FDI and Superstar Spillovers: Evidence from Firm-to-Firm Transactions

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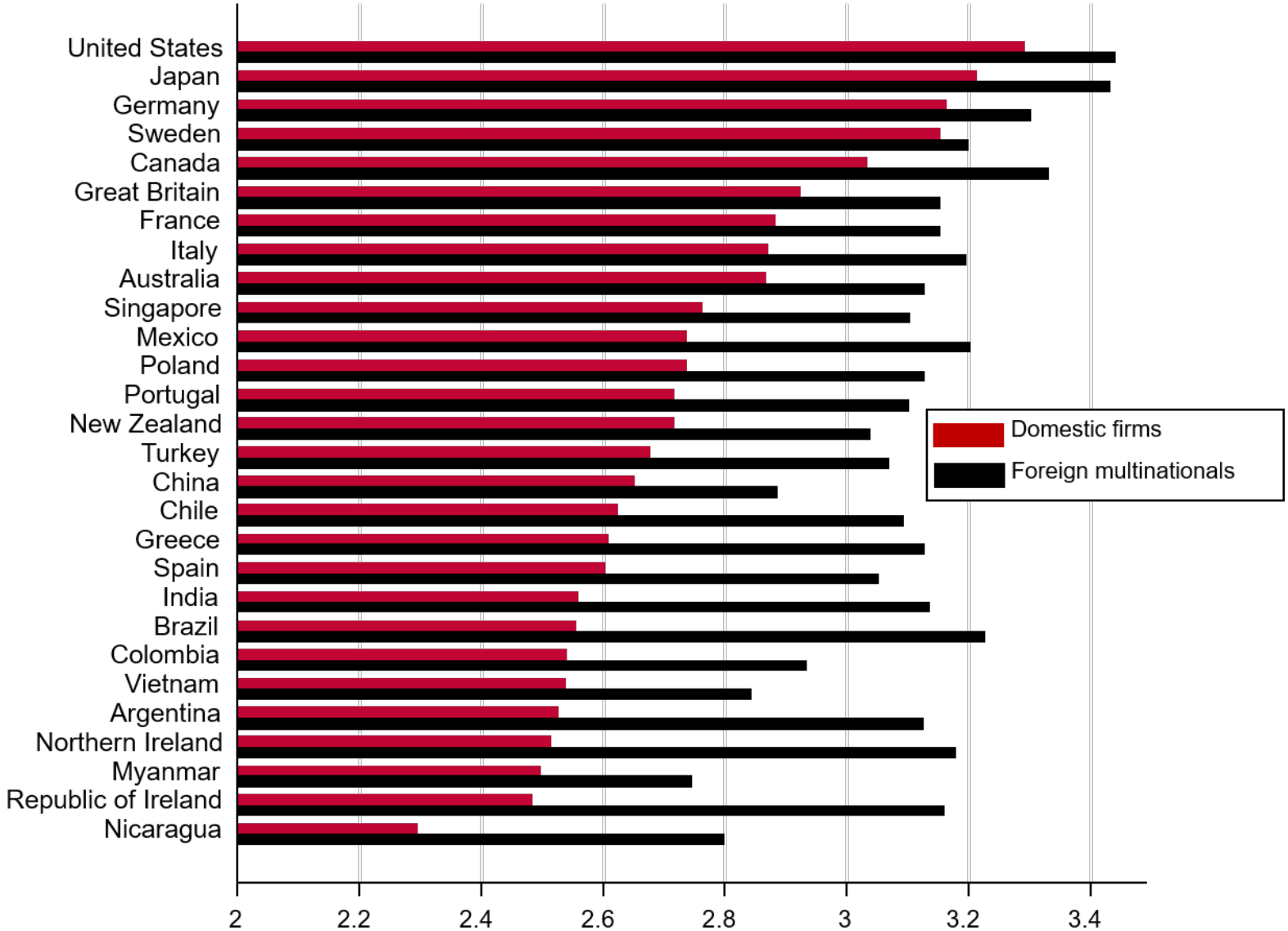
Introduction

- Governments often encourage foreign multinational enterprises (MNEs)
  - MNEs have well-known advantages of higher productivity, pay, technologies, management,. . . .
  - Also see this when looking at takeovers (with lag & much variance). Example: Bloom, Sadun & Van Reenen (2013, AER) on management & IT productivity

DIRECT EFFECT: MULTINATIONALS SEEM TO TRANSPLANT BETTER MANAGEMENT PRACTICES WHEREVER THEY LOCATE



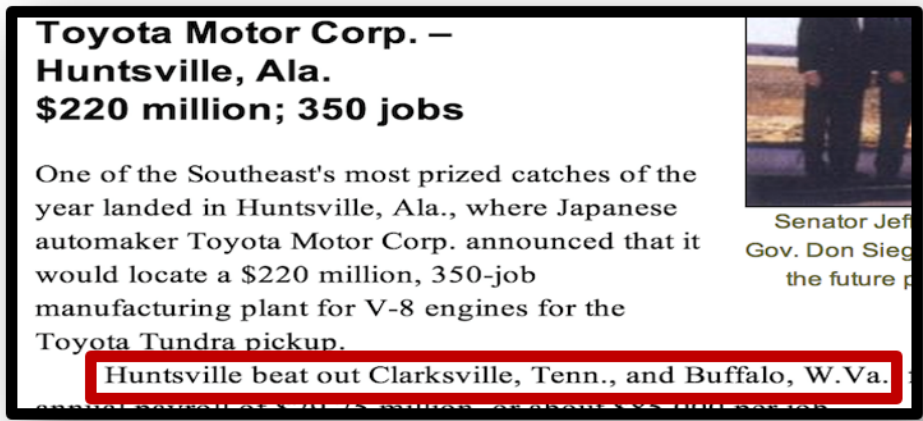
Source: Bloom, Sadun and Van Reenen (2017)

Introduction

- Policy rationale assumes MNEs also generate "spillover" benefits to local firms
- **Case studies**: Iacovone, Javorcik, Keller & Tybout (2015) on Wal-Mex; Sutton (2004); Bloom, Van Reenen & Melvin (2013)
- **Econometrics mixed**: e.g. Aitken & Harrison (1999) find negative effects (horizontal FDI); Javorcik (2004) find positive effects (from downstream FDI)
  - Use industry level data on MNE exposure. But do benefits require having direct relationship with MNE (like case studies)?
  - Alfaro-Urena, Manelici & Vasquez (2019) use firm-to-firm sales from Costa-Rica. Positive TFP effects in selling to MNE (event study).
- Does this result generalize to richer countries? Is it MNEs or any successful "superstar firm" (e.g. heavy exporter and/or very large domestic firms)? If so, what is the mechanism?

