

FDI and Firm Productivity: The Role of Financial Constraints

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- The above two factors may not work in the same direction.

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 - Show this in a simple theoretical model.
 - Find empirical evidence in the firm-level data of China.

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 - High-productivity firms are financed by local banks for start-up costs.
- FDI finances firms with middle-range productivity.

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 - Market stealing effect: Aitken and Harrison (1999)
 - Negative effect on local firm's credit constraint: Harrison and McMillan (2003)

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 - FDI more likely driven by high productivity
- Economies with better financial institutions benefit more from FDI for economic growth.
 - Alfaro et al. (2004)
 - Better local financial institutions finance technology spillovers more efficiently.

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 - FDI may be an indicator of inefficient local financial markets
 - Improving local financial markets can decrease FDI inflows.
 - No policy is needed to maintain FDI inflows in this case.
 - Subsidize low-productivity firms at the cost of high-productivity firms.

Data

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- Income statement: total sales, production, exports, income, costs, etc.

Productivity

- Follow Akerberg, Caves and Frazer (2006)
 - Assumption: Productivity affects firms' decision on labor and capital
 - Advantage: No collinearity problem as in Olley and Parkes (1996) and Levinshon and Petrin (2003)

- $y_{it} = \beta_l l_{it} + \beta_k k_{it} + \omega_{it} + \epsilon_{it}$

- Estimation result: $\hat{\omega}_{it} \Rightarrow \omega_{it}$

- $\omega_{it} = \frac{\hat{\omega}_{it} - \mu_t}{\sigma_t}$
- μ_t : Industry mean
- σ_t : Industry standard deviation

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 - Variables to capture industry characteristics (e.g., Rajan and Zingales (1998))
 - Five variables calculated from publicly traded US firms (Manova, et al. (2013))

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 - Trade credit intensity: $\text{account payable} / \text{total assets}$
 - Asset tangibility: $\text{tangible assets} / \text{total assets}$

Financial vulnerability: statistics

Variable	25th percentile	75th percentile
External finance dependence	-0.27	0.06
Inventory ratio	0.13	0.18
R&D ratio	0.01	0.02
Tangibility	0.20	0.40
Trade credit	0.05	0.08
First principal component (FPC)	-0.79	0.79

- Obtained from Kroszner et al. (2007) and Fisman and Love (2003)
- First principal component (FPC)
 - Orthogonal transformation: 5 measures \rightarrow 5 linearly uncorrelated principal components
 - FPC accounts for the largest portion of variance.

Empirical Results

Result 1: firm productivity and FDI shares

FDI firms more productivity?

For every year:

$$Productivity_{ijp} = \alpha + \beta FDI_{ijp} + \gamma_1 Firmcontrol_i + \gamma_2 Inddummy_j + \gamma_3 Locadummy_p + \epsilon_{ijp}$$

- FDI_{ijp} : FDI share
- $Firmcontrol_i$: log(employment), log(age+1), export/output
- $Inddummy_j$: 2-digit industry dummies
- $Locadummy_p$: Province dummies, economic zone dummies

Result for 2000

	Coefficient	std. err.	t-value	95% Conf. Interval	
FDI share	0.168	0.0121	13.86	0.14	0.19
Employment	-0.054	0.0027	-20.34	-0.06	-0.05
Age	-0.185	0.0038	-48.84	-0.19	-0.18
Export ratio	0.001	0.0001	8.28	0.00	0.00
Economic zone	0.033	0.0094	3.52	0.01	0.05
R-squared	0.12	# of Observations	89,905		

Fixed-Effects Regressions: 2000-2007

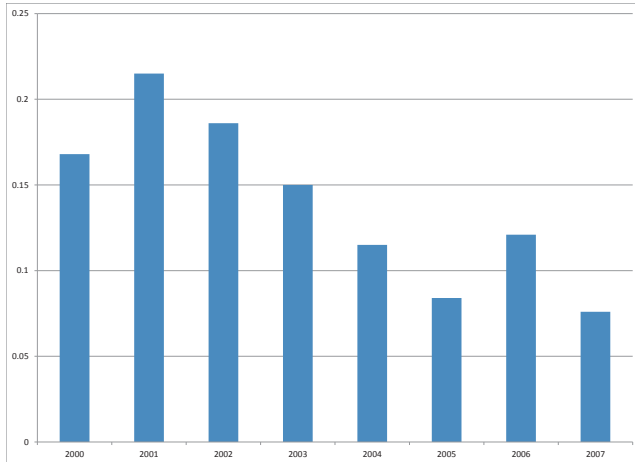
$$Productivity_{ijpt} = \alpha + \beta FDI_{ijpt} + \gamma_1 Firmcontrol_{it} + \gamma_2 Indcontrol_{jt} + \gamma_3 Locacontrol_{pt} + \epsilon_{ijpt}$$

- $Indcontrol_{jt}$: HH index (competitiveness)
- $Locacontrol_{pt}$:
 - Market size: log(RGDP)
 - Market demand: log(RGDP per capita), log(retail sales)
 - Infrastructure: Railway, road
 - R&D: Number of scientists
 - Openness: import/GDP, export/GDP

Fixed-Effects Regressions: 2000-2007

	Coefficient	std. err.	t-value	95% Conf. Interval	
FDI share	0.0218	0.0071	3.06	0.0078	0.0358
Employment	-0.1030	0.0020	-52.79	-0.1068	-0.0992
Age	0.0990	0.0025	39.21	0.0941	0.1040
Export ratio	0.0000	0.0001	-0.20	-0.0001	0.0001
# of Observations	912,343		# of Groups	313,150	

Diminishing elasticity of productivity w.r.t. FDI shares



Test: FDI's productivity advantage diminished?

