Acquisitions, Productivity, and Profitability: Evidence from the Japanese Cotton Spinning Industry

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What We're Looking At

- M&A can in principle reallocate control of productive assets to entities able to apply them more efficiently
  - E.g., Lichtenberg and Siegel (1987), Jovanovic and Rousseau (2002)
- Fits nicely with the idea that managers and management practices shape productivity differences across plants, firms, and even countries
  - Bloom and Van Reenen (2007, 2010), Bloom et al. (2013)
- But a prominent alternative view is that M&A are driven by inefficient motives
  - E.g., Roll (1986), Shleifer and Vishny (2003)

What We're Looking At

- Previous research has not been fully conclusive
  - E.g., McGuckin and Nguyen (1995), Maksimovic and Phillips (2003), Rhodes-Kropf and Robinson (2008), David (2012)

- Partly due to several data problems
  - Couldn't cleanly distinguish between physical (quantity) productivity and revenue productivity
  - M&A may increase market power, leading to higher TFPR even if TFPQ is stagnant (or even falls)

Why We're Looking Here

- Our data doesn't have the price-is-output problem, and also has a lot of other stuff you usually can't observe. E.g.:
  - We can measure profitability separately from productivity
  - We can measure the production process virtually at an engineering level
  - We can measure productivity conditional on operation as well as capacity utilization (fraction of time in operation)
  - We can measure firms' product-market outcomes and connections and their inventory-holding behavior

Why We're Looking Here

- Our setting (cotton spinning industry in Japan, 1890-1920) is interesting from a development point of view
  - Japan isolated until forced opening in 1860s
  - Cotton yarn and cloth accounted for fully one-third of imports during 1868-1875
  - But cotton yarn and cloth soon became first world-class manufacturing industry in Japan (Ohyama, Braguinsky, and Murphy, 2004)
  - Domestic production surpassed imports by 1890; *exporting* started five years later

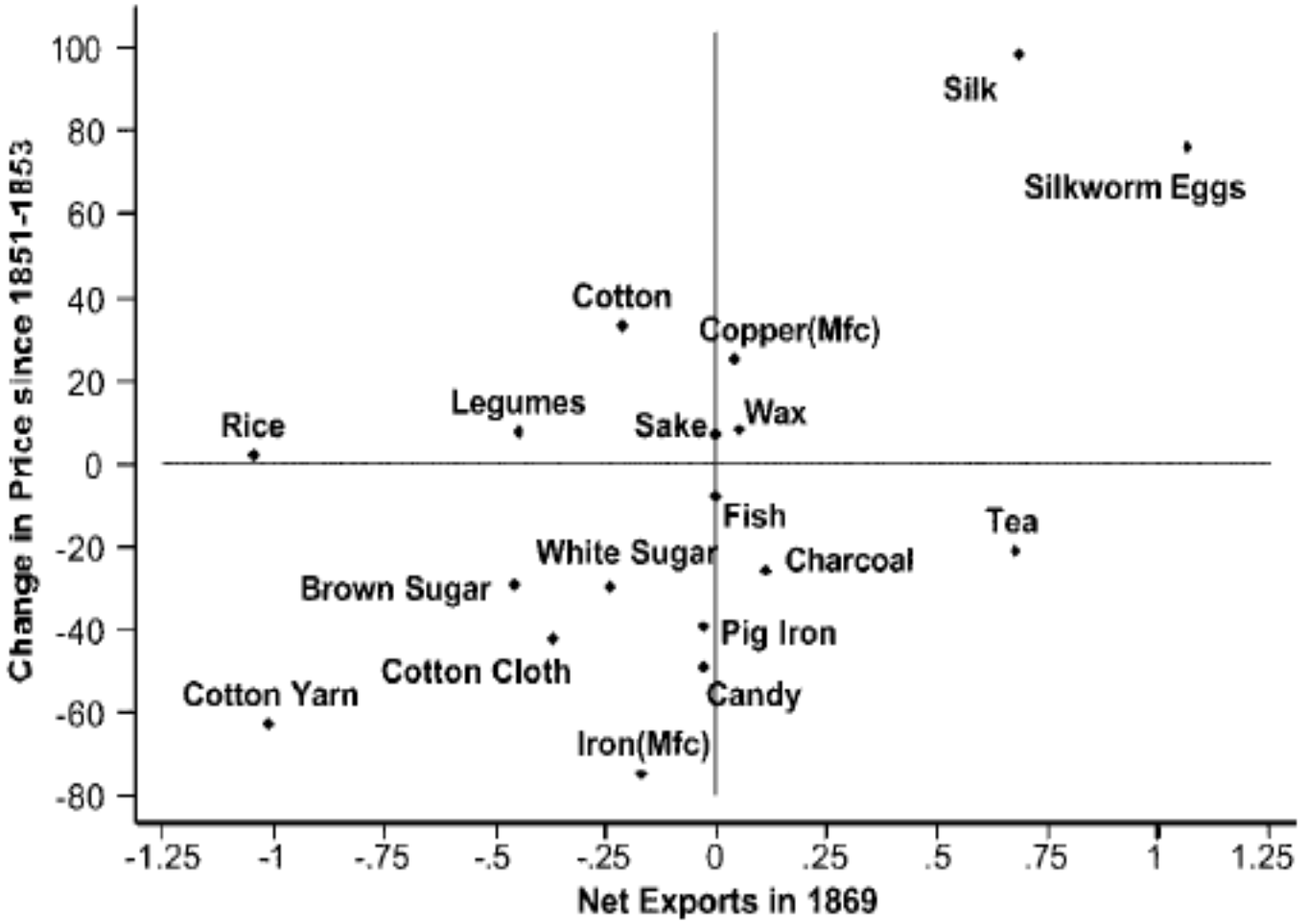


FIG. 4.—Net exports and price changes for 1869. Source: Japan Bureau of Revenue (1893) for trade data and Kinyu Kenkyukai (1937), Miyamoto (1963), Ono (1979), Yamazaki (1983), and Mitsui Bunko (1989) for price data.

Source: Bernhofen and Brown, 2004, p. 63.