Spillover Impact of "Million Dollar Plants" (MDP): Look at incumbents plants in winning vs. runner-up US counties

- Greenstone, Hornbeck & Morretti (2010) use Site Selection magazine: has monthly stories about winning county and runner up counties.
- Find that incumbent plants in winning county have higher productivity growth than incumbent plants in "just losing" counties



Toyota Motor Corp. –
Huntsville, Ala.
$220 million; 350 jobs

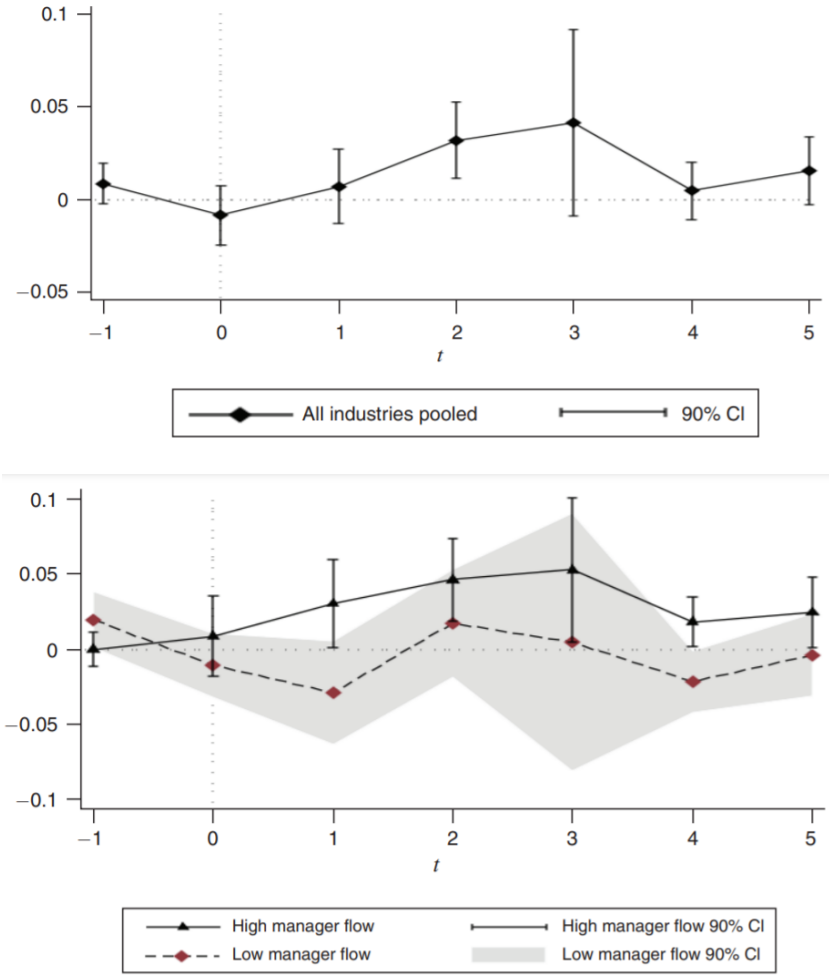
One of the Southeast's most prized catches of the year landed in Huntsville, Ala., where Japanese automaker Toyota Motor Corp. announced that it would locate a $220 million, 350-job manufacturing plant for V-8 engines for the Toyota Tundra pickup.

Huntsville beat out Clarksville, Tenn., and Buffalo, W.Va.

Senator Jef
Gov. Don Sieg
the future p

- In Bloom et al (2019, AER) we bring this data up to date & supplement with news coverage from other sources
- Can replicate their results in 2000s, but also can look at management quality as outcome

MDPs better management spills over to other local plants, improving their management (and TFP, growth, etc.)



Panel A:

Overall Treatment Effect

Panel B:

Bigger effects on plants in industries where we (ex ante) predict managerial information flow higher

Source: Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019, AER)

- **Note that MDPs include foreign MNEs and non-MNEs**

Summary of this paper

- Use B2B firm-level panel data 2002-2014 on universe of Belgian firms.
  - Event studies find positive productivity effects for firms who start selling to a MNE (~10% after 5 years). Also increase in outputs, inputs (jobs, intermediates, capital), exports, etc.
- But we find similar TFP effects of starting to sell to very large firms (even if these are not globally engaged) and/or heavy exporters
- By contrast, no effect from placebo of starting to sell to a non-"superstar" firm
- Mechanisms:
  - **Tech transfer**: treatment effects particularly large when a superstar is intensive in R&D, ICT or human capital
  - **Match making**: Number of buyers increases, but particularly to other firms in the superstar firms' network
- Suggests benefits of high productivity "anchor" firms goes beyond just MNEs

Some Existing Literature

- **MNE Spillovers**: Aitken & Harrison (1999); Javorcik (2004); Alfaro-Urena et al (2019), Alvarez & Lopez (2008), Keller & Yeaple (2009), Keller (2021)
- **Higher productivity of MNEs**: Bloom, Sadun & Van Reenen (2013); Helpman et al. (2004); Chaney (2014), Antràs and Chor (2013), Eaton et al. (2011), Antràs et al. (2017), Lim (2018), Dhyne et al. (2021).
- **Impact of large firm entry**: "Million Dollar Plants" – Greenstone, Hornbeck, and Moretti (2010); Bloom et al (2019)
- **Production Networks**: Acemoglu et al. (2012, 2017); Liu (2019); Acemoglu & Azar (2020); Atalay et al. (2011); Iyoha (2021)
- **Rise of Superstar Firms**: Furman and Orszag (2018); Autor, Dorn, Katz, Patterson & Van Reenen (2017, 2020); Bajgar et al (2018); Philippon (2017); de Loecker et al, 2020

Outline

Data

- NBB B2B Transaction dataset (Dhyne et al, 2015) – value of sales between all buyer-seller relationships in Belgium based on VAT declarations (all $>$€250)
- Company accounts from NBB Central Balance Sheet office (all incorporated firms) – sales, labor, intermediate inputs, capital
- NBB Foreign Direct Investment (FDI) survey
- Intrastat trade survey (intra-EU) & customs trade data (extra EU)
- Productivity measurement – Baseline is Wooldridge (2009) but compare with ACF, OP, Collard-Wexler & de Loecker (2020), value added per worker, etc.

