Productivity Effect of Cross Border M&As:

Evidence from Japan*

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Outline

- Motivation
- Theoretical Underpinnings
- Econometric Strategy
- Data
- Results

Motivation

- The promise that foreign investors will bring in productivity-improving technology is often used by governments to justify policies aimed at attracting multinational firms.

- Various incentives such as grants, tax breaks, and subsidies are often laid out for foreign companies seeking to establish production facilities in the host country.

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Motivation

- Blomström and Kokko (1998) identified three avenues through which productivity improvements from multinational companies can occur:
    1. the movement of skilled workers from the investing country to the host country;
    2. the relationship between the affiliate company and the parent company, and
    3. through competition induced by the entry of the foreign firm.

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Motivation

- A large number of studies have found that multinational firms are, indeed, more productive than domestic firms
  - i.e. R.Caves (1996); Dunning (2013); Globerman, Ries, and Vertinsky (1994); Doms and Jensen (1998); Girma, Thompson, Wright, et al. (2002)
- Many of the previous studies do not distinguish between the two (2) way multinational firms can enter the ah host country:
  - Greenfield foreign direct investments
  - Mergers and Acquisitions

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Motivation

- Drawing causality between cross border M&As and productivity proves to be difficult.

- Foreign firms may choose acquire domestic firms that are already productive.

  "Cherry picking"

- Foreign firms may choose to acquire domestic firms with failing financial conditions.

  "Fire sale"

Motivation

- This paper aims to determine if cross border M&As causes productivity gains for firms in Japan.
  - Differences-in-difference approach is combined with propensity score matchings
  - Foreign-acquired firms were compared with a control group of domestic-acquired firms
  - The identification strategy was applied to three alternative estimates of productivity (TFP)
  - The identification strategy was applied the two major industry groups: agriculture-industry and services

Motivation

Why Japan?

- Japan has the second fastest TFP growth rate among the developed countries in the OECD database.

- However, it ranks 21st in terms hosting FDI stocks.

- It is easy to discount the role FDI in Japan's growth story.

- Does the entry of FDI play a role in the productivity growth of Japan?

- Do FDIs benefit developed countries?

Theoretical Underpinnings

- The relationship between multinational firms and productivity is often described in a heterogenous firms setup.

- Helpman, Melitz, and Yeaple (2004)
  - An extension of Melitz (2003)

Theoretical Underpinnings

- Consider the profit functions of firms serving the domestic market, indexed by *D,* and exporters, indexed by *E*:

$$\pi_D(\varphi) = B\varphi_D^{1-\partial} - f_D$$

$$\pi_E(\varphi) = B\tau^{1-\partial}\varphi_E^{1-\partial} - f_E$$

Where π is the firm's profit, $\varphi^{1-\partial}$ is the firm's productivity, τ is an iceberg trade cost, *B* is a constant and is a function of the elasticity of substitution σ.

f_D is the fixed cost of serving the domestic market and f_E of serving the export market. Note that $f_E > f_D$

Theoretical Underpinnings

- The zero profit condition implies that the cut off level of productivity for firms serving the domestic market serving the export market would be:

$$\varphi_D^{1-\partial} = \frac{f_D}{B}$$

$$\varphi_E^{1-\partial} = \frac{f_E \tau^{\partial-1}}{B}$$

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Theoretical Underpinnings

- Helpman, Melitz, and Yeaple (2004) highlights a third option, where firms can enter the foreign market through the establishment of an affiliate firm. The firm's profit function would be:

$$\pi_I(\varphi) = B\varphi_I^{1-\partial} - f_I$$

Where $f_I = f_D + f_E$. The zero profit condition implies a productivity cut off:

$$\varphi_I^{1-\partial} = \tau^{1-\partial}\varphi_X^{1-\partial} + \varphi_D^{1-\partial}$$

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Theoretical Underpinnings

- This implies that multinational firms are more productive than domestic firms and exporters