Main Findings

- More nuanced picture than the straightforward “higher productivity buys lower productivity” story
- Acquired firms’ production facilities *not* on average any less physically productive than plants of the acquiring firms
- But acquired firms much less *profitable* than acquiring firms
- This profitability gap did not result from any output price differences between the firms

Main Findings

- Profitability gap reflected systematically lower unit capital costs among acquirers
  - Lower average inventory levels
  - Higher capacity utilization
  - These differences arise at least in part due to acquired firms' deficits in demand management
    - Mechanism is new to the literature
- Acquired plants weren't less productive (when operating) because they had newer, better capital

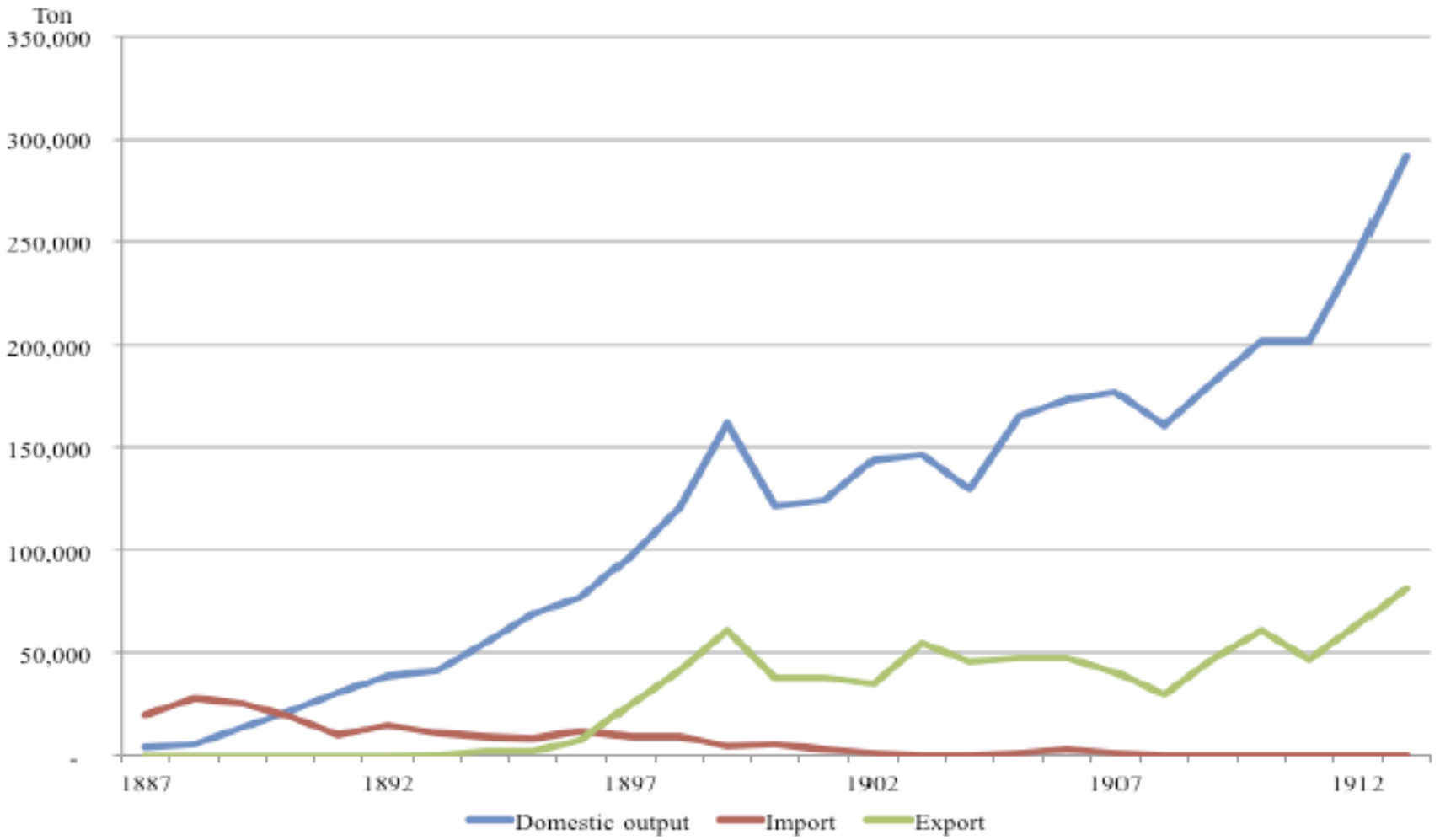
Main Findings

- Acquisitions thus best characterized as “higher profitability buys lower profitability”
  - Acquired firms’ capital was better, but was being used suboptimally
  - New management raised both productivity *and* profitability
- Acquisitions drove industry productivity growth
  - 70% of industry capacity changed hands
  - Average industry TFP growth was 2.5% per year
- Leading firms set apart by better use of productive capital rather than market power

Data

- Decades of information on operations, management, and ownership of the universe of industry plants
  - Plant output and inputs in physical units
  - Output prices, inventories, and K utilization
  - Firm-level accounting data, shareholder lists, board composition, and business histories
- Span critical industrialization period for Japan
  - Less than two decades from difficult entry into modernity
  - Cotton spinning was Japan's first major mfg industry

Domestic Output, Imports, and Exports of Cotton Yarn, 1887-1914: Three Phases



What Role Did Asset Reallocation Play?

- After extensive growth through 1890s, consolidation
  - Better firms expanded extensively rather than intensively
  - Long lead times on new machinery from U.K.
- 73 acquisitions involving 95 plants during 1898-1920, 70% of initial industry capacity changed hands
  - Acquisitions rare in developing countries (lack of trust, enforcement, etc.)
  - But in Japan, firms were mostly joint stock companies with easily transferrable ownership
  - Higher acquisition rates than seen in U.S. mfg

Number of Acquired Plants by Year

Year	Number of acquired plants	Fraction of total	Of which: acquired by largest acquirers	Fraction of total number of acquisitions
1896	0	0.000	0	0.000
1897	0	0.000	0	0.000
1898	1	0.012	0	0.000
1899	5	0.060	0	0.000
1900	7	0.085	3	0.429
1901	1	0.012	0	0.000
1902	2	0.025	1	0.500
1903	15	0.188	7	0.467
1904	2	0.025	0	0.000
1905	3	0.038	0	0.000
1906	5	0.062	3	0.600
1907	11	0.136	6	0.545
1908	2	0.025	0	0.000
1909	1	0.011	0	0.000
1910	1	0.012	0	0.000
1911	6	0.069	4	0.667
1912	5	0.057	2	0.400
1913	0	0.000	0	0.000
1914	0	0.000	0	0.000
1915	4	0.038	2	0.500
1916	5	0.048	2	0.400
1917	3	0.028	0	0.000
1918	11	0.100	7	0.636
1919	3	0.026	0	0.000
1920	2	0.017	0	0.000
Total	95	0.043	37	0.389

