4	2
# customers for MNEs (average)	71	18
# suppliers for MNEs (average)	92	38

Notes: Year 2014. Population is all firms in TSR. Manufacturing restricts the sample to manufacturing firms.

## Fact II : MNE status is correlated in the production network

Table: MNE status correlation matrix

	MNE	Customer MNE	Supplier MNE
MNE	1		
Customer MNE	0.13	1	
Supplier MNE	0.05	0.08	1

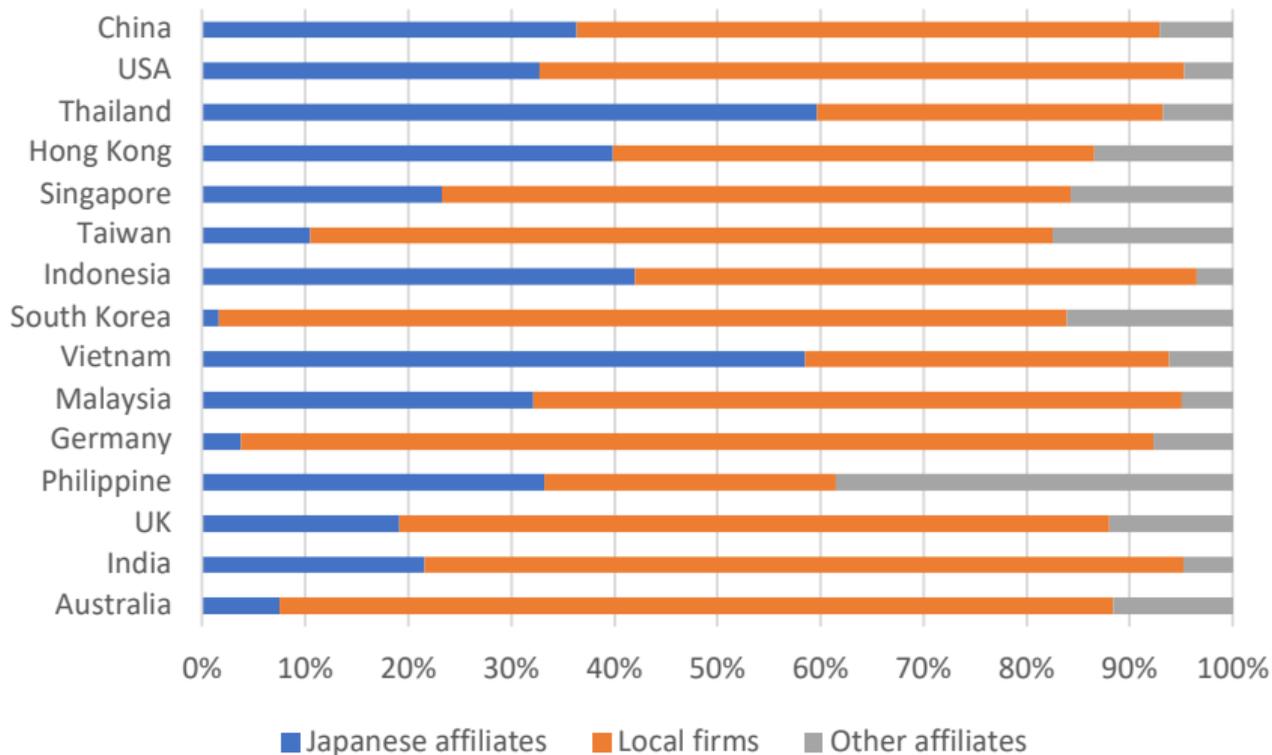
Notes: Year 2014. Population is all firms in TSR.

Table: MNE status regressions

Dep. variable: MNE dummy	All	Manufacturing
MNE customer	0.016*** (0.000)	0.0414*** (0.000)
MNE supplier	0.0140*** (0.000)	0.04181*** (0.000)
Obs	9,408,202	1,194,098
Industry-prefecture-year fixed effects	Yes	Yes

Notes: Years 2014-2022. Standard errors in parentheses. Industry codes are 2-digit JSIC codes.