- How about the affiliate firms?
  - Are there spillover effects from parent companies to affiliate firms?
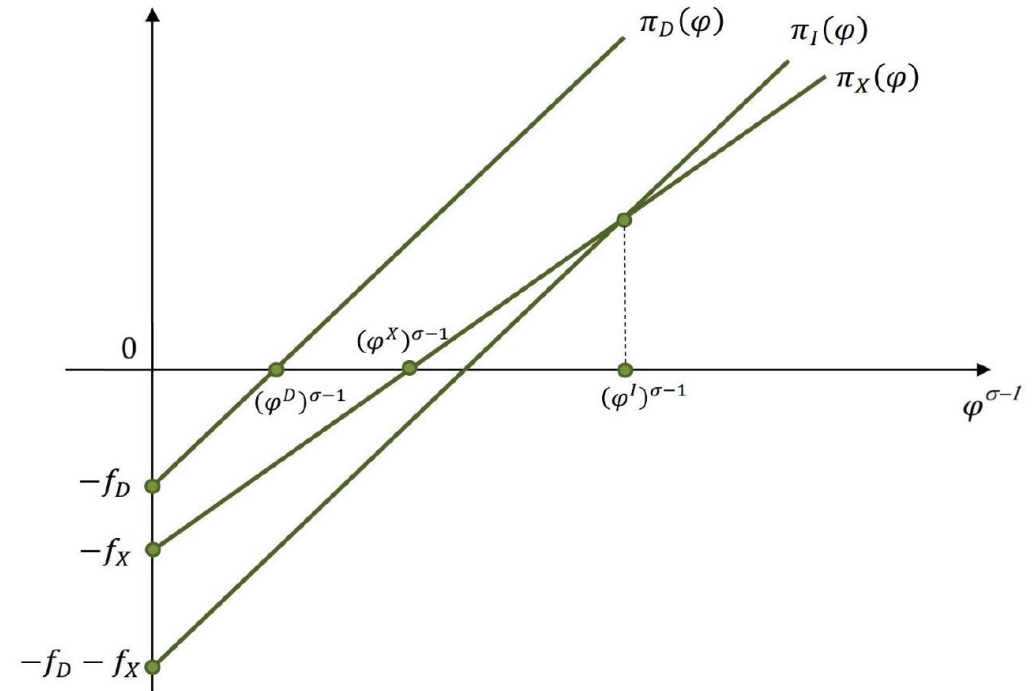
Figure 1: Profits of multinational companies, exporters and domestic firms as a linear function of productivity. The diagram is lifted from "Multinational Firms and the Structure of International Trade" by Antràs and Yeaple (2014).

Theoretical Underpinnings

Nocke and Yeaple (2007)

- Multinational firms entering the host country through Greenfield FDI would always be more productive than firms serving the domestic market.

  - For industries that are intensive in *mobile capability*
    - Multinational firms are more efficient than exporters and firms serving the domestic market

  - For industries that are intensive in *non-mobile capability*
    - Multinational firms are less efficient than exporters and firms serving the domestic market

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Econometric Strategy

- The obvious endogeneity makes it difficult to determine the causal effect of M&As on productivity.
- To address this, we employ two strategies:
  - Differences-in-Differences
  - Propensity Score Matching

Econometric Strategy

- The **differences-in-differences (DID)** estimator was employed with he intention of purging the time-invariant the causes the endogenous relationship between foreign acquisitions and productivity.

$$\Delta\varphi_{itj} = \alpha + \tau^D\big(f_{ij} \times a_t\big) + \delta X_{itj} + \mu_j + \gamma_t + \varepsilon_{ijt}$$

Where φ_{itj} is the total factor productivity of firm *i* of industry *j* at time *t*; f_{ij} are foreign acquired firms at time a_t; μ_j is a vector of industry-specific factor affecting tfp; is a vector of γ_t of time shocks; X_{itj} is a matrix of firm and time varying covariates; ε_{ijt} is the stochastic error term; and α, δ, and $\boldsymbol{\tau^D}$ are parameters to be estimated in the model.

Econometric Strategy

- **Propensity score matching** would allow the comparison of firms with the same probability of being acquired. The average productivity effect of foreign M&As would be calculated as follows:

$$\tau^M = \sum_{f \in A} \varphi_{itj} - \sum_{c \in C} \psi(\phi_f, \phi_c)\varphi_{itj}$$

where ϕ_f is the predicted probability of firms in the foreign-acquired cohort; ϕ_c is the predicted probability of firms in the control group; φ_{itj} is the level of TFP; and $\psi(.)$ is a function that assigns weights to the counterfactual cohort.

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Econometric Strategy

- DiD would be combined with the matching estimator.

$$\tau^{DM} = \sum_{f \in A} \Delta\varphi_{itj} - \sum_{c \in C} \psi(\phi_f, \phi_c)\Delta\varphi_{itj}$$

where ϕ_f is the predicted probability of firms in the foreign-acquired cohort; ϕ_c is the predicted probability of firms in the control group; φ_{itj} is the level of TFP; and $\psi(\cdot)$ is a function that assigns weights to the counterfactual cohort.

Econometric Strategy

- Productivity of foreign acquired firms would be compared with a control group composed of domestic acquired firms.