Future Acquiring, Acquired and Exiting Plants *before* Acquisitions, 1896-97

		Acquiring plants	Acquired plants		Exiting plants
			First cohort	Second cohort	
TFPQ	Mean	0.066	0.034	0.156	-0.211
	(SD)	(0.156)	(0.225)	(0.229)	(0.552)
Profit per paid-in share	Mean	0.274	0.185	0.159	0.159
	(SD)	(0.205)	(0.074)	(0.149)	(0.101)
Price (yen/400lb)	Mean	93.8	92.4	92.8	91.7
	(SD)	(4.9)	(3.8)	(7.4)	(7.0)
Logged price residual	Mean	-0.017	0.008	0.005	0.015
	(SD)	(0.055)	(0.041)	(0.040)	(0.062)
Main count of yarn produced	Mean	21.5	17.5	17.2	14.0
	(SD)	(11.5)	(2.6)	(4.7)	(5.6)
Days in operation	Mean	323.7	315.9	300.6	278.6
	(SD)	(29.8)	(29.5)	(55.6)	(56.8)
Equipment age	Mean	5.28	5.88	2.79	11.77
	(SD)	(3.49)	(2.76)	(1.00)	(6.69)
Firm age	Mean	9.13	11.06	3.31	12.54
	(SD)	(5.08)	(3.81)	(2.05)	(7.86)
Observations		32	33	32	24

Comparisons of Machine Vintages

	Pre-1892 vintage	1892-97 vintage
Spindle rotation speed (RPM x 1000)	7.10	7.71
Cotton yarn count designed for	17.53	19.96
Number of spindles per ring frame	332.25	377.71
Number of cotton types designed for	1.06	2.47
Designed for Indian cotton	0.00	0.56
Designed for US cotton	0.04	0.44

Comparisons of Machines

		Acquiring plants	Acquired plants		Exiting plants
			First cohort	Second cohort	
Spindle rotation speed (RPM x 1000)	Mean	7.46	7.44	7.70	7.01
	(SD)	0.34	0.29	0.14	0.33
Cotton yarn count designed for	Mean	18.57	18.35	20.32	17.80
	(SD)	1.46	1.87	2.24	0.84
Number of spindles per ring frame	Mean	365.91	357.01	379.92	314.69
	(SD)	22.58	33.43	8.60	47.46
Number of cotton types designed for	Mean	1.89	1.57	2.48	1.29
	(SD)	0.69	0.70	0.22	0.61
Designed for Indian cotton	Mean	0.32	0.17	0.59	0.11
	(SD)	0.30	0.25	0.15	0.25
Designed for US cotton	Mean	0.28	0.21	0.43	0.11
	(SD)	0.24	0.25	0.13	0.14
Observations		32	31	38	23

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TFPQ Measurement

- We use De Loecker (2013) method, an extension of PF proxy estimators that accounts for systematic input choice changes coincident with (or caused by) productivity-enhancing shifts
  - Move to exporting in De Loecker's case; here, acquisition

- Production Function

$$y_{it} = \beta_k k_{it} + \beta_l l_{it} + \beta_i i_{it} + \beta_a a_{it} + \omega_{it} + \varepsilon_{it}$$

- Productivity process

$$\omega_{it+1} = g(\omega_{it}, acq_{it}) + \xi_{it+1}$$

$$g(\omega_{it}, acq_{it}) = \sum_{j=1}^{3} \gamma_j \omega_{it}^{j} + \theta_1 lb\_acq_{it} + \theta_2 ea\_acq_{it} + \theta_3 la\_acq_{it}$$

Within-Acquired-Plant Estimates

- Within acquired plant specification:

$$y_{it} = \alpha + \theta_1 lb\_acq_{it} + \theta_2 ea\_acq_{it} + \theta_3 la_{acq_{it}} + m_A + \mu_t + \varepsilon_{it}$$

  - Distinguishes between early and late pre- and post-acquisition periods

Within-Acquired-Plant Estimates

	All acquisitions		
Dependent variable	TFPQ	Plant ROCE	Log price res.
Late pre-acquisition dummy	-0.003	0.020	0.011
	(0.019)	(0.013)	(0.013)
Early post-acquisition dummy	0.045*	0.060***	0.036
	(0.026)	(0.022)	(0.027)
Late post-acquisition dummy	0.126***	0.089***	0.044
	(0.033)	(0.025)	(0.034)
Constant	0.603***	0.102***	0.029***
	(0.032)	(0.013)	(0.010)
Acquisition fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	1,078	891	1,118
Adjusted R-squared	0.734	0.639	0.097

Within-Acquisition Estimates

- Within acquisitions (matched on same owner):

$$\bar{y}_{it} = \alpha_0 + \beta_1 AA_{it} + \beta_2 Aquired_{it} + \beta_3 Aquired_i \times AA_{it} + m_{it} + \mu_t + \varepsilon_{it}$$

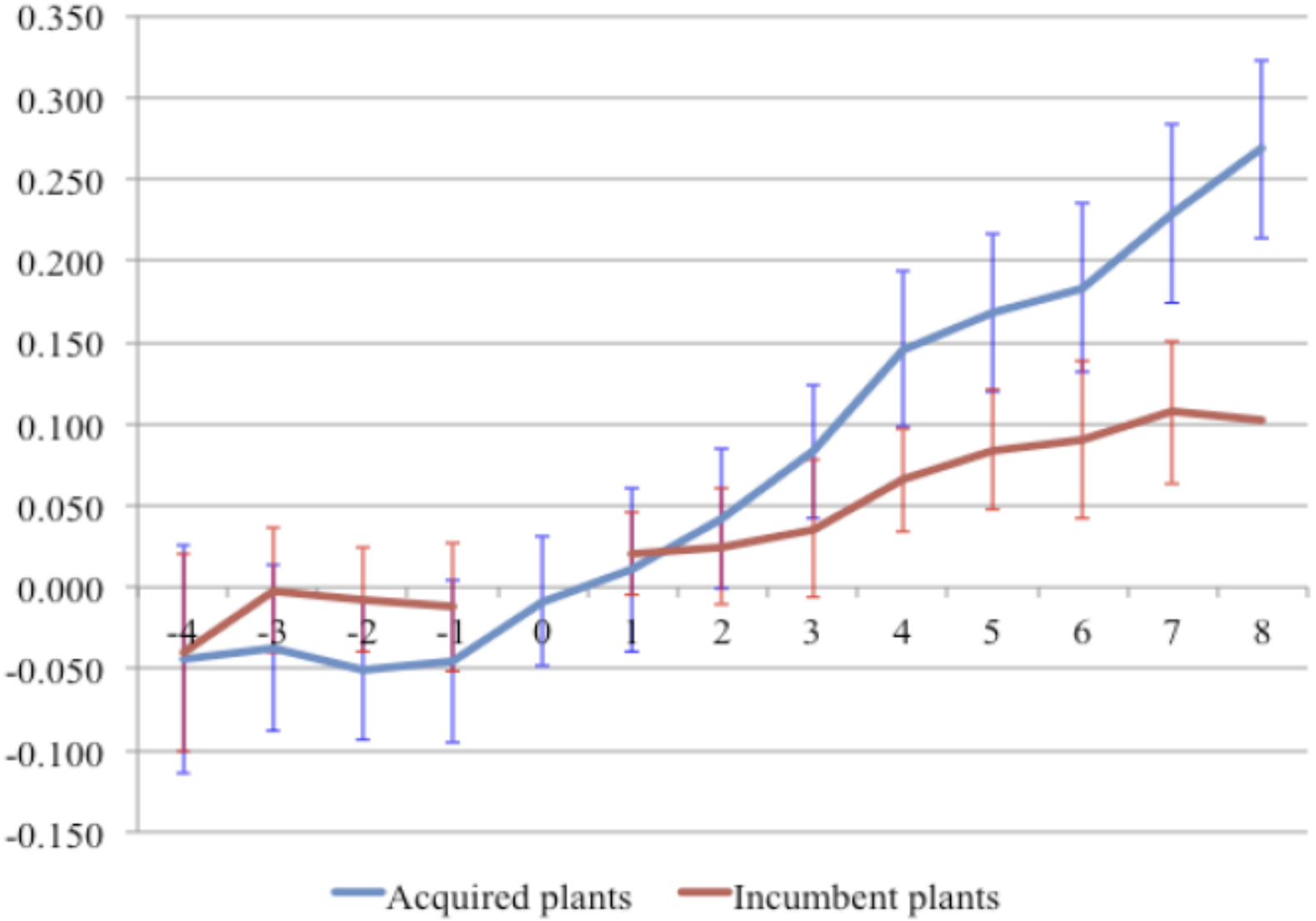
$$\bar{y}_{it} = \frac{1}{\#m_A} \sum_{j \in m_A} \omega_j y_{jt}$$