Outline

Empirical Strategy

- Event study Diff-in-Diffs
- Examine Superstar j defined in three separate ways
  - MNE (>10% foreign owned, inward FDI)
  - Exporter (non-wholesalers with >10% of sales exported)
  - Large Firm (top 0.1% of the sales distribution)
- Examine a firm i who starts selling to superstar firm j at time t
  - focus on "serious relationships": firm i must sell at least 10% of its sales to the superstar:

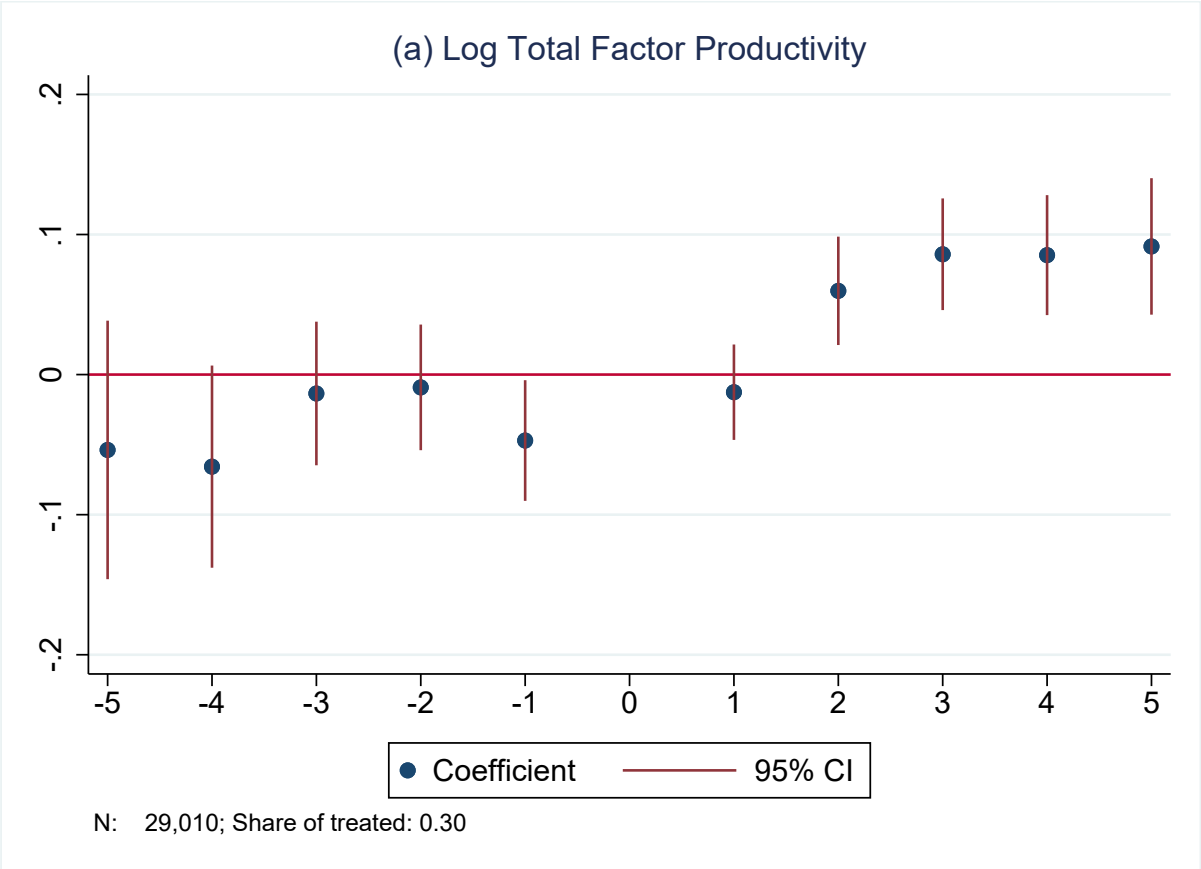
$$y_{i,t} = \sum_{t=-5}^{5} \beta_t I_{i,t} + \delta_i + \varphi_{s,t} + \epsilon_{i,t}$$

$I_{i,t} = 1$ when firm i starts selling to superstar, otherwise zero
δ_i = firm FE; $\varphi_{s,t}$ = 4 digit NACE (538 industries) by year FE

Outline

Selling to MNE increases TFP by ~9% after 5 years

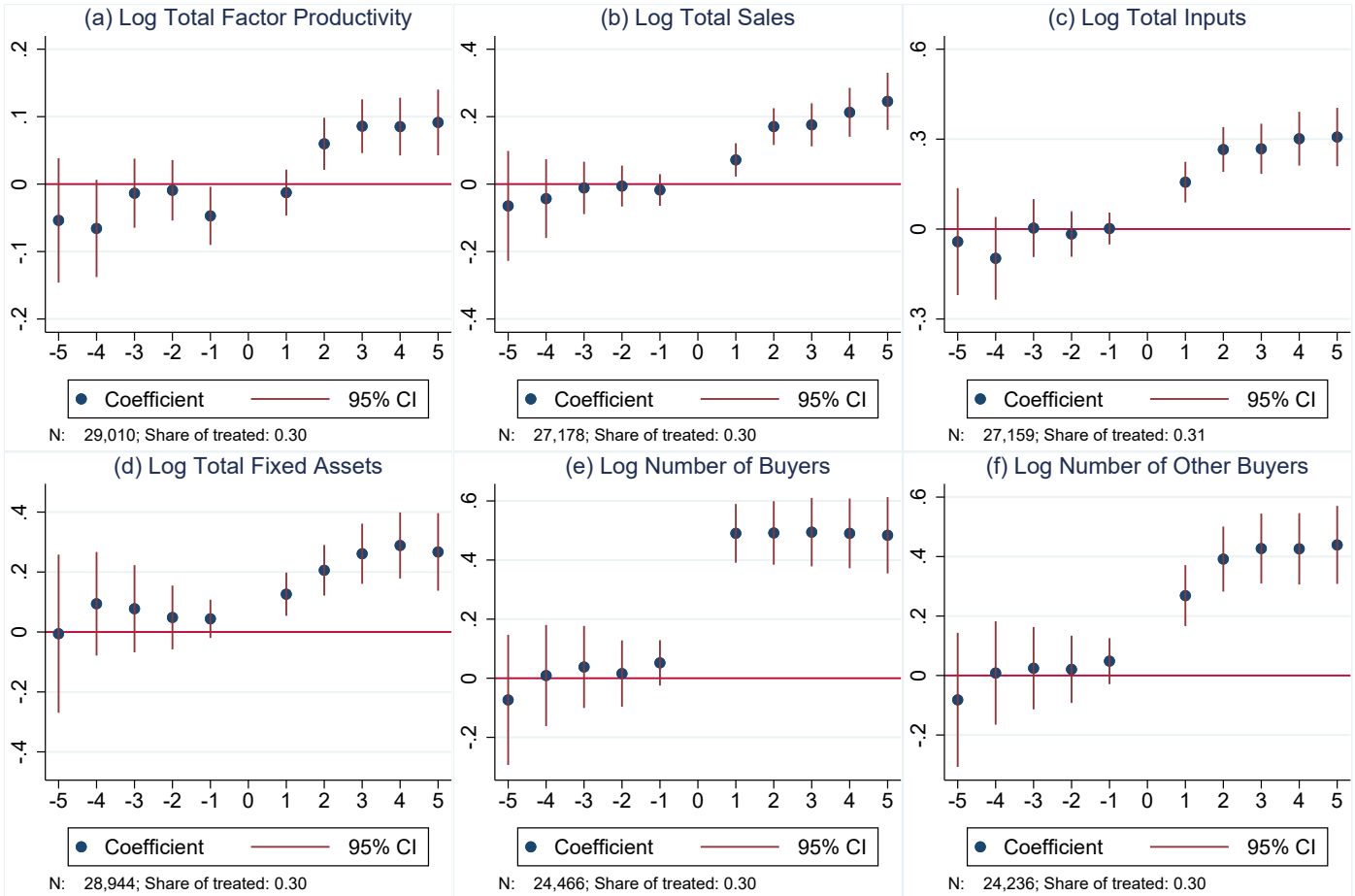
Figure 1: Event study of selling to FDI firms



Notes: $t = 1$ first year of treatment; $t = 5$ is all years ≥ 5. Regressions include 4 digit industry by year dummies and firm fixed effects. TFP estimated by Wooldridge (2009) method.