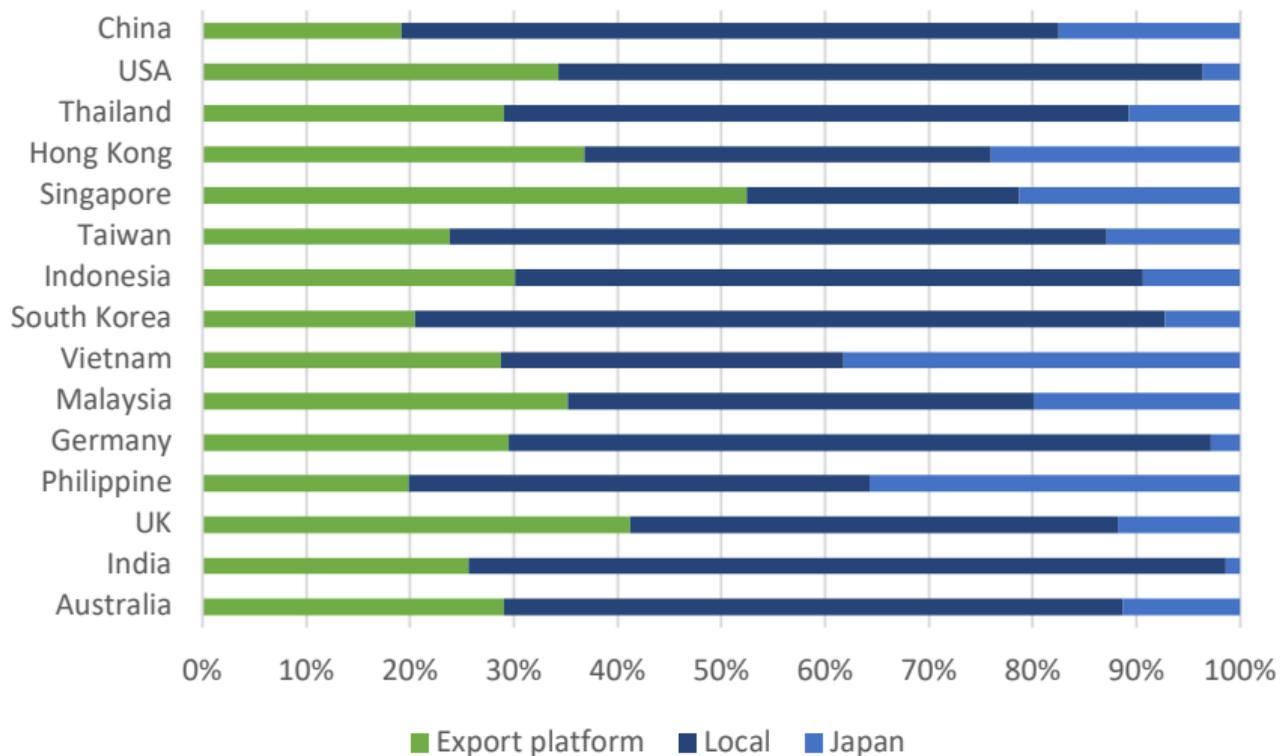
## Fact III : 1/3 of local affiliate sales go to other Japanese MNEs



Share of purchases also 1/3.