- Causal effect would be estimated for two major industry groups: agriculture-industry and services

- As a robustness check: identification strategy would be applied to three different productivity estimates:
  - **Levinshon and Petrin (2003)**
  - Fixed Effects
  - Caves et. al. (1983)

Data

- We utilized a unique dataset that was created by combining:
  - **Orbis dataset:** provides information on the firm's financial and operating conditions.
  - **Zephyr dataset:** provides information on timing, value, status, and stakeholders of mergers and acquisitions.
- Both databases are published by Bureau van Dijk
- A panel of 2,969,724 firms from 2012 to 2017

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Data

Table 1: No. of completed M&As in Japan from 2012 to 2017

Year	Number of M&As			Percent (%) to Total		
	Foreign	Domestic	Total	Foreign	Domestic	Total
2017	158	2,526	2,684	5.9	94.1	100
2016	197	2,903	3,100	6.4	93.6	100
2015	365	4,368	4,733	7.7	92.3	100
2014	330	3,721	4,051	8.1	91.9	100
2013	179	2,437	2,616	6.8	93.2	100
2012	170	2,698	2,868	5.9	94.1	100
All Years	**1,399**	**18,653**	**20,052**	**7.0**	**93.0**	**100**

Source of basic data: Zephyr database
*Figures may not add up due to rounding.

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Data

Table 2: Summary statistics of basic data for the pooled data set from 2012 to 2017

	Foreign-Acquired			Domestic-Acquired			Not Acquired		
	Obs	Mean	Standard Error	Obs	Mean	Standard Error	Obs	Mean	Standard Error
Operating revenues	797	2,939,409	371,929	8,079	1,989,863	105,353	2,203,374	33,433	496
Sales	708	3,024,400	379,581	6,967	2,084,326	117,579	942,238	47,871	852
Labour	729	6,941	664	7,123	5,190	240	1,136,171	97	2.0
Profit margins	729	6.6	0.6	7,093	6.8	0.2	945,017	2.9	0.0
ROE	724	8.4	1	7,090	9.5	0.6	844,947	18.9	0.1
Fixed assets	708	2,426,157	492,328	6,956	1,539,485	123,497	902,277	29,046	1,105
Compensation	57	31,750	8,500	1,216	17,962	4,329	814,245	1,599	36
R&D	632	94,371	17,446	5,308	63,198	5,779	137,008	2,739	179
Total assets	737	9,725,738	3,830,889	7,224	8,115,109	1,000,069	946,644	237,204	15,520
Liabilities	632	3,339,566	731,913	5,252	2,147,627	186,282	13,586	1,098,506	54,280
age	878	42.6	1	9164	38.5	0.3	2,959,682	29.4	0

Source of basic data: Orbis database

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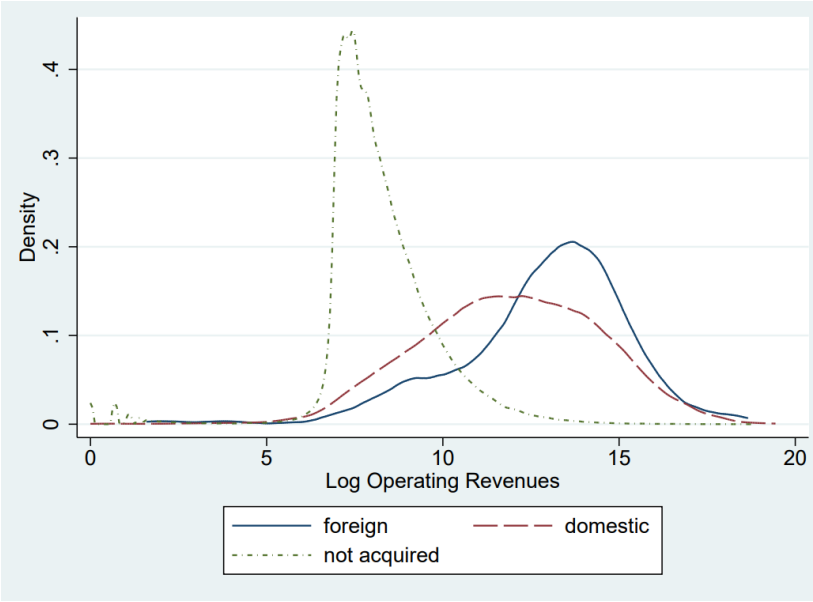
Data