Selling to MNE also increases sales, intermediate inputs, capital & #Buyers

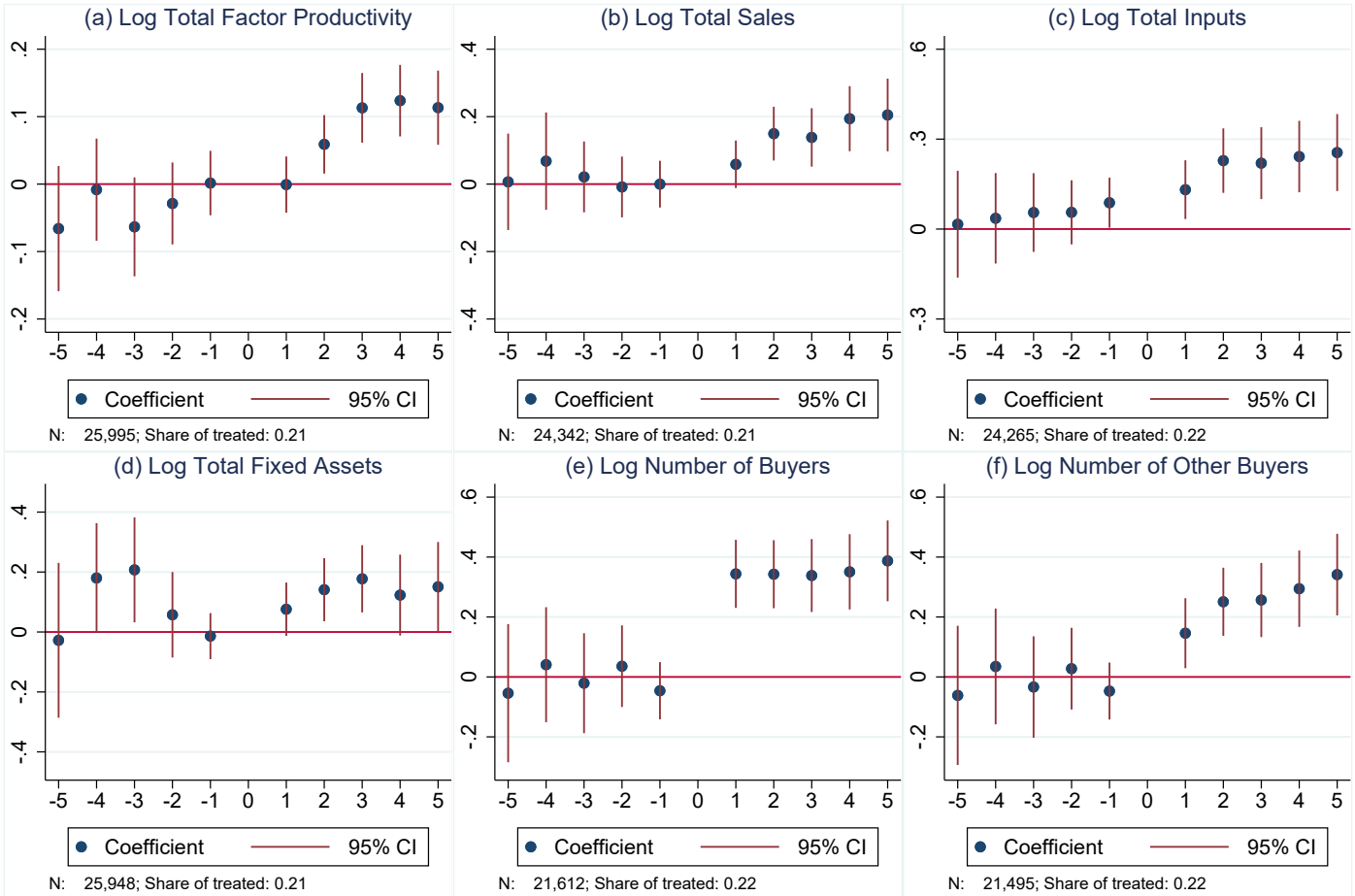
Figure 2: Gains from selling to FDI Firms



Notes: $t = 1$ first year of treatment; $t = 5$ is all years ≥ 5. Regressions include 4 digit industry by year dummies and firm fixed effects. TFP estimated by Wooldridge (2009) method.

BUT Selling to a "Serious exporter" also increases TFP, sales, intermediate inputs, capital & #Buyers

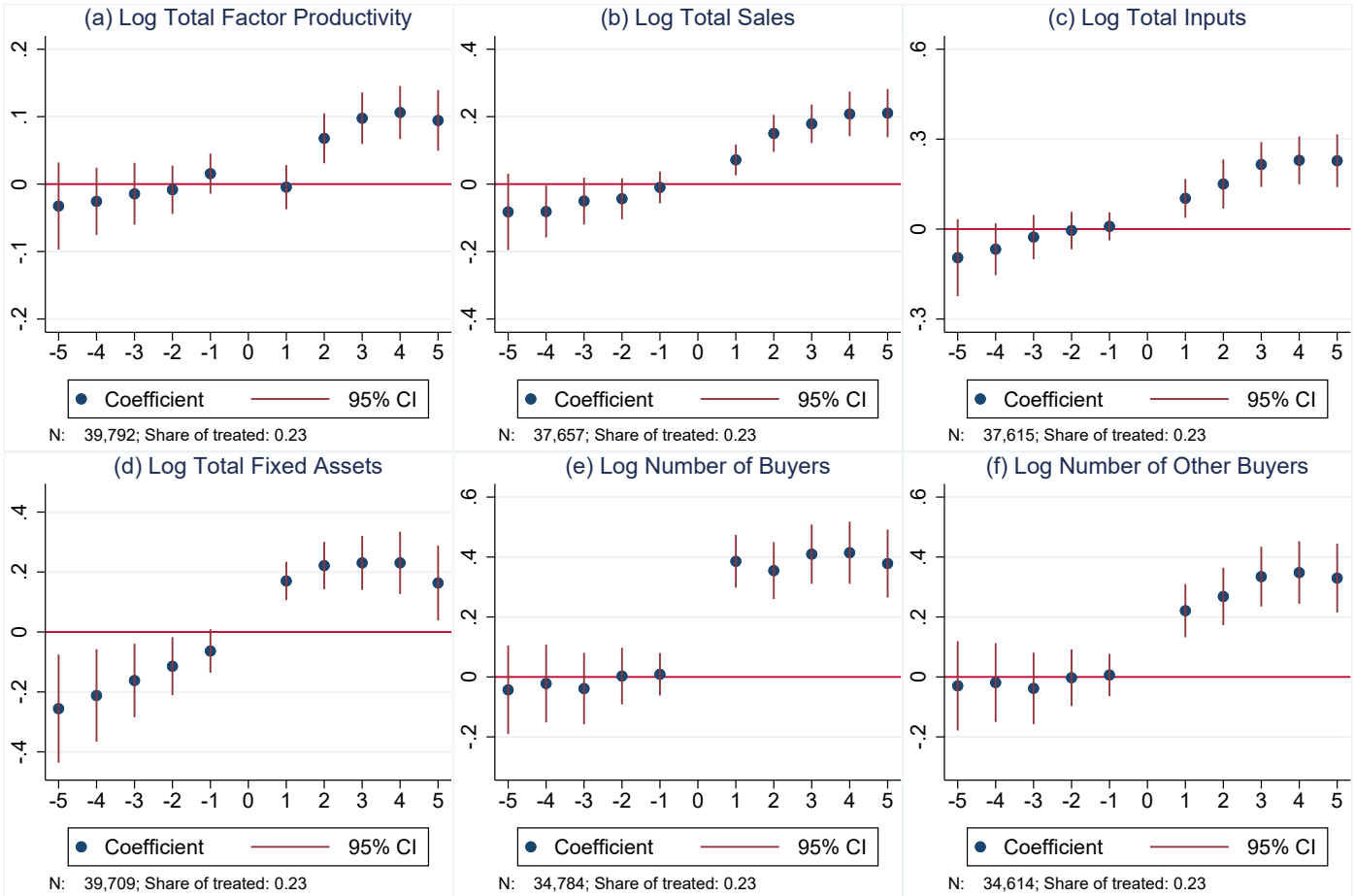
Figure 3: Gains from selling to Exporting Firms