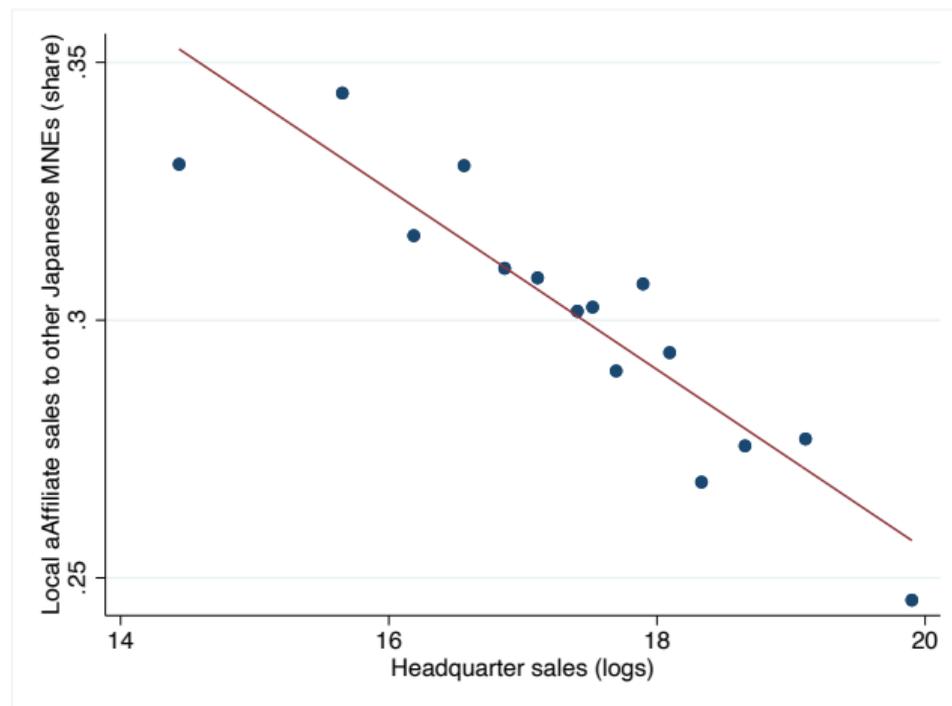
## Fact III

..and 55% (50%) of affiliate sales (purchases) go to the local market



## Fact IV : Follow FDI firms are smaller at home

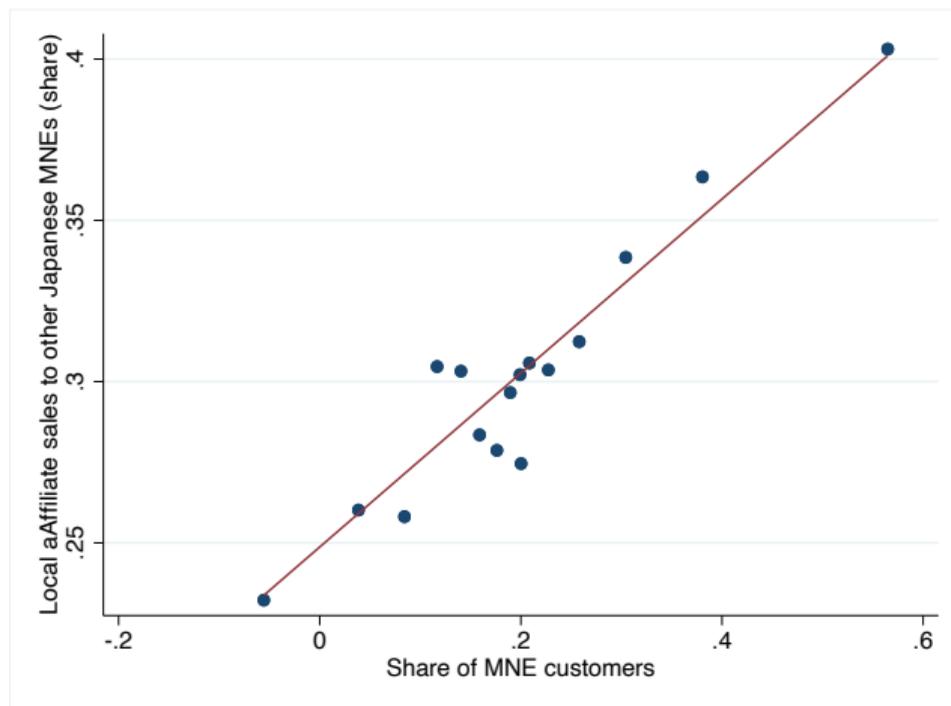
- Lower headquarter sales are associated with a higher share of affiliate sales going to other JP affiliates



Notes: Year 2014. The binned scatterplots group firms into 20 equal-sized bins by log headquarter sales, and compute the mean of the variables on the x- and y-axes in each bin. The dependent variable is the share of affiliate sales sold to other Japanese affiliates in that market. All variables are demeaned by country and JSIC 2-digit industry averages.

## Fact IV : Follow FDI firms are smaller at home

- ..and more home MNE customers associated with a higher share of affiliate sales going to other JP affiliates



Notes: Year 2014. The binned scatterplots group firms into 20 equal-sized bins by the share of domestic MNE customers, and compute the mean of the variables on the x- and y-axes in each bin. The dependent variable is the share of affiliate sales sold to other Japanese affiliates in that market. All variables are demeaned by country and JSIC 2-digit industry averages.

## Empirical strategy

- Event study: Impact of becoming a first-time supplier to an MNE between 2014 and 2022.
- Population:
  - ▶ Firms that become a first-time supplier to an MNE.
  - ▶ Firms that never sell to MNEs.
  - ▶ Drop firms that always sell to MNEs.

Table: Event study sample

	All			Manufacturing		
	# firms	Avg. sales	Avg. # workers	# firms	Avg. sales	Avg. # work
Treatment firms	126,888	1,800,000	30	26,451	972,000	29
Control firms	957,190	744,000	20	70,892	293,000	12

Notes: Sales are measured in 1000s yen.

## Firm-level event study : Details

- Estimate

$$y_{it} = \alpha_i + \lambda_{spt} + \sum_{k=-4}^4 \theta_k D_{it}^k + \epsilon_{it}$$

- $y_{it}$  is  $I$  [ $i$  is MNE].
- $\alpha_i$  is firm fixed effect.
- $\lambda_{spt}$  is industry-prefecture-calendar year fixed effect.
- $D_{it}^k$  is event-time dummies:

