Outward FDI and Domestic Input Distortion: Evidence from Chinese Firms

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Motivation: Outward FDI from Developing Countries

- Outward foreign direct investment (outward FDI) from developing countries is increasing at a high speed (UNCTAD World Investment Report (2015)):
  - In 2014, MNCs from developing economies invested almost 468 billion USD abroad, a 23 per cent increase from the previous year.

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  - In 2014, MNCs from developing economies invested almost 468 billion USD abroad, a 23 per cent increase from the previous year.
  - Developing and transition economies represent 9 of the 20 largest investor economies globally.
  - Developing economies now account for more than one third of global FDI outflows, up from 13 per cent in 2007.

Chinese Firms' Going Globe

- China has seen an astonishing increase in its outward FDI flows in the past decade.
  - China's outward FDI flows: 6.5% of the world's FDI flows in 2012.
  - China's outward FDI flows have increased by 37.8 times in the past ten years, while GDP and trade volume of FDI have only increased by less than fourfold.

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  - China's outward FDI flows have increased by 37.8 times in the past ten years, while GDP and trade volume of FDI have only increased by less than fourfold.
- China's outward FDI flows (140 billion USD) surpassed its inward FDI flows (119 billion USD) in 2014.

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  2. Constrained in the exporting market: Bai, Krishna & Ma (2013), Bai, Hsieh & Song (2015), Khandelwal, Schott & Wei (2013).
  3. Higher cost of acquiring land: Tian, Sheng & Zhang (2015).

Stylized Facts

1. Although non-FDI private firms are more productive than non-FDI SOEs on average, private FDI firms are *less productive* than state-owned FDI firms on average (productivity premium for state-owned MNCs).
   - Puzzling, since it is well known that SOE are less productive than private firms in China.

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   - Puzzling, since it is well known that SOE are less productive than private firms in China.
2. Compared with private firms, SOEs are *less likely* to undertake outward FDI, and the fraction of outward FDI firms is smaller among SOEs.
   - Puzzling, since SOEs are much bigger and receive supports from government for going abroad.

Main Results

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2. Institutional arbitrage:
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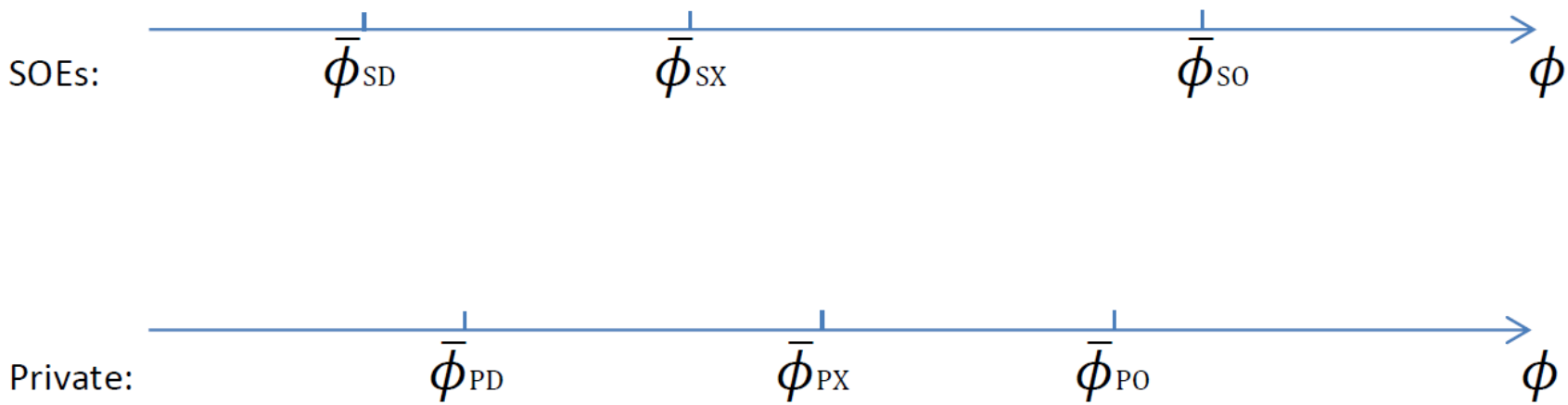
3. Selection reversal:
   - For private firms (compared with SOEs): tougher selection in the domestic market and less stringent selection in the FDI market.