Notes: $t = 1$ first year of treatment; $t = 5$ is all years ≥ 5. Regressions include 4 digit industry by year dummies and firm fixed effects. TFP estimated by Wooldridge (2009) method.

AND selling to a Very Large Firm also increases TFP, sales, intermediate inputs, capital & #Buyers

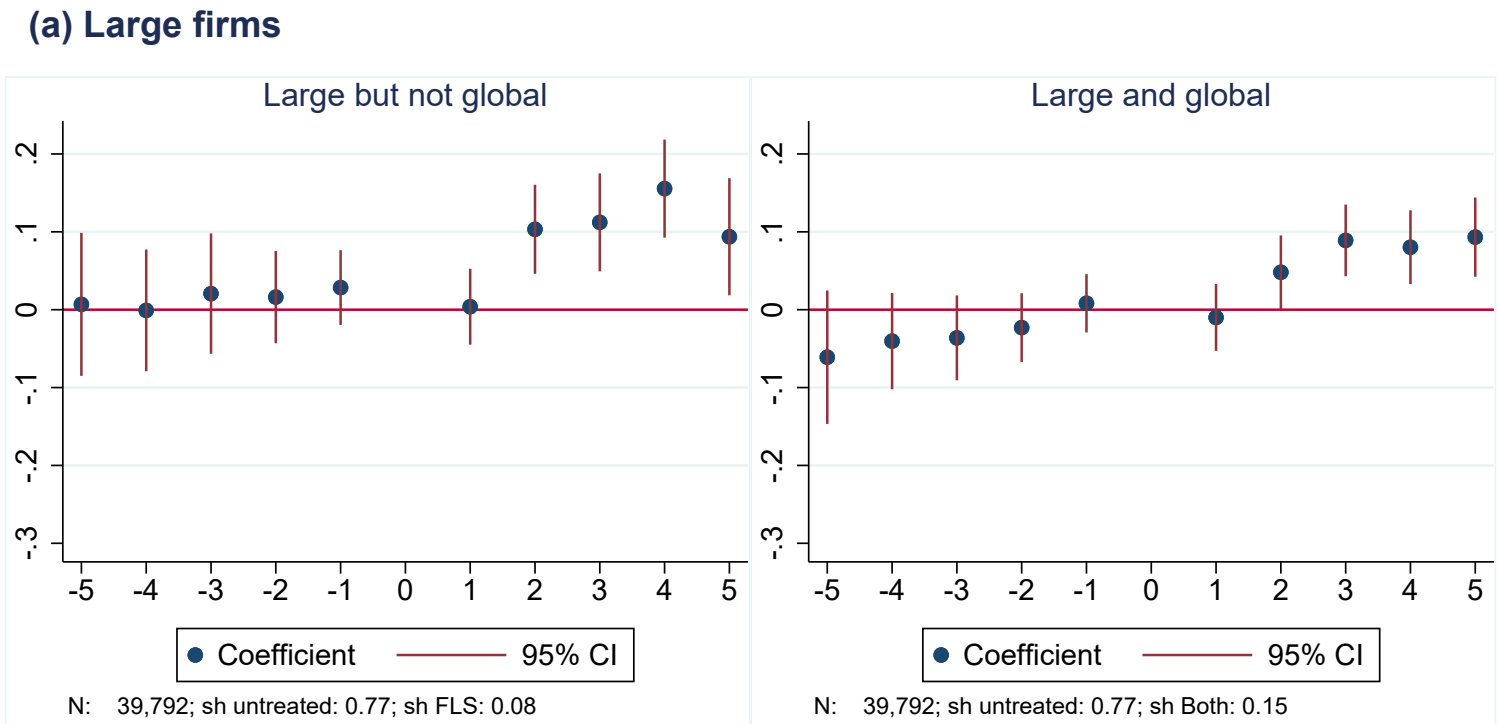
Figure 4: Gains from selling to Large Firms



Notes: $t = 1$ first year of treatment; $t = 5$ is all years ≥ 5. Regressions include 4 digit industry by year dummies and firm fixed effects. TFP estimated by Wooldridge (2009) method.