$$D_{it}^k = 1 [t = \tau_i + k], k \in (-4, 4)$$

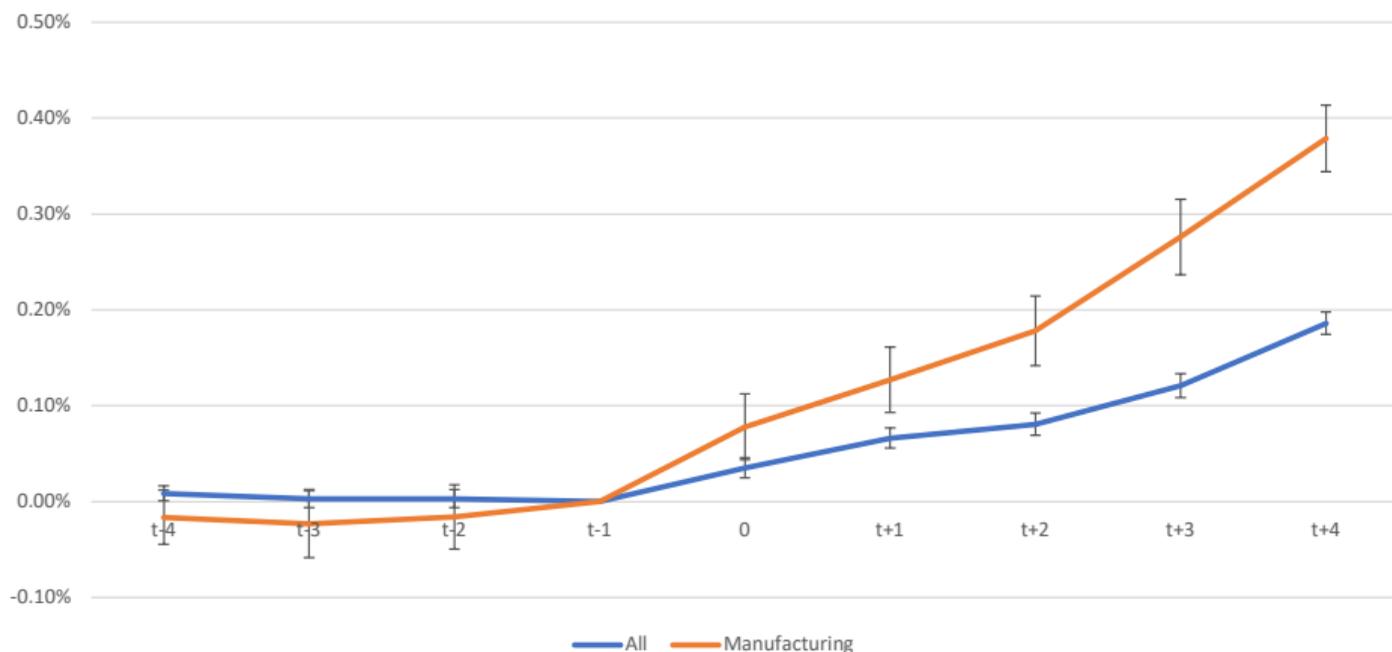
$$D_{it}^4 = 1 [t \geq \tau_i + 4]$$

$$D_{it}^{-4} = 1 [t \leq \tau_i - 4]$$

where  $\tau_i$  is the first year when firm  $i$  sells to an MNE (absorbing state).

- Identification assumption: firms yet to supply MNEs and firms that started to supply in earlier years form a credible counterfactual for firms that start supplying to MNEs (after controlling for time-invariant differences in sector-prefecture-year shocks).

# Results



Notes: Standard errors clustered at 2-digit industry-prefecture level. Vertical bars are 95% confidence bands.

0.2pp increase in likelihood being MNE.

Likelihood of MNE  $\uparrow$  33% (share of MNEs 0.6%  $\rightarrow$  0.8%).

## Firm-country event study

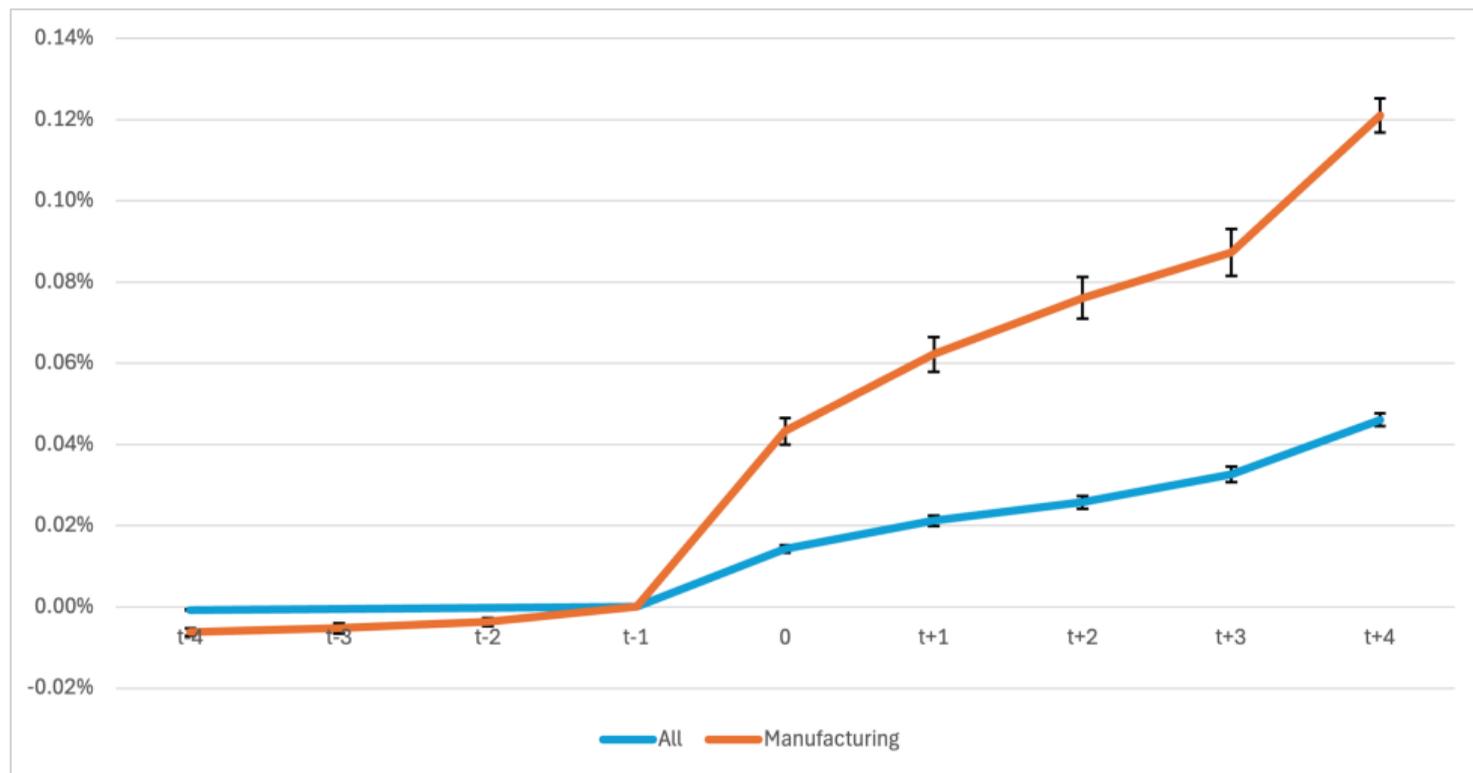
- Concern: High-growth firms may simultaneously (i) attract MNE customers and (ii) start foreign expansion.
- Solution: Firm-destination analysis - firm gets a customer that is an MNE in country  $c$ .
- Firm-year FE controls for any firm-level time-varying shocks.
  - ▶ Identification comes from cross-country variation in customer exposure.
- Estimate