Related Literature

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   - Horizontal: Markusen (1984), Brainard (1997), Helpman, Melitz and Yeaple (2004);
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3. Chinese Economy, Distortions and Chinese MNCs:
   - Bai, Hsieh and Song (2015), Brandt, Tombe and Zhu (2013), Khandelwal, Schott and Wei (2013);
   - Rosen and Hanemann (2009), Tian and Yu (2014).

Data Source

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- Orbis data on Chinese MNCs from 2005 to 2008 (merged with first three data sets).

Summary Statistics

Table 1: FDI Share in Chinese Manufacturing Firms (2000-08)

Firm type	2000	2001	2002	2003	2004	2005	2006	2007	2008
(1) FDI starting firm-country-affiliates	22	20	69	81	241	1,067	1,212	1,532	1,715
(2) FDI accumulating firm-country-affiliates	155	175	244	325	566	1,633	2,845	4,377	6,092
(3) Mfg. firms	83,579	100,068	110,498	129,448	199,873	198,260	224,807	257,140	191,018
(4) FDI mfg. firm-country-affiliates	14	17	20	30	103	431	761	1,168	1,183
(5) SOE FDI mfg. firm-country-affiliates	3	3	3	4	4	18	22	29	18
(6) FDI share (%)	0.017	0.017	0.018	0.023	0.052	0.22	0.34	0.45	0.62
(7) SOE FDI share (%)	21.4	17.6	15.0	13.3	3.8	4.17	2.89	2.48	1.52
(8) FDI mfg. firms	5	6	9	20	56	276	524	836	761
(9) SOE FDI mfg. firms	1	2	2	2	3	12	19	23	17
(10) FDI share (‰)	0.59	0.60	0.82	1.55	2.80	13.9	23.3	32.5	39.8
(11) SOE FDI share (%)	20.0	33.3	22.2	10.0	5.35	4.34	3.62	2.75	2.23

Note: Data on FDI starting firms were obtained from the Ministry of Commerce of China and authors' calculations. FDI share in row (6) is obtained by dividing the number of FDI manufacturing firms (with many country-regions) by the number of manufacturing firms (i.e., (6) = (4)/(3)). SOE FDI share in row (7) is obtained by dividing the number of SOE FDI manufacturing firm-country-affiliates by the number of FDI manufacturing firm-country-affiliates (i.e., (7) = (5)/(4)). That is, if firm F invests in countries A and B, there will be two MNCs recorded by the Ministry of Commerce: firm F-A and firm F-B. Rows (8) and (9) instead only allow one-firm-one-record each year even if a firm invests in multiple countries in a given year. For example, we only record Firm F once as in the previous example. As a result, (10) = (8)/(3) and (11) = (9)/(8).

Findings: Productivity Premium for State-owned MNCs and Smaller Fraction of MNCs among SOEs

Table 2: Selection Reversal: State-Owned MNCs Are More Productive than Private MNCs

Category	Non-MNCs				MNCs		# of	# of	Fraction of
	domestic only		domestic+export		all firms	with exports	MNCs	All firms	MNCs
PSM Matching	unmatched	matched	unmatched	matched	unmatched	unmatched			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(i) Private firms	3.63	3.54	3.62	3.58	4.28	4.28	3,623	1,100,212	0.33%
(ii) SOE	2.99	2.99	3.05	3.05	4.48	4.76	104	40,612	0.25%
Difference=(i)-(ii)	0.63***	0.55***	0.57***	0.53***	-0.20*	-0.48***			
	(93.60)	(41.34)	(95.76)	(46.73)	(-1.67)	(-3.30)			

Note: Columns (1) and (2) show that private firms have higher TFP than SOEs among non-MNCs with only domestic sales. Columns (3) and (4) show that private firms have higher TFP than SOEs for non-FDI firms with domestic sales and exports. Columns (5) and (6) show that, on average, private MNCs are less productive than state-owned MNCs. This is consistent with part 1 of Proposition 1. Column (9) reports the fraction of MNCs that is obtained by dividing column (8) by column (7). Clearly, the share of MNCs is smaller among SOEs than among private firms, which is consistent with part 2 of Proposition 1. Firm size (i.e., log employment) and sales are used as covariates to obtain the propensity score. The numbers in parentheses are t-values. *** (**, *) denotes the significance at 1 percent (5 percent, 10 percent).