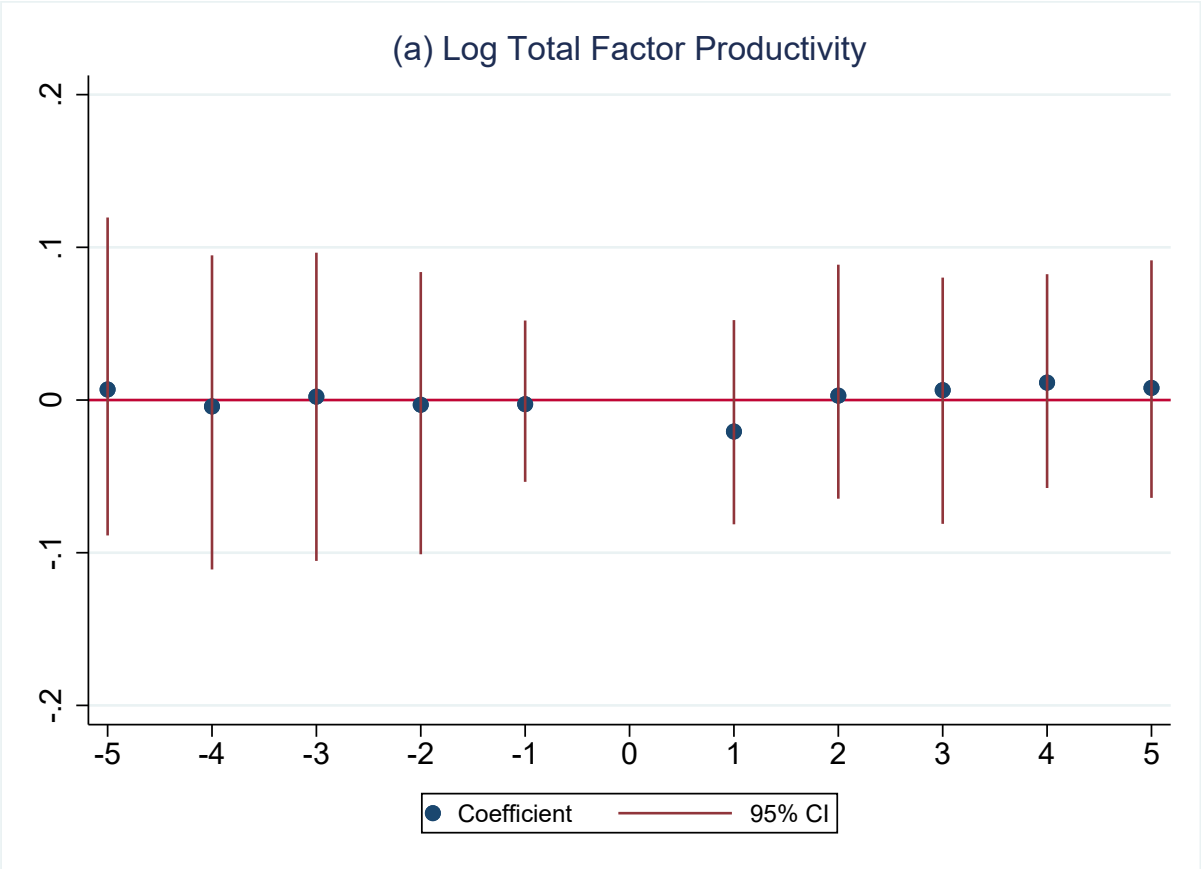
Large domestic firms give just as big a TFP pay-off as large global firms.

Figure 5: TFP gains from selling to Large vs Global Firms



Notes: $t = 1$ first year of treatment; $t = 5$ is all years ≥ 5. Regressions include 4 digit industry by year dummies and firm fixed effects. TFP estimated by Wooldridge (2009) method.

Maybe any new relationship generates these effects? Placebo: No TFP effect from starting to sell to a random firm



Notes: $t = 1$ first year of treatment; $t = 5$ is all years ≥ 5. Regressions include 4 digit industry by year dummies and firm fixed effects. TFP estimated by Wooldridge (2009) method.

Outline

Mechanism I: Tech transfer – impact on TFP much larger for high tech/high skill superstar firms

Dependent variable:	Log TFP		
	Technology type		
	RD	ICT	Skill labor
	(1)	(2)	(3)
FDI			
2 or more years after event	0.092***	0.074***	0.073***
	(0.020)	(0.023)	(0.021)
x technology	0.037	0.056**	0.076**
	(0.035)	(0.028)	(0.031)
Observations	29,010	29,010	29,010
Adjusted R^2	0.730	0.730	0.730
Exporters			
2 or more years after event	0.100***	0.085***	0.101***
	(0.024)	(0.025)	(0.030)
x technology	0.067*	0.074**	0.025
	(0.035)	(0.034)	(0.035)
Observations	25,995	25,995	25,995
Adjusted R^2	0.730	0.730	0.730
Large			
2 or more years after event	0.078***	0.094***	0.076***
	(0.018)	(0.022)	(0.018)
x technology	0.074**	-0.005	0.054*
	(0.035)	(0.026)	(0.030)
Observations	39,792	39,792	39,792
Adjusted R^2	0.725	0.725	0.725

Mechanism II: Dating Agency – impact on buyers within the superstar's network is strong

Dependent variable:	Number of buyers in network (1)	Number of buyers outside network (2)
FDI		
2 or more years after event	0.048***	0.038***
	(0.010)	(0.011)
Observations	36,907	36,907
Adjusted R^2	0.671	0.664
Exporters		
2 or more years after event	0.024***	0.028***
	(0.006)	(0.007)
Observations	33,342	33,342
Adjusted R^2	0.753	0.684
Large		
2 or more years after event	0.059***	0.029***
	(0.013)	(0.008)
Observations	49,400	49,400
Adjusted R^2	0.637	0.666

Outline

Other Robustness Tests

- Alternative Ways of measuring TFP
- Geographical/culturally based spillovers (don't find much)
- Placebo on other outcomes
- Treatment effects on yet more outcomes: employment, wages, exports, imports
- Further exploration of global vs. size

Table 1: TFP Robustness

	WR (1)	WR with wagebill (2)	ACF (3)	ACF with translog (4)	OP (5)	CWDL (6)	OLS (7)	Value added per worker (8)
FDI								
1 year after event	0.010	0.023	-0.004	0.039*	0.002	-0.005	-0.011	0.006
	(0.018)	(0.018)	(0.019)	(0.023)	(0.018)	(0.020)	(0.019)	(0.019)
2 or more years after event	0.102***	0.112***	0.070***	0.174***	0.086***	0.068***	0.059***	0.075***
	(0.020)	(0.019)	(0.019)	(0.027)	(0.019)	(0.022)	(0.020)	(0.020)
Observations	29,010	29,010	29,010	29,010	29,010	28,951	29,010	31,007
Adjusted R^2	0.730	0.747	0.772	0.837	0.699	0.716	0.660	0.725
Exporters								
1 year after event	0.016	0.017	0.010	0.028	0.013	0.008	0.006	0.014
	(0.022)	(0.022)	(0.023)	(0.028)	(0.022)	(0.025)	(0.023)	(0.024)
2 or more years after event	0.116***	0.109***	0.091***	0.173***	0.104***	0.104***	0.088***	0.084***
	(0.022)	(0.023)	(0.023)	(0.031)	(0.022)	(0.025)	(0.023)	(0.024)
Observations	25,995	25,995	25,995	25,995	25,995	25,979	25,995	27,859
Adjusted R^2	0.730	0.755	0.793	0.851	0.702	0.718	0.664	0.728
Large								
1 year after event	-0.002	0.012	-0.019	0.061***	-0.011	-0.043**	-0.038**	-0.002
	(0.017)	(0.017)	(0.018)	(0.021)	(0.017)	(0.019)	(0.018)	(0.018)
2 or more years after event	0.092***	0.106***	0.061***	0.178***	0.078***	0.047**	0.045**	0.071***
	(0.017)	(0.017)	(0.017)	(0.024)	(0.017)	(0.020)	(0.018)	(0.018)
Observations	39,792	39,790	39,792	39,792	39,792	39,717	39,792	42,146
Adjusted R^2	0.725	0.743	0.755	0.836	0.693	0.713	0.654	0.713