(a)
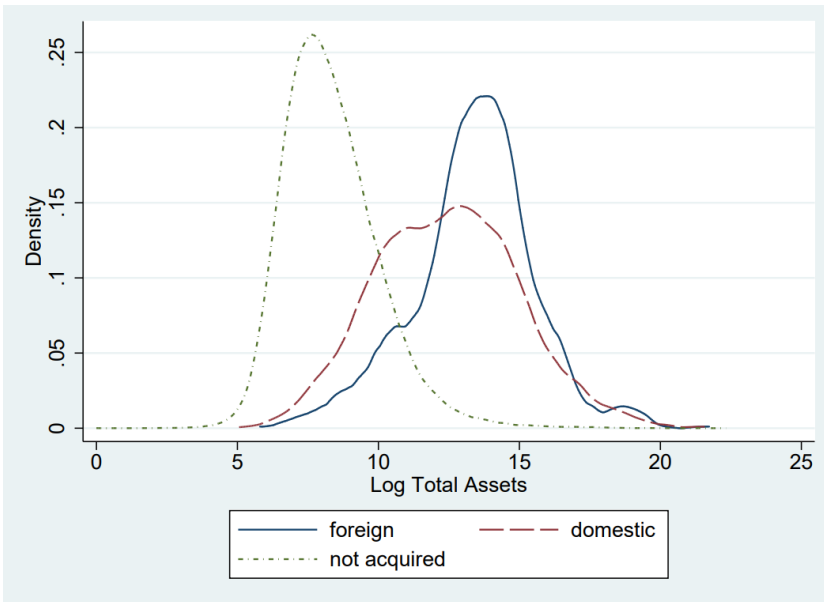
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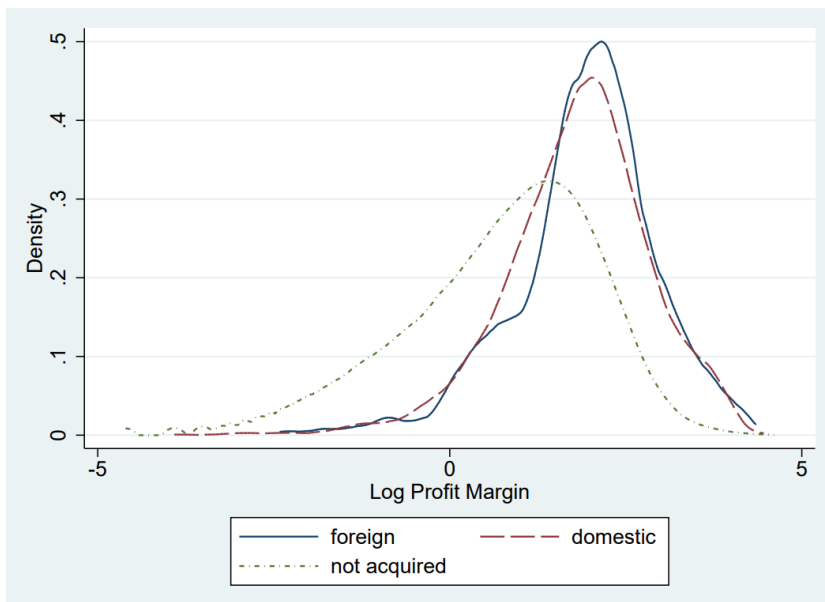
(c)

Figure 1: Kernel distribution of operating revenues, total assets, and profit margins for the pooled dataset (2012 to 2017)
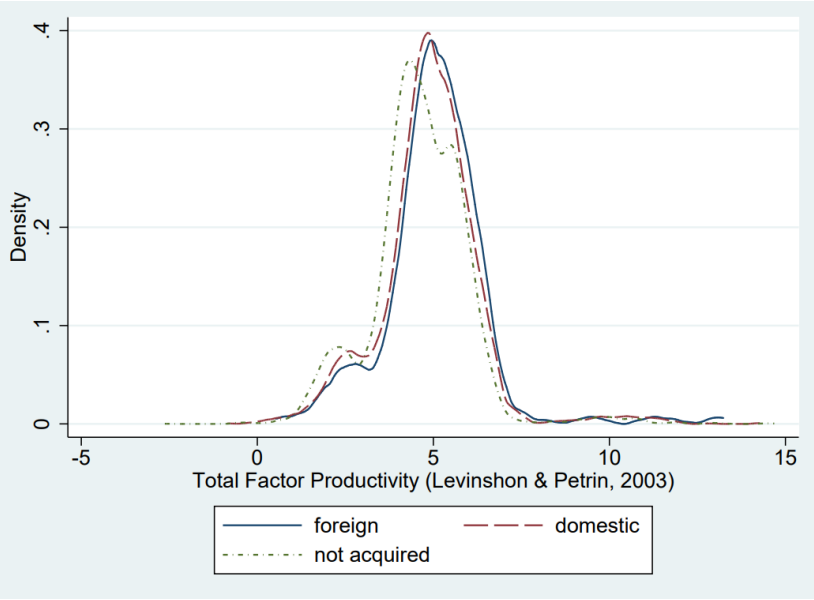
Data

## Table 3: Summary statistics of the estimated TFP from 2012 to 2017 (pooled)

|	Foreign-Acquired			Domestic-Acquired			Not Acquired		
	Obs	Mean	Standard Error	Obs	Mean	Standard Error	Obs	Mean	Standard Error
Panel A: All firms									
Levinshon and Petrin (2003)	606	5.1	0.06	4,876	4.9	0.02	12,897	4.6	0.01
Fixed Effects	606	0.4	0.04	4,876	0.2	0.01	12,897	-0.1	0.01
Caves (1982)	606	2.1	0.04	4,876	2.1	0.02	12,897	2.1	0.01
Panel B: Agri-Industry									
Levinshon and Petrin (2003)	354	4.7	0.05	2,555	4.5	0.02	6,996	4.2	0.01
Fixed Effects	354	0.4	0.04	2,555	0.3	0.02	6,996	-0.1	0.01
Caves (1982)	354	2.0	0.04	2,555	2.0	0.01	6,996	1.9	0.01
Panel C: Services									
Levinshon and Petrin (2003)	252	5.6	0.12	2,321	5.3	0.03	5,901	5.1	0.02
Fixed Effects	252	0.3	0.06	2,321	0.2	0.02	5,901	-0.1	0.01
Caves (1982)	252	2.3	0.09	2,321	2.2	0.03	5,901	2.3	0.02