Robustness: Productivity Premium for State-owned MNCs only Exists in Capital Intensive Industries

- Consistent with distortion against private firms in credit and capital markets.
- Lower fixed cost of doing outward FDI for SOEs.

Table E.3: *Relative TFP and Capital Intensity (2001-2008)*

Chinese Industry	Private MNCs		State-owned MNCs		Difference=(2)-(4)	
(2-digit level)	Obs.	Mean	Obs.	Mean	Mean	*t*-value
	(1)	(2)	(3)	(4)	(5)	(6)
Labor Intensive	1,193	0.588	25	0.537	0.051	(1.14)
Capital Intensive	2,430	0.629	79	0.686	-0.056***	(-2.48)

Note: This table reports size difference between private MNCs and state-owned MNCs. Firm size is measured by log number of employees in the top module and by firm TFP (Olley-Pakes) in the bottom module. The top module shows that the average firm size of private MNCs is smaller than that of state-owned MNCs by year, especially for years after 2004. This pattern exists for years after 2006 when measured by firm productivity. This is probably because there were few state-owned MNCs before 2005, as shown in Table 1. The numbers in parentheses are *t*-values. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Robustness: Distribution of Relative TFP for State-Owned MNCs FOSD that for Private MNCs

Table E.2: *Distribution of Relative TFP (2001-2008)*

Percentiles	State-owned MNCs	Private MNCs
	(1)	(2)
10%	0.368	0.347
25%	0.497	0.475
50%	0.648	0.608
75%	0.842	0.752

Notes: Productivity of the most productive firms in each industry is normalized to one.

Robustness: Productivity Difference by Year

Table E.4: Size Difference by Year

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Log Number of Employees (incumbent firms)									
(1) Non-MNCs	5.173	5.096	5.057	4.947	4.685	4.746	4.685	4.634	4.556
(2) All MNCs	8.146	8.075	7.874	7.901	5.949	5.957	5.975	5.908	5.502
(3) SOE MNCs	8.645	8.629	8.593	9.048	8.756	8.049	8.824	8.820	6.602
(4) Private MNCs	8.010	7.957	7.748	7.724	5.836	5.866	5.890	5.833	5.485
Size Difference=(3)-(4)	0.635	0.672	0.845	1.324	2.919***	2.183***	2.934***	2.986***	1.117***
	(0.71)	(0.64)	(0.79)	(1.16)	(2.79)	(5.62)	(2.25)	(10.01)	(2.32)
Firm TFP (incumbent firms)									
(5) Non-MNCs	3.109	3.002	3.218	3.283	3.065	3.421	3.540	3.659	4.966
(6) All MNCs	4.396	4.190	4.376	5.309	4.163	3.855	3.738	3.877	5.194
(7) SOE MNCs	3.713	3.451	3.973	4.638	5.208	4.154	4.217	4.570	5.222
(8) Private MNCs	4.582	4.348	4.447	5.413	4.120	3.842	3.724	3.859	5.193
Size Difference=(7)-(8)	-0.869	-0.897*	-0.473	-0.774	1.087	0.312	0.492**	0.710***	0.029
	(-1.49)	(-1.66)	(-0.73)	(-1.20)	(1.63)	(1.16)	(2.12)	(3.41)	(0.13)
Firm TFP (starting Firms)									
(9) SOE MNCs	2.78	–	–	5.85	3.61	3.82	3.77	4.29	5.96
(10) Private MNCs	3.44	2.83	4.29	4.48	3.31	3.51	3.71	3.77	5.20

Notes: This table reports size difference between private MNCs and state-owned MNCs. Firm size is measured by log number of employees in the top module and by firm TFP (Olley-Pakes) in the bottom module. The top module shows that average firm size of private MNCs is smaller than that of state-owned MNCs by year, especially for years after 2004. Such a pattern exists for years after 2006 when measured by firm productivity. This is probably due to the fact that there were few state-owned MNCs before 2005, as shown by Table 1. Numbers in parentheses are t-values. ***(**, *) denotes significance at the 1% (5%, 10%) level.