  - Outcomes at incumbent plants collapsed to weighted average across those plants within the acquisition
  - Acquisition-year fixed effects makes this akin to D-in-D estimations
  - Results robust to more statistical approaches to creating control group

Within-Acquisition Estimates

	All acquisitions		
Dependent variable	TFPQ	Plant ROCE	Log price res.
After acquisition	-0.055***	-0.004	-0.031**
	(0.013)	(0.012)	(0.013)
Acquired plant	-0.025	-0.030***	-0.019
	(0.021)	(0.011)	(0.014)
After acquisition x Acquired plant	0.091***	0.040***	0.024
	(0.023)	(0.014)	(0.017)
Constant	0.480***	0.145***	0.038***
	(0.034)	(0.018)	(0.008)
Acquisition fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	1,487	1,392	1,528
Adjusted R-squared	0.347	0.433	0.108

Figure A15. Within-acquisition TFPQ of acquired and incumbent plants



Where Do Profitability Differences Come From?

- We conduct a set of accounting decompositions to explore the source of profitability differences

- ROCE = Gross margin per K – wage per K – unit K costs

$$\frac{\pi_i}{C_i} = \frac{(1-\upsilon)Y_i}{C_i} - \frac{w_i L_i}{C_i} - \frac{R_i}{C_i}$$

- ln(gross margin per K) = ln(price) + ln(inputs per K) + TFPQ

$$\log\left(\frac{\psi Y_i}{C_i}\right) = \log(\psi p_i) + \log\left[\frac{\exp(\hat{Y}_i)}{C_i}\right] + TPFQ_i$$

Profitability Decompositions: Pre-Acquisition Means

Pre-acquisition means	Acquired plants (A)	Incumbent plants (B)	Difference (B-A)	Percentage difference
ROCE	0.053	0.104	0.051	95.3***
of which:				
net output value/capital employed	0.193	0.257	0.065	33.5***
minus:				
wage cost/capital employed	0.077	0.094	0.018	22.9***
capital cost/capital employed	0.062	0.059	-0.004	-6.2***
# of observations	133	269		

Profitability Decompositions: Pre- and Early-Post-Acquisition Means

Pre- and early post-acquisition means	Pre-acquisition (A)	Early post-acquisition (B)	Difference (B)-(A)	Percentage difference
ROCE	0.062	0.126	0.063	101.7***
of which:				
net output value/capital employed	0.202	0.286	0.084	41.6***
minus:				
wage cost/capital employed	0.078	0.103	0.025	32.2***
capital cost/capital employed	0.062	0.058	-0.004	-7.0**
# of observations	163	159		

Profitability Decompositions: Pre- and Late-Post-Acquisition Means

Pre- and late post-acquisition means	Pre-acquisition (A)	Late post-acquisition (B)	Difference (B)-(A)	Percentage difference
ROCE	0.062	0.163	0.100	161.1***
of which:				
net output value/capital employed	0.202	0.317	0.114	56.6***
minus:				
wage cost/capital employed	0.078	0.103	0.025	31.7***
capital cost/capital employed	0.062	0.051	-0.011	-17.3***
# of observations	163	280		

Net Output Value Decompositions: Pre-Acquisition Means

Pre-acquisition means of logs	Acquired plants (A)	Incumbent plants (B)	Difference (B)-(A)	Percentage difference
ln(net output value/capital employed)	-1.791	-1.436	0.355	39.7***
of which:				
ln(price margin)	-1.407	-1.377	0.030	3.1
TFPQ	0.500	0.568	0.069	7.1***
ln(total input/ capital employed)	-0.883	-0.627	0.256	29.2***
# of observations	129	262		

Net Output Value Decompositions: Pre- and Early-Post-Acquisition Means

Pre- and early post- acquisition means of logs	Pre-acquisition (A)	Early post-acquisition (B)	Difference (B)-(A)	Percentage difference
ln(net output value/capital employed)	-1.735	-1.392	0.343	40.9***
of which:				
ln(price margin)	-1.438	-1.367	0.071	7.4**
TFPQ	0.499	0.568	0.069	7.2***
ln(total input/capital employed)	-0.795	-0.593	0.202	22.4**
# of observations	157	157		

Net Output Value Decompositions: Pre- and Late-Post-Acquisition Means

Pre- and late post- acquisition means of logs	Pre-acquisition (A)	Late post-acquisition (B)	Difference (B)-(A)	Percentage difference
ln(net output value/capital employed)	-1.735	-1.275	0.460	58.4***
of which:				
ln(price margin)	-1.438	-1.316	0.122	13.0***
TFPQ	0.499	0.685	0.187	20.5***
ln(total input/capital employed)	-0.795	-0.644	0.151	16.3***
# of observations	157	278		

Changes in Various TFP Metrics around Acquisitions

	Within-acquired plants estimations		
Dependent variable	TFPR	TFPQU	TFPQ
Late pre-acquisition dummy	0.020	-0.027	-0.003
	(0.051)	(0.044)	(0.019)
Early post-acquisition dummy	0.168***	0.104***	0.045*
	(0.058)	(0.038)	(0.026)
Late post-acquisition dummy	0.290***	0.211***	0.126***
	(0.080)	(0.050)	(0.033)
Constant	0.750***	0.304***	0.603***
	(0.065)	(0.053)	(0.032)
Acquisition fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	1,047	1,077	1,078
Adjusted R-squared	0.824	0.478	0.734