Placebo: Apart from the mechanical effect of adding another buyer, no effects on other outcomes

Figure 6: Placebo

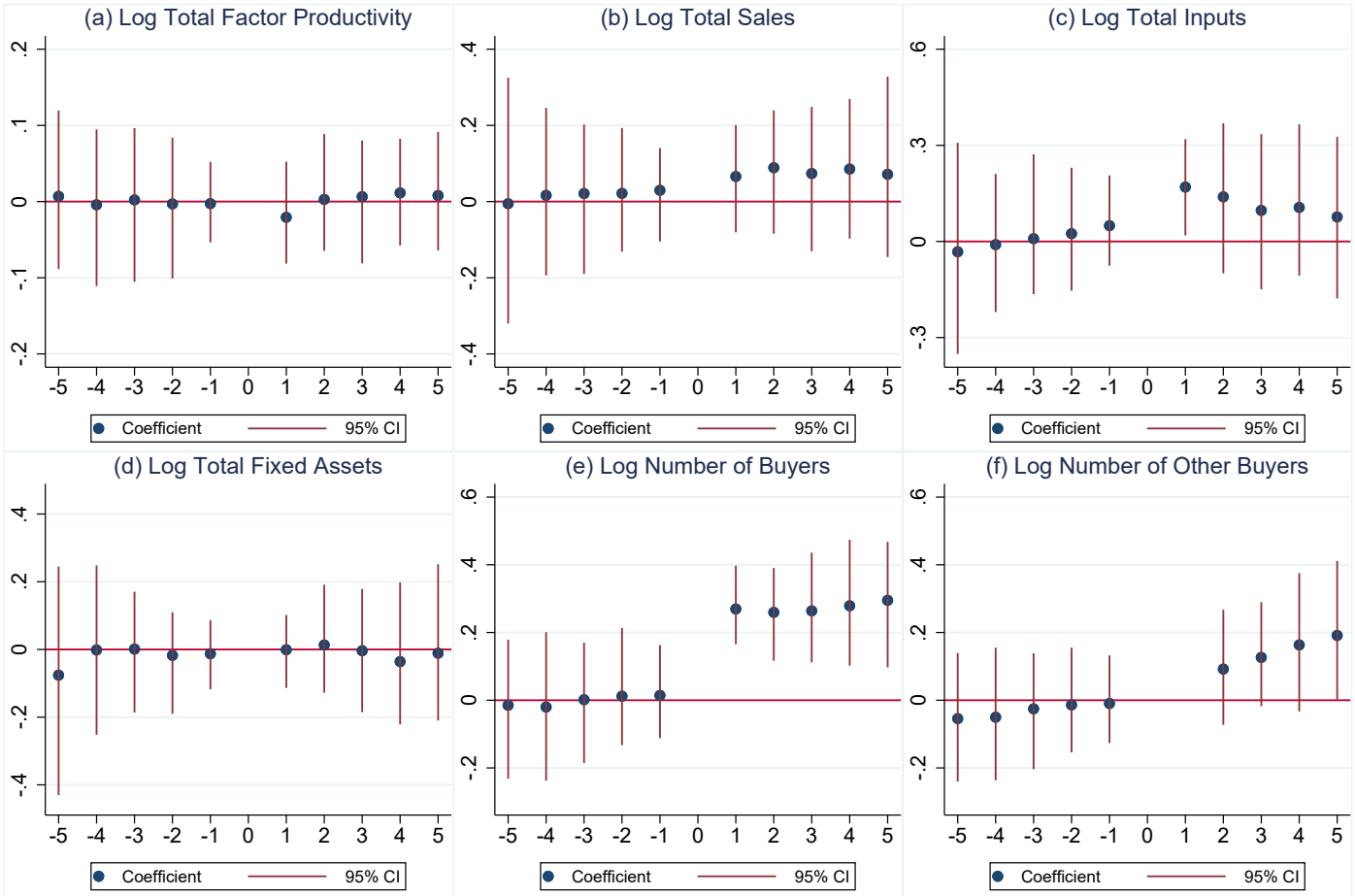


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Table 2: Robustness Additional Outcomes

	Log employment (1)	Log average wages (2)	Export value (3)	Export dummy (4)	Export varieties (5)	Import value (6)	Import dummy (7)	Import varieties (8)
FDI								
1 year after event	0.720***	2.436***	0.590*	0.054***	0.003*	0.884***	0.073***	0.004***
	(0.041)	(0.126)	(0.346)	(0.010)	(0.002)	(0.290)	(0.012)	(0.001)
2 or more years after event	0.763***	2.386***	1.970***	0.060***	0.006***	1.357***	0.089***	0.006***
	(0.047)	(0.145)	(0.536)	(0.010)	(0.002)	(0.324)	(0.012)	(0.001)
Observations	36,907	36,907	36,907	36,907	36,907	36,907	36,907	36,907
Adjusted R^2	0.681	0.488	0.827	0.706	0.856	0.754	0.699	0.848
Exporters								
1 year after event	0.602***	2.202***	0.368**	0.022**	0.003	0.116	0.052***	0.004***
	(0.051)	(0.153)	(0.168)	(0.011)	(0.005)	(0.167)	(0.013)	(0.001)
2 or more years after event	0.579***	1.818***	0.189	0.019*	-0.005	0.234	0.053***	0.004***
	(0.061)	(0.188)	(0.307)	(0.011)	(0.011)	(0.169)	(0.014)	(0.001)
Observations	33,342	33,342	33,342	33,342	33,342	33,342	33,342	33,342
Adjusted R^2	0.678	0.473	0.616	0.609	0.340	0.619	0.650	0.808
Large								
1 year after event	0.617***	1.960***	1.840**	0.054***	0.007***	1.534**	0.073***	0.005***
	(0.037)	(0.109)	(0.857)	(0.009)	(0.003)	(0.645)	(0.010)	(0.001)
2 or more years after event	0.618***	1.792***	2.444**	0.064***	0.008**	1.993***	0.077***	0.007***
	(0.044)	(0.132)	(1.085)	(0.009)	(0.003)	(0.725)	(0.010)	(0.001)
Observations	49,400	49,400	49,400	49,400	49,400	49,400	49,400	49,400
Adjusted R^2	0.683	0.476	0.680	0.729	0.723	0.698	0.721	0.848

Conclusions

- Forming a relationship with a superstar firm improves outcomes, likely through the transfer of know-how (+ match making)
- Does not rule out more general spillovers (these are absorbed by industry*year effects)
- Non-trivial magnitudes
- But does not have to be a MNE or globally engaged firm. Local superstars also bring benefits
- Policy: barriers to firms to grow to be future superstar could be costly (misallocation). e.g. Aghion, Bergeaud & Van Reenen (2021) on French regulations
- Next Steps: IVs for superstar partnerships; quantification