Source of basic data: Orbis database

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Data

(a)
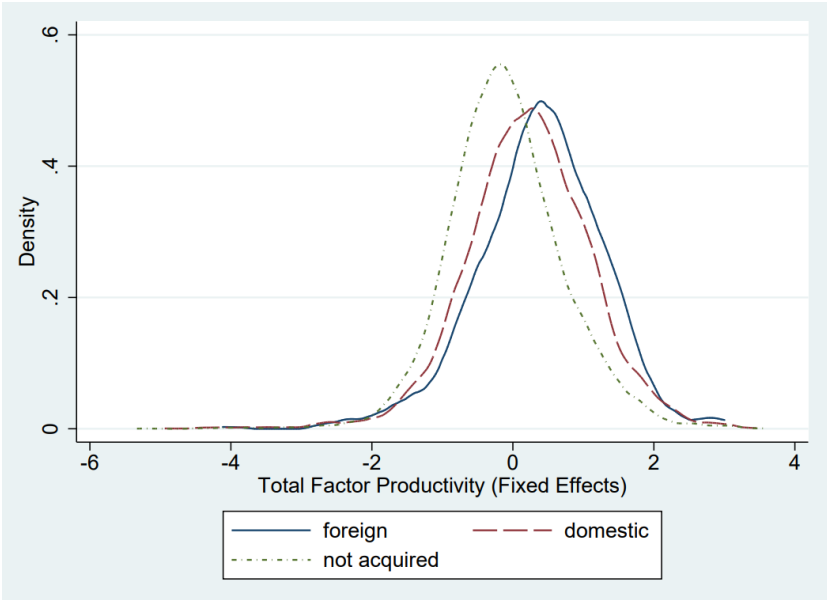
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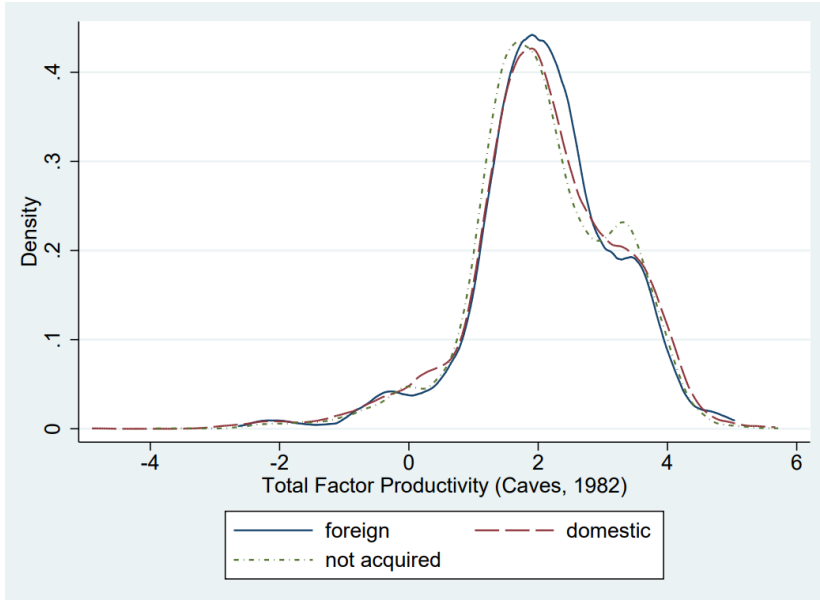
(c)

Figure 2: Kernel distribution of TFP estimates for the pooled dataset (2012 to 2017)

Data

- Observed differences in the firm-level characteristics points to the likely selection bias
- Caution in naively comparing the observed differences in the TFP estimates

Empirical Results

Empirical Results

- Observed differences in the firm-level characteristics points to the likely selection bias

- Caution in naively comparing the observed differences in the TFP estimates

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Table 5: Summary of the OLS and DiD Results