Decompositions: Implications

- Most of profitability differences are explained gross margin ROC
- This differential capital profitability comes in the short run mostly from differences in input utilization rather than price or TFPQ differences
  - Both utilization and TFPQ have roles in the longer run
- Note that TFPQ measured *conditional on operating*; traditional measures using capital stocks rather than flows as inputs show larger TFP effects

Productivity, Profitability, and Demand

- Demand must play a role in acquired firms' initial unprofitability
- We can reject the role of simple price-setting market power—no differential price levels or changes
- But lack of price differentiation does not mean no other forms of output-market differentiation
- Rationing occurred during times of low demand
- Stronger companies were more reputable among buyers and had a broader network of connections at trading houses

Unrealized Output—Stuff That Isn't Sold

Means	Acquired plants (A)	Incumbent plants (B)	Difference (B-A)	Percentage difference
Inventory/produced output (C)	0.046	0.018	-0.028	-61.0***
Accrued revenues/produced output (D)	0.031	0.015	-0.016	-50.6***
Unrealized/produced output (C)+(D)	0.078	0.033	-0.045	-57.4***
# of observations	113	195		

	Pre-acquisition (A)	Early post-acquisition (B)	Difference (B-A)	Percentage difference
Inventory/produced output (C)	0.048	0.013	-0.034	-72.0***
Accrued revenues/produced output (D)	0.029	0.020	-0.010	-32.4**
Unrealized/produced output (C)+(D)	0.078	0.032	-0.046	-59.4***
# of observations	139	100		

	Pre-acquisition (A)	Late post-acquisition (B)	Difference (B-A)	Percentage difference
Inventory/produced output (C)	0.048	0.009	-0.039	-81.5***
Accrued revenues/produced output (D)	0.029	0.015	-0.014	-48.1***
Unrealized/produced output (C)+(D)	0.078	0.023	-0.055	-70.6***
# of observations	139	124		

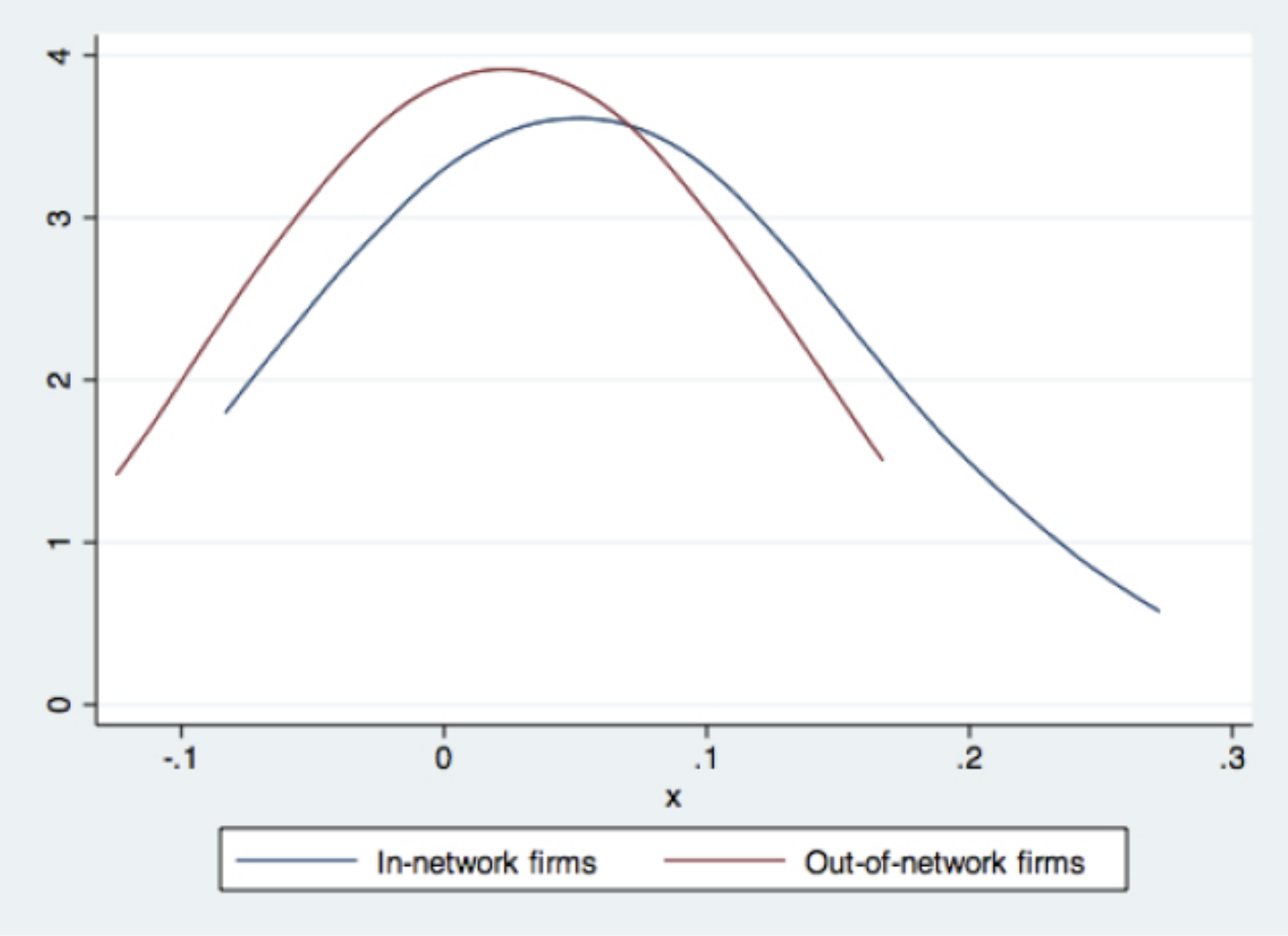
Measuring Producers' Connections to Trading Houses

- Use 1898 nationwide registry to identify those most likely connected to cotton spinners' output markets
- Yielded list of 154 individuals
  - 98 cotton yarn traders across Japan who paid more than 50,000 yen worth of operation tax that year
  - 25 individuals listed as board members of the 4 largest incorporated cotton yarn-related trade companies
  - 31 board members and traders registered at Osaka cotton and cotton yarn exchange
- "Trader network" dummy = 1 if firm had at least 1 trader among board members and top shareholders (33 of 67 firms)
- Similar results using shares of stock owned by connected traders