Finding: Relative Size Premium for State-owned MNCs

Table 4: Relative Size Premium for SOEs

Year coverage	Avg.	$\leq$ 2001	$\leq$ 2002	$\leq$ 2003	$\leq$ 2004	$\leq$ 2005	$\leq$ 2006	$\leq$ 2007	$\leq$ 2008
	relative size of FDI firms to non-exporting firms (l_o/l_d)								
(1) Private Firms	4.50	4.59	4.59	4.56	4.54	4.53	4.52	4.51	4.50
(2) SOE	5.48	5.65	5.64	5.58	5.55	5.53	5.51	5.49	5.48
Size Difference=(1)-(2)	-0.97***	-1.06***	-1.05***	-1.02***	-1.01***	-1.00***	-0.99***	-0.98***	-0.98***
	(-488.1)	(-234.0)	(-283.5)	(-329.0)	(-374.1)	(-400.1)	(-430.4)	(-445.5)	(-466.6)

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where $\beta \equiv \frac{\sigma-1}{\sigma}$. Aggregate environment:

$$D_i \equiv P_i^{\sigma-1} E_i \qquad i \in \{H, F\}$$

Supply: SOEs

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- Productivity draw: φ.
- Total variable cost features CRS. For SOEs:
  - non-FDI:

$$\frac{(q_H + I_{\{q_E>0\}}\tau q_E)w_H}{\varphi}, \tag{4}$$

    where w_H: wage at home. $I_{\{}q_E > 0\}$ is an indication function for exporting. q_H and q_F: domestic sales and exports.
  - FDI:

$$\frac{q_H w_H}{\varphi} + \frac{q_F w_F}{\varphi}, \tag{5}$$

    where w_F wage in foreign country. q_F:output produced by the foreign affiliate.

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- Evidence: financing cost, cost of acquiring land. No evidence on wage.

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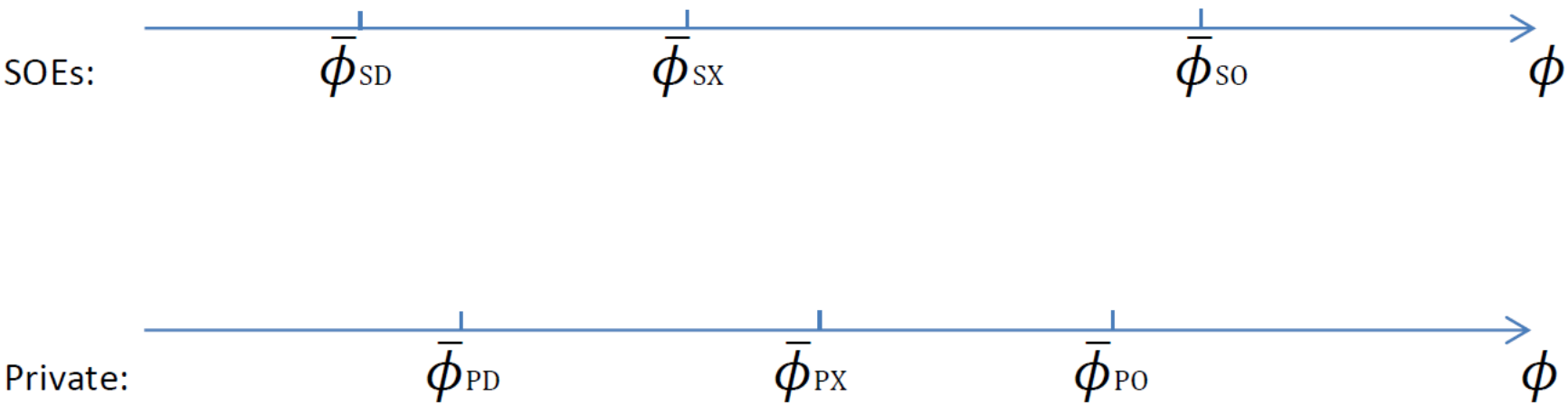
- Firm at FDI cutoff compares exporting with FDI $\rightarrow$ selection reversal.

Cutoffs: Graphical Representation



Testable Predictions: Likelihood of Going abroad and Average Productivity of MNCs

Proposition 1

(1). Conditioning on the initial draw, private firms are more likely to become MNCs. Next, Assume that the initial productivity draw follows the same Pareto distribution for SOEs and private firms. (2). Fraction of MNCs is higher among private firms than among SOEs. (3). Average productivity of private MNCs is smaller than that of state-owned MNCs.

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- Selection reversal $\longrightarrow$ productivity premium and tougher selection for state-owned MNCs.