$$y_{ict} = \alpha_{it} + \lambda_{sp} + \sum_{k=-5}^5 \theta_k D_{ict}^k + \epsilon_{ict}$$

## Firm-country event study : zeroes

- If we include all  $(i, c)$  pairs with  $D_{ict} = 0$ , the data set explodes.
- Solution:
  - ▶ Randomly draw 5% from the set of firm-country observations with  $D_{ict} = 0$ , and add them to the sample.
  - ▶ Weight these observations with the inverse of the sampling probability.
  - ▶ Restrict to countries with  $> 10$  MNEs (55 countries)
  - ▶ We get 118 mill observations.

## Results

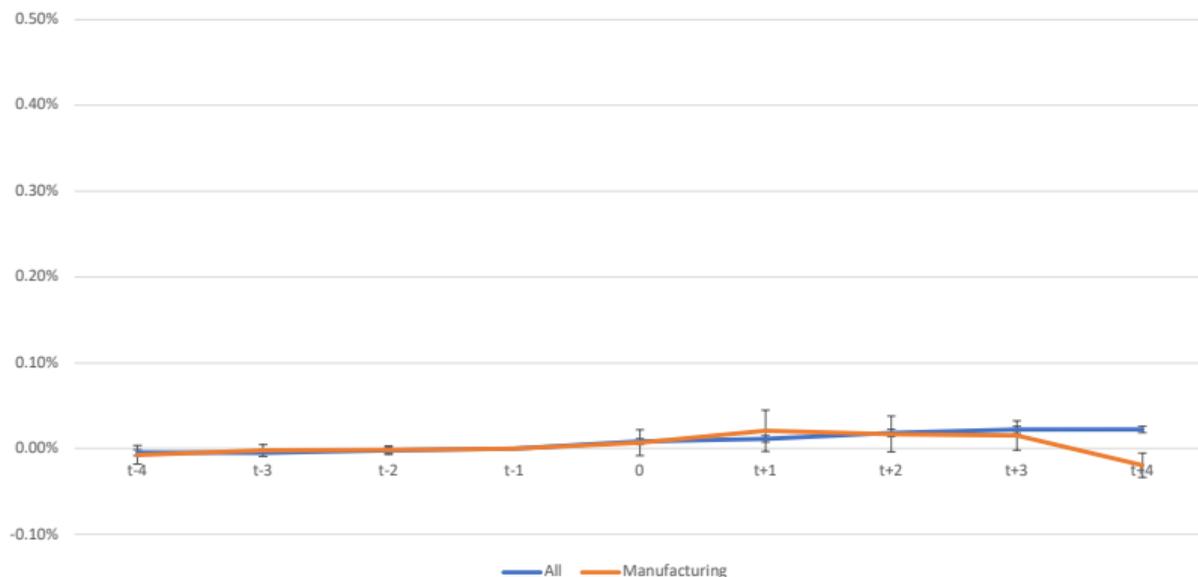


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Firm-year FE absorbs all firm growth.