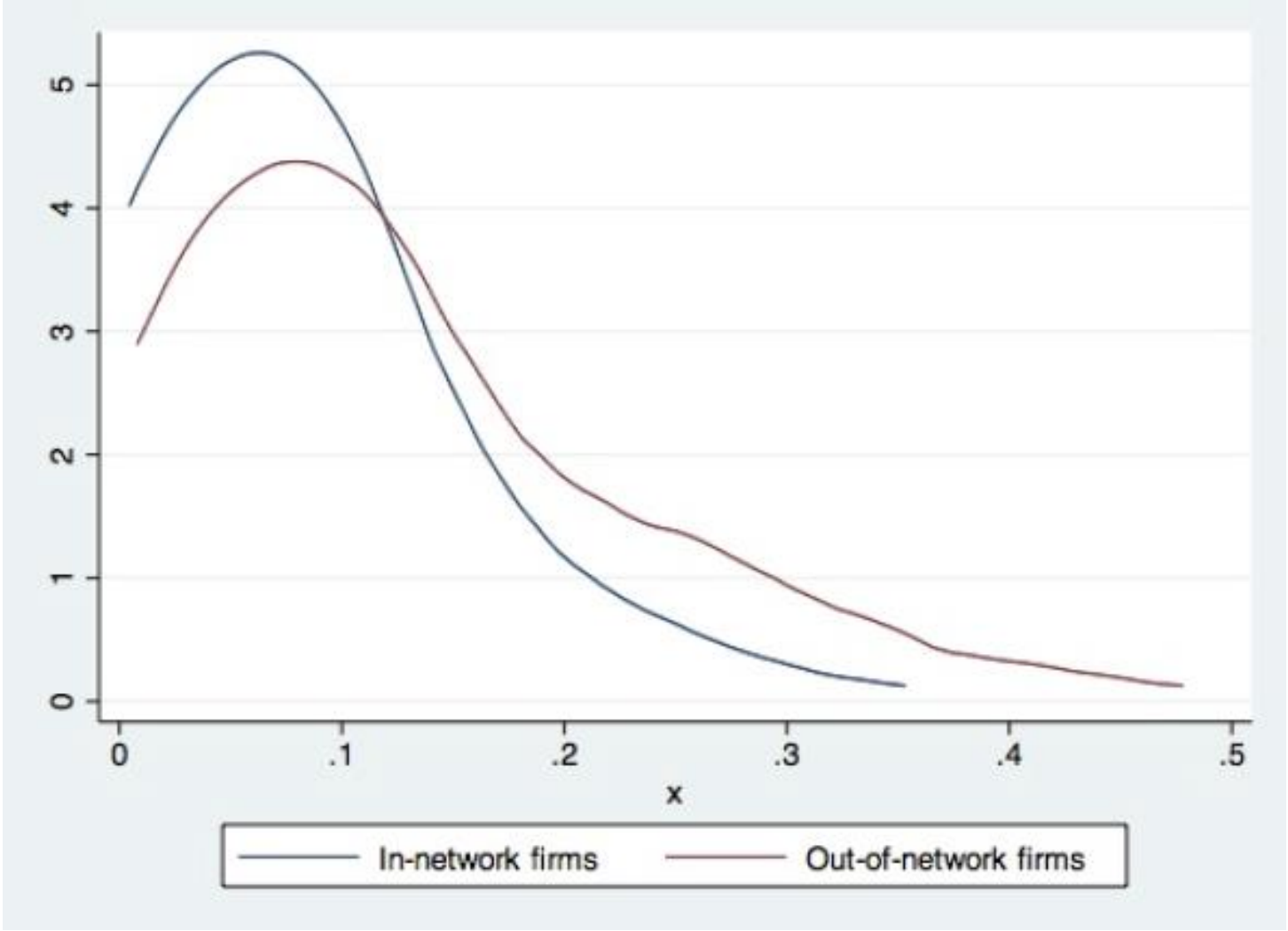
Performance Metrics for In-Network and Out-of-Network Producers, 1898-1902

Outcome	Out-of-network (A)	In-network (B)	Difference (B-A)
TFPQ	0.433	0.488	0.055***
TFPQU	0.117	0.241	0.123***
ROCE	0.023	0.059	0.037***
Unrealized output ratios	0.127	0.084	-0.043***
Spindle utilization rates	0.739	0.781	0.043**
Logged price residuals	-0.025	0.018	0.044***
# of observations	127	170	

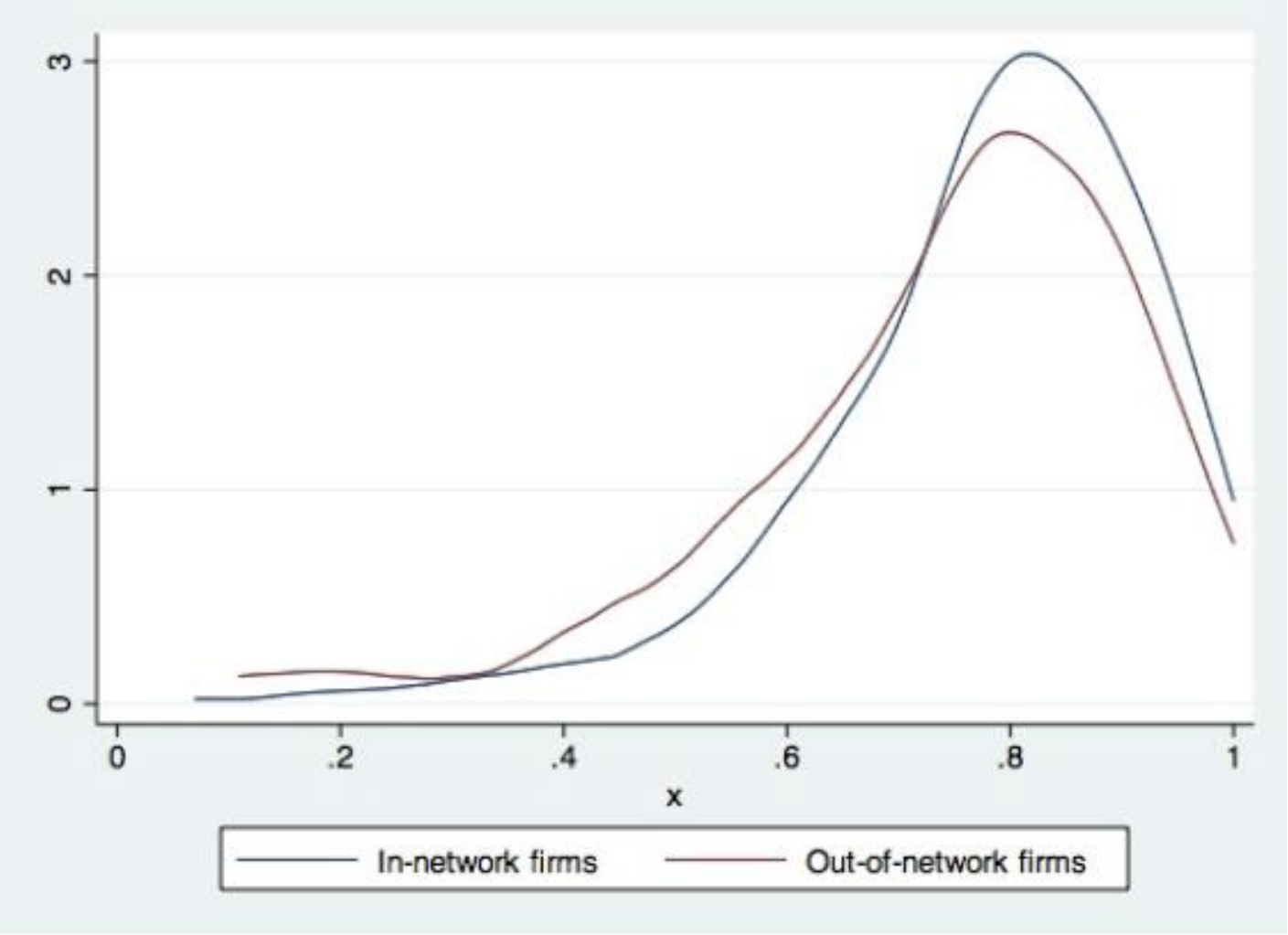
ROCE Distribution for In-Network and Out-of-Network Producers, 1898-1902