Figure 7: TFP gains from selling to Large vs Global Firms

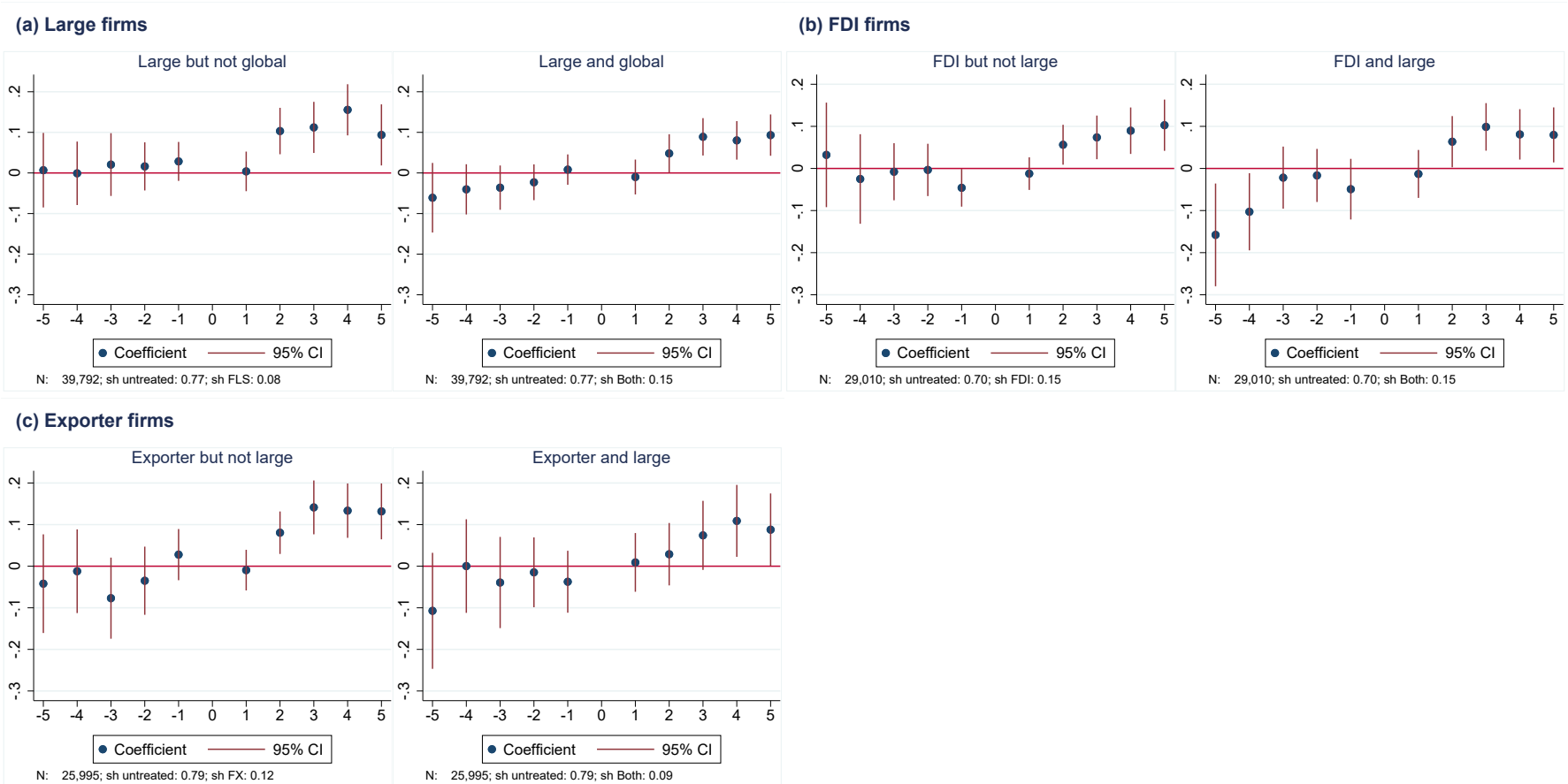

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Table 3: Summary Statistics–Sample and Cleaning

Sample cleaning

Sample	Average annual		Share of sample dropped	
	N firms (thousands)	Employment (millions)	N firms	Employment
Full sample NBB	368.19	1.78		
Drop missing or zero initial emp	148.62	1.78	59.3	
Drop <10 full-time equivalent	23.21	1.48	84.3	10.0
Drop missing 4-digit NAICS	23.07	1.47	0.6	0.3
Drop firms not in B2B	21.98	1.44	4.7	1.1

Summary statistics

Variable	P5	P50	P95	Mean	SD	N
$ln(TFP_{WR})$	-0.70	0.23	1.29	0.24	0.65	258,829
$\Delta ln(TFP_{WR})$	-0.36	0.02	0.36	0.01	0.32	232,826
Sales (millions euros)	0.25	4.06	66.93	25.80	321.40	272,921
Inputs (millions euros)	0.10	2.77	52.97	21.87	333.16	273,080
Total fixed assets (millions euros)	0.00	0.43	8.76	4.48	61.37	282,906
# buyers (thousands)	0.00	0.04	0.67	0.19	0.89	283,842
$ln(TFP_{WR})$ with wagebill	-0.60	0.36	1.52	0.39	0.69	258,827
$ln(TFP_{ACF})$	-1.10	-0.15	0.99	-0.12	0.68	258,829
$ln(TFP_{ACF})$ with translog	-1.06	0.44	2.15	0.49	1.02	258,829
$ln(TFP_{OP})$	-0.73	0.11	1.08	0.13	0.60	258,829
$ln(TFP_{CWDL})$	-0.80	0.16	1.27	0.18	0.68	258,646
$ln(TFP_{OLS})$	-0.89	-0.12	0.74	-0.11	0.55	258,829
Value added per worker (thousands euros)	23.96	56.69	167.11	77.84	406.15	266,969
Number of j buyers	1	44	700	199	912	272,002

Table 4: Summary Statistics by Treatment Type

Total N		491,155	
Treatment type	FDI	FX	Large
N	2,841	4,260	491
Share of firms	0.58	0.87	0.10
Share of employment	25.11	20.12	24.06
FDI intensity	71.79		
Export intensity (average)		0.46	
Out of treated, share of:			
FDI		13.38	57.84
Large	10.00	3.71	
FX	20.06		32.18
FDI or FX			66.40
Large or FX	25.98		
Large or FDI		14.37	
High TFP (1 percentile)	14.75	4.08	45.42
RD top-10 percentile cutoff	0.003	0.014	0.009
ICT top-25 percentile cutoff	0.021	0.012	0.022
Skill labor top-25 percentile cutoff	0.680	0.264	0.682
Networks			
Median number of buyers	32	37	132
Mean number of buyers	499	115	1,588
Mean number in network as share of all potential buyers	0.024	0.008	0.139
Median sales (million euros)	0.107	0.042	0.384
Mean sales (million euros)	1.104	0.277	3.438