	OLS			DiD		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	TFP	**TFP**	**ΔTFP**	**ΔTFP**	**ΔTFP**	**ΔTFP**
foreign-acquired$_t$	-0.003	-0.003	-0.005	-0.005	-0.015	-0.016
	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)
N	14,751	14,751	14,751	14,751	4,428	4,428
adj. R2	0.675	0.675	0.089	0.089	0.09	0.091
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Time shocks	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors in parenthesis. Columns 1, 3, and 5 incorporated lagged levels of profits, ROE, total assets, total liabilities, age, capital-labour ratio as covariates. Columns 2, 4, and 6 included the lagged liquidity ratio, leverage ratios as additional covariates. Columns 5 and 6 uses only domestic-acquired firms as counterfactual. See manuscript for the full results.
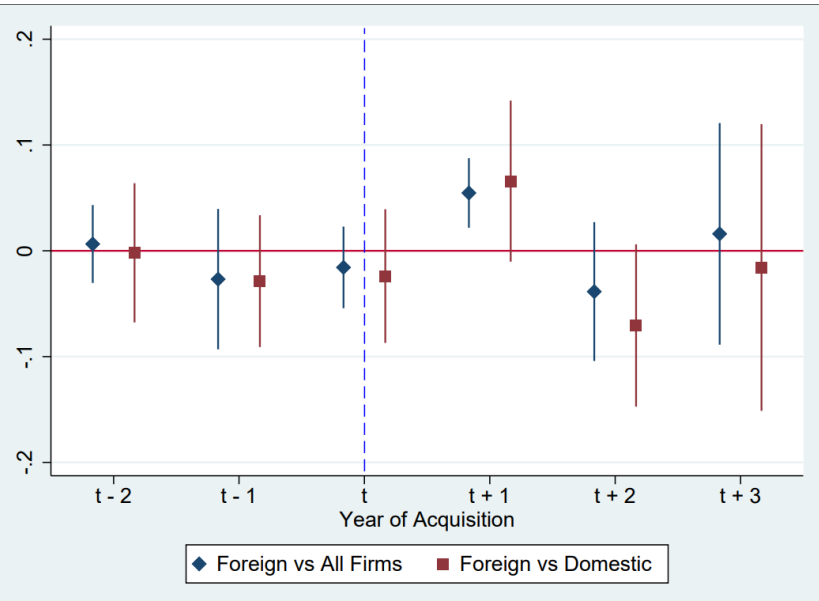* $p < 0:10$, ** $p < 0:05$, *** $p < 0:01$
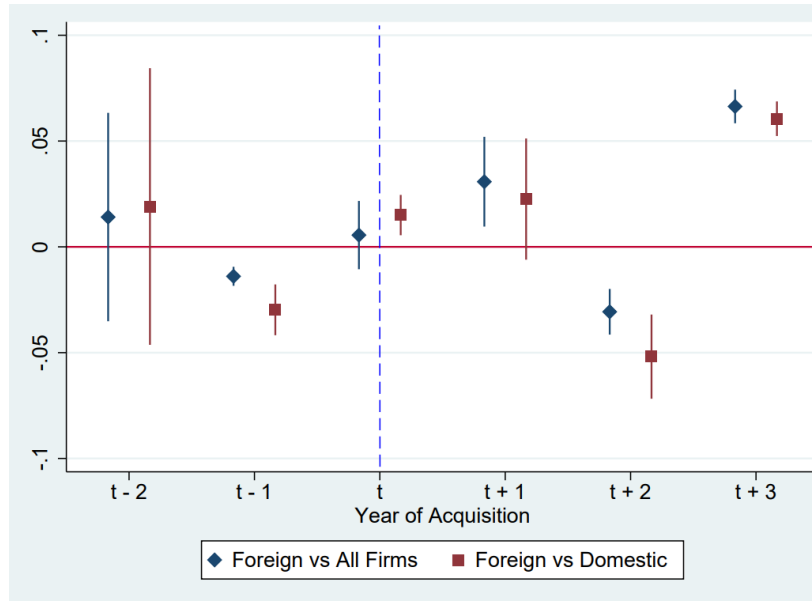
Table 6: Summary Dynamic DiD Results