## Robustness : Placebo

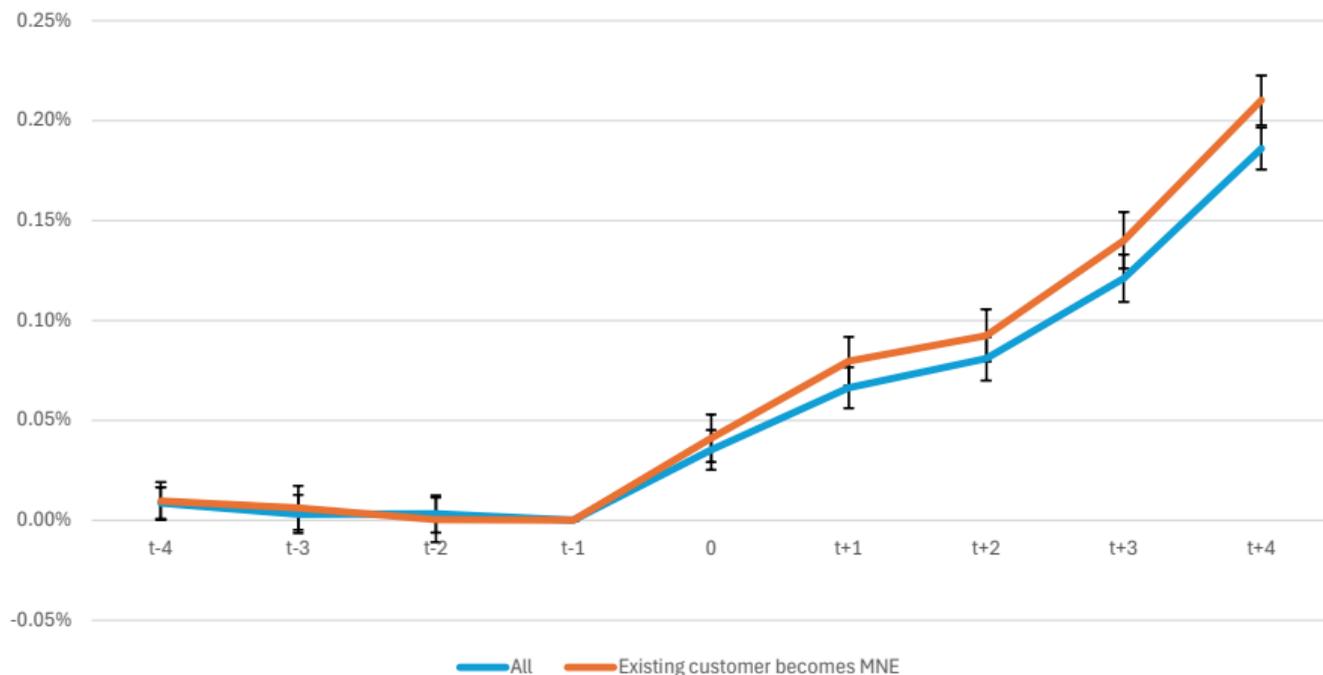
- Are results driven by selling to an MNE or selling to a big firm?
- Alternative event: Firms starting to sell to a large firm, defined as  $\geq$  average size of MNE log sales (& non MNE).
- Control group: firms that never start selling to large firm (& never to MNE)



Notes: Standard errors clustered at 2-digit industry-prefecture level. Vertical bars are 95% confidence bands.

## Robustness: Existing customer becomes MNE

- Treatment: Events where an existing customer becomes an MNE - intuitively more exogenous.



Notes: Standard errors clustered at 2-digit industry-prefecture level. Vertical bars are 95% confidence bands.

## Model & Mechanisms

- Geographic proximity + inputs/suppliers not easily substitutable.
  - ▶ Transport costs / logistics, to customer
  - ▶ Information / learning.
  - ▶ Transaction costs / coordination.
  - ▶ Less uncertainty (e.g. certain demand).
- Specification with firm-year fixed effects suggest mechanisms are *market-specific*.

## Model sketch

- Lead firm has a fixed supplier.
- Supplier faces trade costs  $\tau$  when exporting and fixed cost  $F$  when MP.
- What happens to the incentives of the supplier when the lead firm exogenously moves abroad?

## Model : Lead firm

- Lead firm Cobb-Douglas production function

$$Y = A l^\alpha z^{1-\alpha},$$

where  $l$  is labor and  $z$  is effective inputs from supplier.

- If both firms move:  $z = x$ . If only lead firm moves:  $z = x/\tau$ .
- Result: If supplier stays at home, lead firm's optimal demand for  $x$  is reduced by