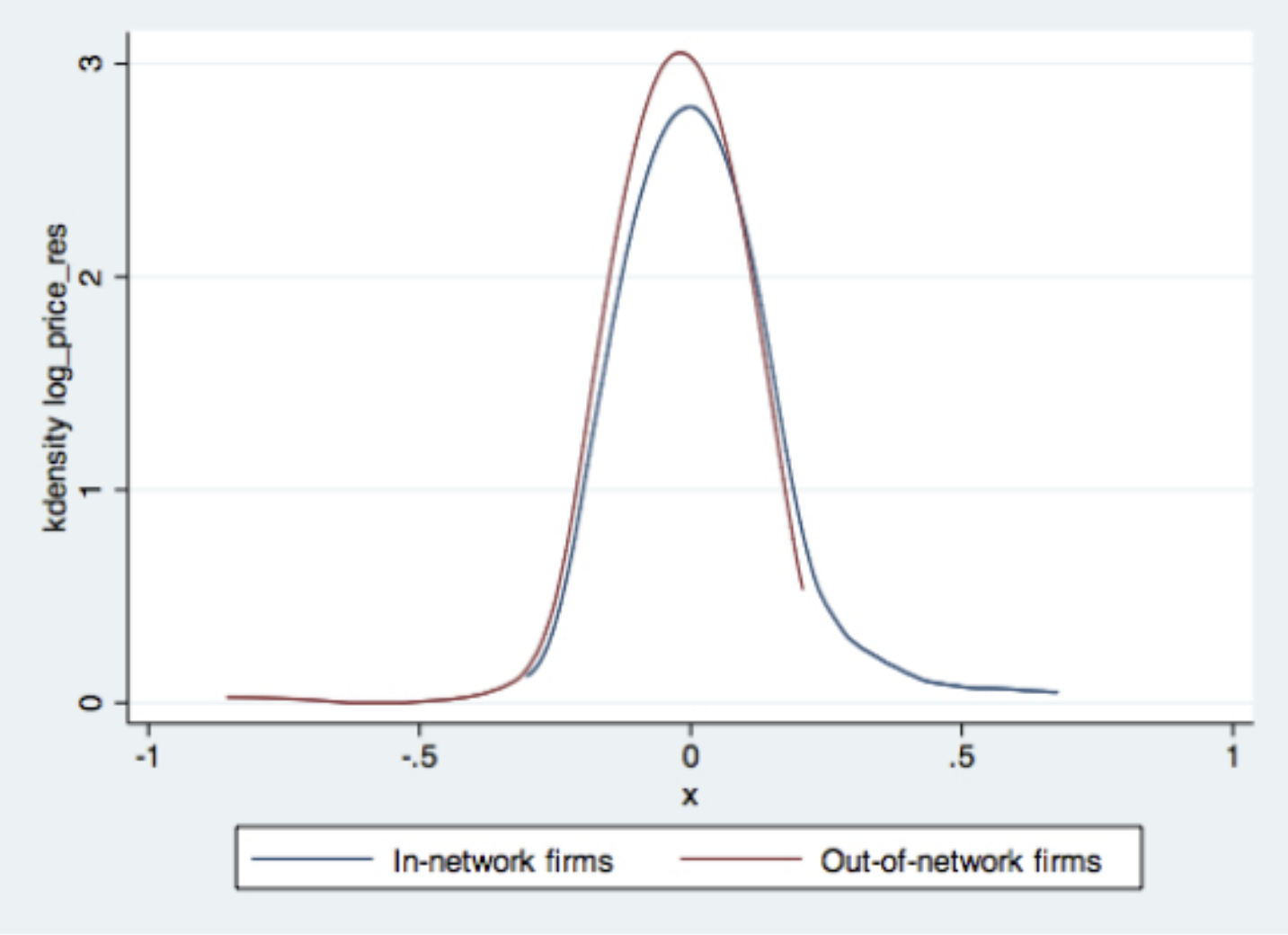
Share of Unrealized Output for In-Network and Out-of-Network Producers, 1898-1902



Spindle Utilization Rates of In-Network and Out-of-Network Producers, 1898-1902



Output Prices of In-Network and Out-of-Network Producers, 1898-1902



Robustness

- Measuring TFP using alternative methods: Alternative De Loecker functional forms, Blundell-Bond system GMM, index number
  - Same implications
- Multiple alternative control groups in the D-in-D specifications created using matching criteria
  - Same implications
- Placebo test: randomly assign acquisition status to plants and use this in specifications
  - Small economic and statistical significance

A possible mechanism

- A framework that delivers empirical patterns: a managerial time allocation decision
  - Owners/managers trade off spending more time managing demand (increasing sales) vs. spending less time managing production (decreasing productivity)
  - Higher-ability managers are more effective per unit time, can raise both sales and productivity
  - It is possible that more productive plants are bought by more profitable ones
- However, we can't observe manager time allocations in data and other possible mechanisms could exist

Producers Performance with and without Educated Engineers, 1898-1902

Outcome	No formally educated engineer (A)	Formally educated engineer (B)	Difference (B-A)
TFPQ	0.435	0.517	0.082***
TFPQU	0.131	0.286	0.156***
ROCE	0.024	0.072	0.047***
Unrealized output ratios	0.119	0.077	-0.042***
Spindle utilization rates	0.746	0.792	0.046***
Logged price residuals	-0.014	0.021	0.035**
# of observations	188	109	

Conclusions

- Asset turnover can happen for many reasons
- Can be an important mechanism to raise productivity within an industry
- We find this in our case, but the mechanisms are a bit subtle
- Acquired firms are not initially less productive as much as they are less profitable (though their inputs were under utilized)
- Acquisition by better managed and better connected firms increased both productivity and profitability of acquired assets

The setup

- Production technology is

$$y = u\omega x$$

- Demand is

$$q = \lambda(u;\gamma)\, p^{-\sigma}$$

where $\frac{\partial \lambda(u;\gamma)}{\partial u} < 0$, $\frac{\partial \lambda(u;\gamma)}{\partial \gamma} < 0$, $\frac{\partial}{\partial \gamma}\left(\frac{\partial \lambda(u;\gamma)}{\partial u}\right) > 0$.