- Seemingly Uncorrelated Regression
- Cross-model comparison
 - $H_0 : \beta^{t+1} = \beta^t$
 - $H_1 : \beta^{t+1} \neq \beta^t$
- A Wald Test

Productivity Elasticity of FDI Share Over Time

Year	Elasticity	t-value	Cross-year Comparison	χ^2 Statistic
2001	0.215	19.66	2002 vs. 2001	9.15***
2002	0.186	17.57	2003 vs. 2002	3.85**
2003	0.150	15.34	2004 vs. 2003	6.58***
2004	0.115	13.84	2005 vs. 2004	7.78***
2005	0.084	10.29	2006 vs. 2005	7.33***
2006	0.121	15.80	2007 vs. 2006	11.37***
2007	0.076	10.55	2001 vs. 2007	18.73***

TFP of new entrants decreases with the FDI share

Year	New Entrants (Age=0)			Incumbents (Age>0)		
	Coefficient	std. err.	t-value	Coefficient	std. err.	t-value
2000	-0.274	0.123	-2.220	0.159	0.012	13.040
2001	-0.101	0.072	-1.410	0.203	0.011	18.390
2002	-0.215	0.088	-2.440	0.184	0.011	17.330
2003	-0.129	0.062	-2.080	0.144	0.010	14.630
2004	-0.033	0.040	-0.820	0.111	0.008	13.150
2005	-0.070	0.047	-1.510	0.077	0.008	9.360
2006	-0.003	0.045	-0.070	0.114	0.008	14.740
2007	-0.041	0.044	-0.930	0.069	0.007	9.540

A possible explanation

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 - More sectors are opened to FDI.
 - More FDI driven by financial advantages
- The shrinking difference in TFP is also caused by the fast catch-up by local firms.

New entrants and financial vulnerability

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New entrants and financial vulnerability

- For each group, regress

$$\text{Productivity}_{ijp} = \alpha + \beta \text{FDI}_{ijp} + \gamma_1 \text{Firmcontrol}_i + \gamma_2 \text{Inddumy}_j + \gamma_3 \text{Locadumy}_p + \epsilon_{ijp}$$

- Test if β is the same for these two groups

- $H_0 : \beta^{25th} = \beta^{75th}$
- $H_1 : \beta^{25th} \neq \beta^{75th}$

	Less vulnerable			More vulnerable			χ^2
	Coef.	s.e.	No.	Coef.	s.e.	No.	
Ex. Fin.	-0.039	(0.045)	4391	-0.184***	(0.044)	4460	5.29**
Inv.	0.008	(0.037)	6922	-0.125***	(0.031)	7459	7.33***
R&D	-0.026	(0.026)	14185	-0.159**	(0.045)	4641	6.32**
Tang.	-0.091***	(0.040)	4575	-0.028	(0.047)	5905	1.03
T. Credit	-0.088	(0.070)	1725	-0.128***	(0.042)	5412	0.23
FPC	-0.024	(0.038)	6860	-0.184***	(0.040)	4820	8.46***

Result 2: FDI share and financial vulnerability

FDI shares and financial vulnerability

- FDI firms finance through: Parent firms/international markets
- If no financial friction: FDI share is equalized across sectors
- Financial friction: FDI share should be higher in financially more vulnerable industries

$$FDIshare_{ijp} = \alpha + \beta Finvul_i + \gamma_1 Firmcontrol_i + \gamma_2 Inddummy_j + \gamma_3 Locadummy_p + \epsilon_{ijp}$$

Higher FDI Shares in Financially More Vulnerable Sectors

	2000	2007	
	Coefficient	Coefficient	χ^2
Ex. Fin.	0.007***	0.016***	10.08***
Inv. ratio	0.017	0.323***	68.84***
R&D ratio	0.009	0.016	0.30
Tang.	-0.089***	-0.216***	115.45***
T. Credit	-0.299***	-0.160***	6.67***
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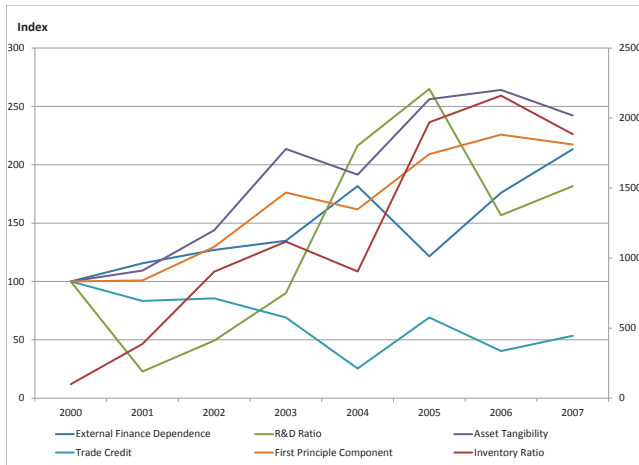
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FDI Share Grows in Financially Vulnerable Industries



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● Future work

- Loose ends in empirical exercises
- Theoretical model