$$x_{stay}^* = x_{move}^* \tau^{-(1-\alpha)}$$

## Model : Supplier

- Profit when move

$$\pi^{move} = (p - c) x_{move}^* - F$$

- Profit when stay

$$\pi^{stay} = (p - c) x_{stay}^* = (p - c) x_{move}^* \tau^{-(1-\alpha)}$$

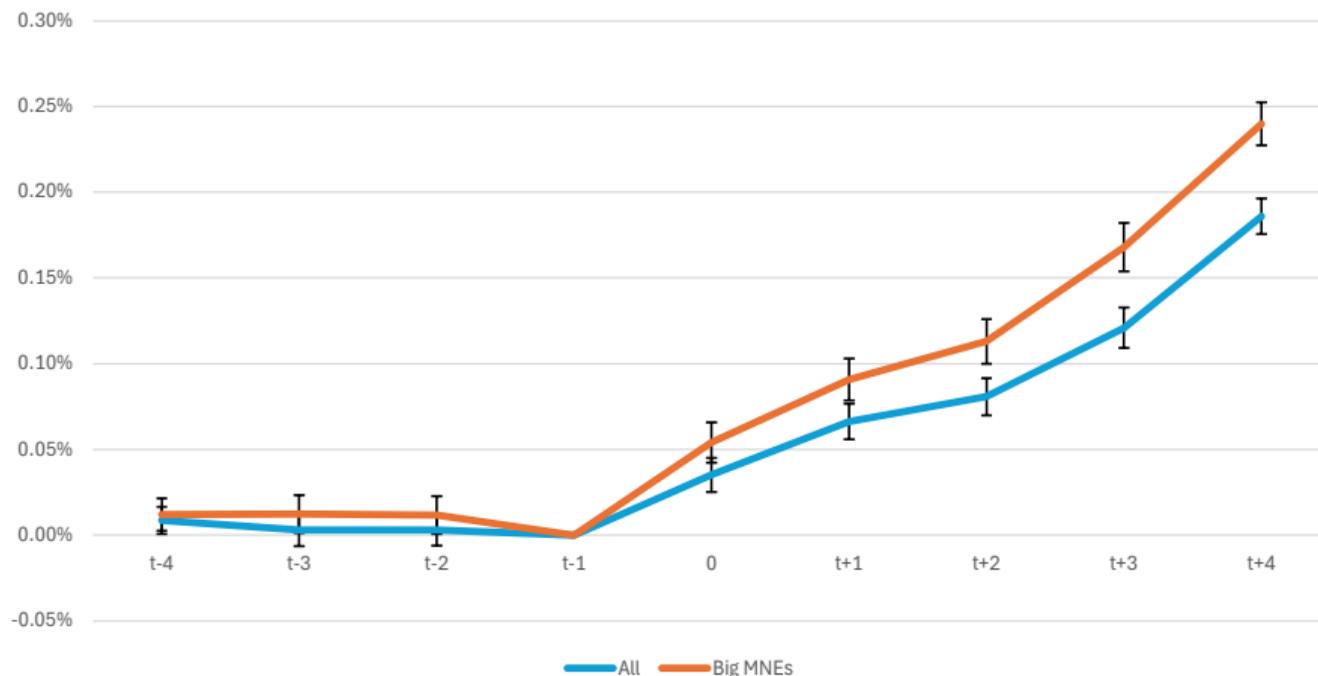
- Supplier will follow when  $\pi^{move} > \pi^{stay}$ , or

$$x_{move}^* (p - c) \left[ 1 - \tau^{-(1-\alpha)} \right] > F$$

- Testable predictions of the model: Follow FDI more likely when
  - ▶ Customer demand high, or high customer mark-up.
  - ▶ Customer input share high.
  - ▶ Trade costs  $\tau$  high / fixed costs low.

## Prediction I: High input demand

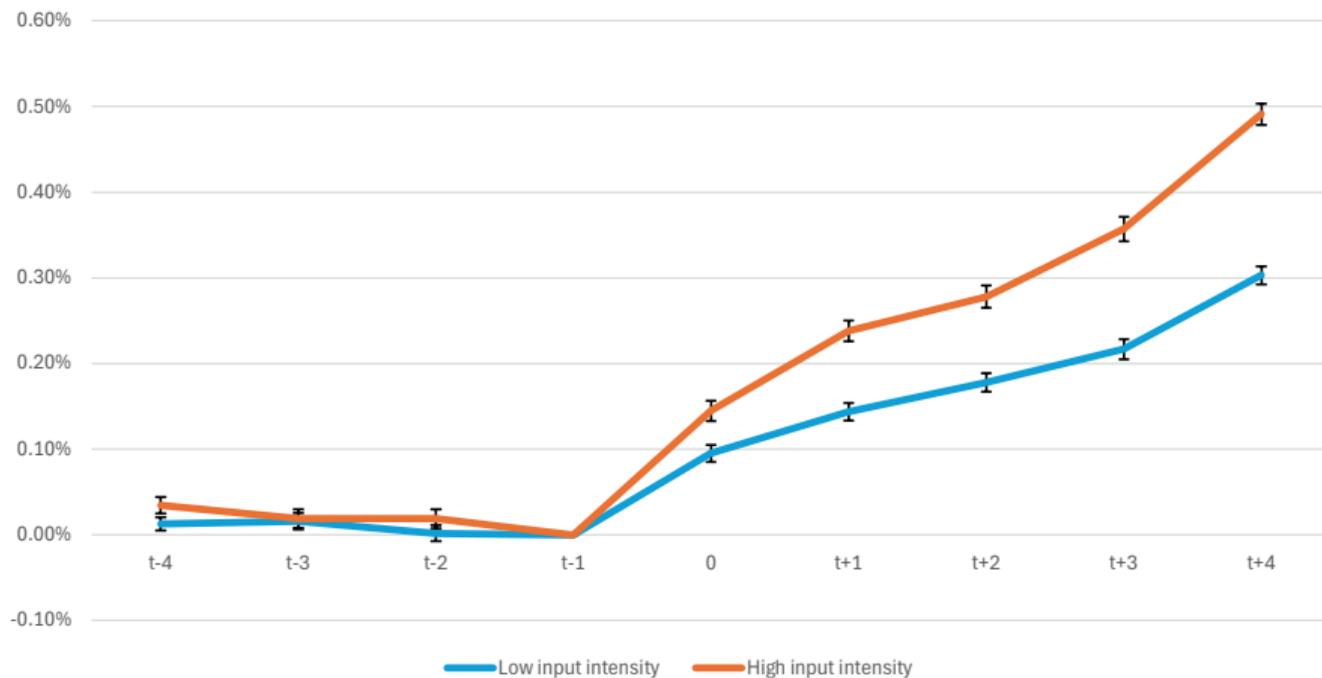
- Do not observe demand directly but we observe the size of the customer.
- Treatment: First-time supplier to a top 25% MNE.