	OLS		Industry		Services	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	ΔTFP	**ΔTFP**	**ΔTFP**	**ΔTFP**	**ΔTFP**	**ΔTFP**
foreign-acquired$_{t-1}$	0.0547***	0.0659*	0.031**	0.023*	0.082**	0.136**
	(0.0149)	(0.0346)	(0.008)	(0.010)	(0.033)	(0.052)
foreign-acquired$_{t-2}$	-0.0385	-0.0706*	-0.031***	-0.052***	-0.053	-0.112
	(0.0298)	(0.0348)	(0.004)	(0.007)	(0.088)	(0.108)
foreign-acquired$_{t-3}$	0.0160	-0.0158	0.066***	0.061***	-0.04	-0.079
	(0.0476)	(0.0615)	-0.003	(0.003)	(0.099)	(0.129)
foreign-acquired$_t$	-0.0157	-0.0239	0.006	0.015**	-0.047	-0.082**
	(0.0175)	(0.0287)	(0.006)	(0.003)	(0.026)	'(0.028)
foreign-acquired$_{t+1}$	-0.0268	-0.0287	-0.014***	-0.030***	-0.064	-0.053
	(0.0301)	(0.0283)	(0.002)	(0.004)	(0.053)	(0.058)
foreign-acquired$_{t+2}$	0.00643	-0.00190	0.014	0.019	-0.022	0.085
	'(0.0167)	(0.0299)	(0.018)	(0.024)	(0.034)	(0.045)
N	2940	1110	14,751	14,751	4,428	4,428
adj. R2	0.095	0.126	0.089	0.089	0.09	0.091
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Time shocks	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors in parenthesis. Columns 1, 3, and 5 employed all firms as counterfactual. Columns 2, 4, and 6 employed only domestic-acquired firms as counterfactual.
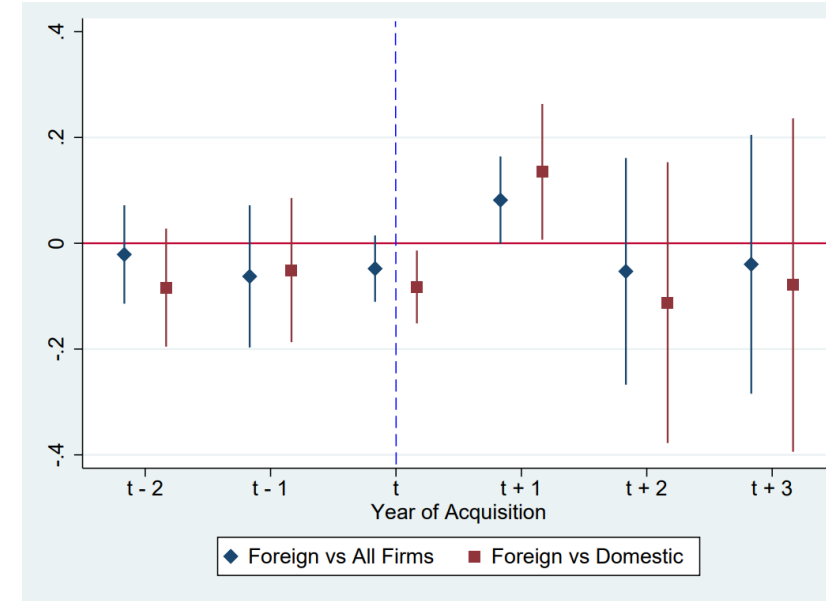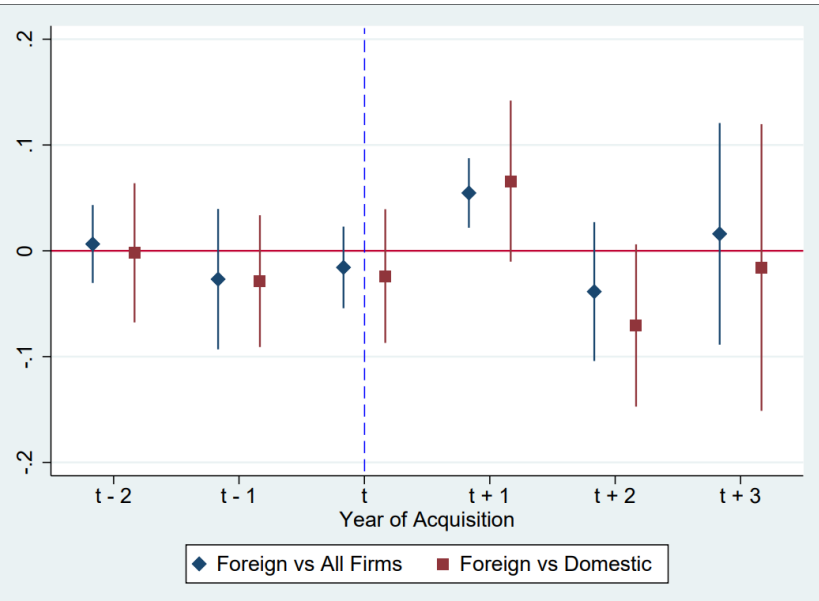
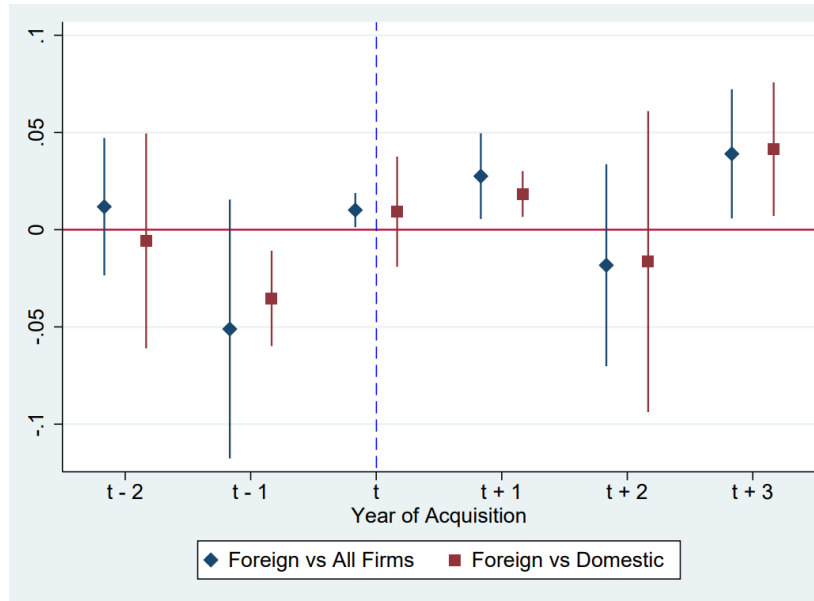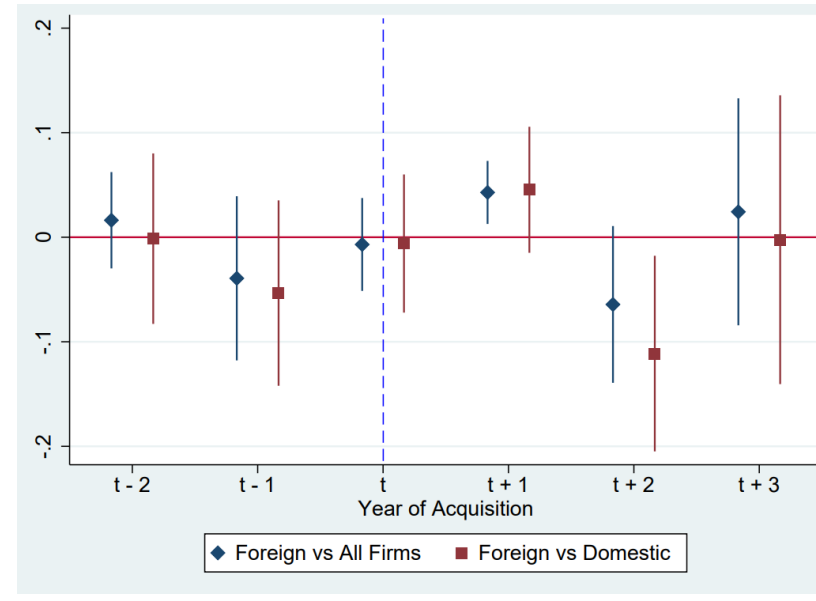* p < 0:10, ** p < 0:05, *** p < 0:01