- A firm's profit is

$$\pi(u;\gamma) = \mu(\omega,\sigma)\,\lambda(u;\gamma)\,u^{\sigma-1}$$

- A manager's time allocation problem is

$$Max_{u\in[0,1]}\ \lambda(u;\gamma)\,u^{\sigma-1}$$

- The trade-off is that u decreases λ (sales), but increases output

The first order condition for an interior solution is

$$\frac{\partial \lambda(u;\gamma)}{\partial u} u = -(\sigma - 1)\lambda(u;\gamma).$$

Let $u(\gamma)$ denote an optimal solution. A simple comparative exercise yields

Lemma 1: Assume that the function $\lambda(u;\gamma)$ satisfies properties above. Then,

(i) $\frac{du(\gamma)}{d\gamma} > 0$; Time allocated to managing production at the plant, $u(\gamma)$, increases with ability γ.

(ii) $\frac{\partial \pi(u(\gamma);\gamma)}{\partial \gamma} > 0$ and $\frac{\partial \pi(u(\gamma);\gamma)}{\partial \omega} > 0$; Profits increase in ability γ and plant quality ω.

Acquisitions

Two cohorts of plants, first cohort enters before technology refinement, second after it, so we have $\omega_2 > \omega_1$.

Only some firms from the first cohort are endowed with (or develop) higher γ, so we have $\gamma_2 < \gamma_1$.

An opportunity to negotiate a merger or acquisition arrives randomly, and plant owners are matched into negotiating pairs also randomly.

- Proposition 1: In any acquisition, a higher-ability plant owner acquires a plant managed by a lower-ability plant owner. Higher-quality plants are more likely to change ownership than lower-quality plants. The most common acquisition pattern will be an high-ability early entrant with a relatively aged plant acquiring a more recent entrant with lower ability but a newer plant.

Implications

- Proposition 2: The productivity of an acquired plant rises after an acquisition.
- Proposition 3: The profits of an acquired plant increase after an acquisition.
- Intuition: the new manager's superior ability to manage sales allows him to increase the time allocated to managing the production facility without sacrificing (or even increasing) actual sales at any given price.

Implications

- Under suitable functional form restrictions on $\lambda(u;\gamma)$, the ratio of effective sales to output in a given plant increases following an acquisition, and its profitability increases by more than its TFPQ.
- Proposition 4: Under suitable parametric restrictions, pre-acquisition TFPQ of an acquiring plant can be lower than that of an acquired plant even if pre-acquisition profitability of an acquiring plant is higher than that of an acquired plant.

Within-acquired plants comparisons of productivity, not including and including ability control functions

	Dependent variable: log output (adjusted for count).		
Late pre-acquisition dummy	-0.017	0.003	-0.053
	(0.028)	(0.028)	(0.033)
Early post-acquisition dummy	0.032	-0.021	-0.025
	(0.033)	(0.036)	(0.045)
Late post-acquisition dummy	0.111**	0.028	-0.002
	(0.048)	(0.048)	(0.054)
Log spindles-days in operation	0.715***	0.751***	0.702***
	(0.039)	(0.050)	(0.086)
Log worker-days	0.248***	0.115***	0.228***
	(0.037)	(0.032)	(0.053)
Log capacity change	-0.090*	-0.003	-0.173*
	(0.050)	(0.050)	(0.092)
Log fixed cost to output ratio		-0.276***	
		(0.040)	
Log inventory to output ratio			-0.075***
			(0.020)
Constant	-1.075*	-0.500	-0.742
	(0.544)	(0.722)	(1.194)
Plant fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	1,248	1,027	572
R-squared	0.944	0.946	0.943

I wish I had such photos too

What Bloom et al. saw at Indian plants: dirty and unsafe

Garbage outside the plant

Garbage inside a plant

Flammable garbage in a plant

Chemicals without any covering

The plant floors were often disorganized and aisles blocked

Instrument not removed after use, blocking hallway.

Old warp beam, chairs and a desk obstructing the plant floor

Dirty and poorly maintained machines

Tools left on the floor after use

The inventory rooms had months of excess yarn, often without any formal storage system or protection from damp or crushing

Yarn without labeling, order or damp protection

Yarn piled up so high and deep that access to back sacks is almost impossible

Different types and colors of yarn lying mixed

A crushed yarn cone, which is unusable as it leads to irregular yarn tension

- Bloom et al. conducted a controlled experiment to see if consulting can improve this situation (it did)
- Fast backward 100+ years to August 1898
- A new manager arrived at Onagigawa Cotton Products plant in Tokyo
- We don’t have photos of what he saw, so here is the photo of the man himself

Hibiya Heizaemon

- We also have a historic record of what he saw
  - Workers brought portable charcoal stoves and smoked inside the plant.
  - Women cooked and ate on the factory floor, strewing garbage.
  - Cotton and other materials were everywhere, blocking hallways, while workers in inventory room played gambling games.
  - And the managerial personnel were out at the nearby river fishing
- Reads like annotation to Bloom's slides

- What did Hibiya do?
- As it turns out, pretty much the same as McKinsey consultants in the Bloom team
  - Clean the plant premises, stop work-unrelated and hazardous activity
  - Daily productivity meetings with workers
  - Daily inspections of machines and product quality
  - Etc., etc.
- Only he also had a chance to fire some management personnel and station an off-duty police officer on the premises for some time (consultants cannot do that, right?)

What about outcomes?

- Western consultants: 17% productivity increase in treated plants
- Hibiya Heizaemon's measures: 50% increase in TFP in three years after his arrival compared to 3 years before. 70% increase in labor productivity.
- Two comparable plants in Tokyo increased their labor productivity by just 6% over the same period.

- A controlled experiment like in Bloom et al. is an economist's dream.
- We do not have a controlled experiment.
- But we have a multitude of cases where similar changes were implemented, motivated by the desire to improve plant performance.
- Most importantly, the impetus and the mechanism came from within the industry itself.