Notes: Standard errors clustered at 2-digit industry-prefecture level. Vertical bars are 95% confidence bands.

## Prediction II: High input share of customer

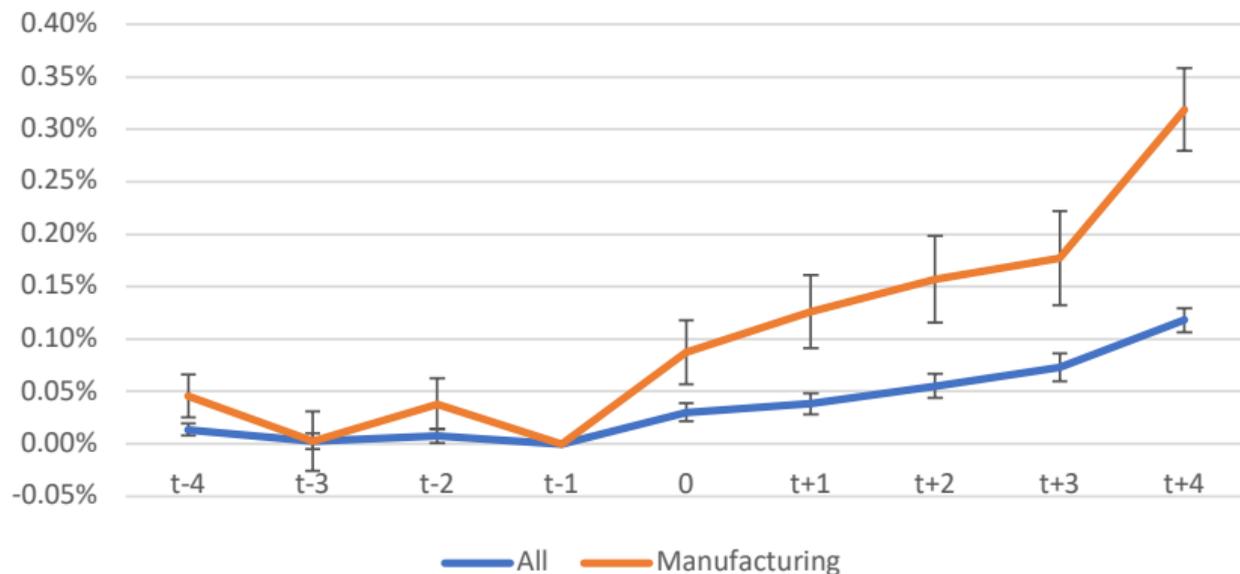
- Measure intermediates/sales by 2-digit industry.
- Treatment: First-time supplier to a top 25% input-intensity MNE.



Notes: Standard errors clustered at 2-digit industry-prefecture level. Vertical bars are 95% confidence bands.

## High- vs low follow FDI countries

- Using firm-country sample, restrict to countries where follow FDI is high (>40% of affiliates of manufacturing firms have “local Japan” ratio > 30%).



Notes: Standard errors clustered at 2-digit industry-prefecture level. Vertical bars are 95% confidence bands.

Point estimates  $\uparrow$  50% compared to baseline.

# Conclusions

- Domestic production networks shape global production networks.
  - ▶ Large proportion of affiliate sales (purchases) go to other JP MNEs in the same market.
- Event studies confirm a casual link between serving an MNE at home and starting as an MNE yourself.
  - ▶ Four years later, MNE probability is up 33%.
- Firms & MNEs are not islands.
  - ▶ FDI is network-dependent.
  - ▶ Implications for industrial policy & FDI promotion.

## Appendix : Drop never-MNEs

Table: Robustness: Drop Never-MNEs

	Baseline		No never-MNEs	
t-4	0.01	(0.01)	0.07	(0.02)
t-3	0.00	(0.01)	0.03	(0.01)
t-2	0.00	(0.01)	0.02	(0.01)
t-1	0	0	0	0
0	0.04	(0.01)	0.03	(0.01)
t+1	0.07	(0.01)	0.03	(0.01)
t+2	0.08	(0.01)	0.04	(0.02)
t+3	0.12	(0.01)	0.06	(0.02)
t+4	0.19	(0.01)	0.09	(0.03)
n	7,718,288		880,791	

Notes: Coefficients are multiplied by 100. Standard errors clustered at 2-digit industry-prefecture level.