Figure 3: Long-run effects of cross-border M&As. The diagram represents all the point estimates and standard errors of coefficients (not including the covariates). The blue, dashed line represents the year of acquisition.

Levinshon and Petrin
(a)

Fixed Effects
(b)

Caves
(c)

Figure 3: Long-run effects of cross-border M&As. The diagram represents all the point estimates and standard errors of coefficients (not including the covariates). The blue, dashed line represents the year of acquisition.

Table 7: Summary of the Propensity Score Matching Results

	(1) TFP	(2) ΔTFP	(3) ΔTFP	(4) TFP	(5) ΔTFP	(6) ΔTFP
Foreign-acquired$_t$	-0.00545	-0.0224		0.0184	-0.0144	
	(0.0783)	(0.0154)		(0.0508)	(0.0173)	
Foreign-acquired$_{t-1}$			0.0330**			0.0277*
			(0.0154)			(0.0165)
N	14,751	14,751	14,751	4,428	4,428	4,428

Bootstrap standard errors in parenthesis. Columns 1, 2, and 3 employed all firms as counterfactual. Columns 4, 5, and 6 employed only domestic-acquired firms as counterfactual

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Table 8: Summary of the Propensity Score Matching Results by Industry

	All Firms		Industry		Services	
	(1)	(2)	(3)	(4)	(5)	(6)
	ΔTFP	ΔTFP	ΔTFP	ΔTFP	ΔTFP	ΔTFP
Foreign-acquired$_{t-1}$	0.0330**	0.0277*	0.00398	0.0499**	0.0469**	0.0455
	(0.0154)	(0.0165)	(0.0158)	(0.0202)	(0.0217)	(0.0372)
N	14,751	4,428	8,064	2,371	6,687	2,057

Bootstrap standard errors in parenthesis. . Columns 1, 3, and 5 employed all firms as counterfactual. Columns 2, 4, and 6 employed only domestic-acquired firms as counterfactual.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Conclusions

- This study has founds evidence that the entry of multinational companies through cross-border M&As results in firm-level productivity gains.

- This study has also shown that the effects of foreign acquisitions are not homogeneous across production sectors.

- These results imply that while cross-border acquisitions do improve productivity for some firms, these effects are likely not universal. Governments intending to grant incentives for foreign firms may want to select key industries, wherein multinational firms could improve firm productivity.

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Thank you