Testable Predictions: Relative Size Premium

Proposition 3

Suppose the initial productivity draw follows the same Pareto distribution for SOEs and private firms. (1). Relative domestic size of private MNCs (i.e., compared with private non-exporting firms) is smaller than that of state-owned MNCs as well.

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- Tougher selection for state-owned MNCs. $\rightarrow$ relative size premium for state-owned MNCs.

Testable Predictions: Allocation of Output

- Allocation of output:

Proposition 4

Ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs. Suppose there is a reduction in fixed cost of FDI. Conditional on initial productivity draw and other firm-level characteristics, increase in overall firm size is larger for new private MNC than for state-owned MNC.

Testable Predictions: Allocation of Output

- Allocation of output:

Proposition 4

Ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs. Suppose there is a reduction in fixed cost of FDI. Conditional on initial productivity draw and other firm-level characteristics, increase in overall firm size is larger for new private MNC than for state-owned MNC.

- Extra benefit for private firms to invest abroad $\rightarrow$ increase in overall firm size is bigger for them.
- Private MNCs produce and sell *disproportionately more* in foreign markets owing to non-existence of distortion in that market.

Evidence for Part One of Proposition One

- Conditional on other firm-level characteristics, SOEs are less like to do outward FDI.

Table 5: Private firms are more to undertake likely to FDI (2000-08)

Regressand: FDI Indicator	LPM	LPM	Probit	Logit	Complementary Log-Log	Rare Event Logit
Variable:	(1)	(2)	(3)	(4)	(5)	(6)
SOE Indicator	-0.002**	-0.003**	-0.268***	-0.703***	-0.628**	-0.975***
	(-2.09)	(-2.56)	(-2.66)	(-2.71)	(-2.56)	(-9.50)
Firm TFP	0.001***	0.001***	0.043**	0.140**	0.146**	0.493***
	(3.96)	(3.31)	(2.25)	(2.16)	(2.15)	(28.22)
Log Firm Labor	0.003***	0.003***	0.232***	0.606***	0.566***	0.535***
	(6.52)	(5.34)	(12.11)	(10.69)	(8.90)	(36.78)
Export Indicator	0.004***	0.006***	0.426***	1.150***	1.156***	1.154***
	(7.45)	(12.60)	(8.49)	(6.07)	(6.13)	(27.01)
Foreign Firms Dropped	No	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Number of Observations	1,140,824	899,910	898,800	898,800	898,800	899,910

Note: The regressand is the FDI indicator. All columns except column (1) include both 2-digit level industry dummies and year dummies. Column (1) includes foreign-invested firms whereas the rest columns drop those firms. Numbers in parentheses are t-values clustered at firm level. *** denotes significance at the 1% level. Such results are highly consistent with Prediction 1(ii): SOEs are less likely to engage in FDI whereas private firms are more likely to engage in FDI.

Existence of Discrimination Against Private Firms

- Private firms pay higher financing cost and land acquisition cost than SOEs.

Table 6: Distortions in Input Factors Markets

Regressand	Measured Firm Interest Rates			City Land Price			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SOE Indicator	-0.124***	-0.134*	-0.212*				
	(-2.58)	(-1.90)	(-1.75)				
SOE Intensity				-125.5***	-105.9**	-137.8**	-164.0***
				(-2.76)	(-2.08)	(-2.09)	(-3.27)
One Lag of SOE Intensity							
Other Firm Factors Controls	No	No	Yes	No	No	Yes	Yes
Year-specific Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry-specific Fixed Effects	No	Yes	Yes	No	Yes	Yes	Yes
City-specific Fixed Effects	No	No	No	No	No	Yes	Yes
Number of Obs.	1,119,454	1,119,454	1,119,446	547	547	547	507
R-squared	0.01	0.01	0.01	0.08	0.15	0.11	0.14

Note: The regressand in columns (1) to (3) is the firm-level interest rate calculated as the ratio of firm interest expenses to current liabilities. Column (1) is the simple OLS estimate, whereas column (2) controls for year-specific and industry-specific fixed effects. Column (3) adds other firm-characteristic controls such as firm TFP, log firm labor, foreign indicator, and export dummy as well as industry- and year-specific fixed effects. The SOE indicator is shown to be negative and statistically significant. The regressand in columns (4) to (6) is the city-level average price of land purchased by firms from the government. This is defined as the ratio of government's total land revenue to its land area in each prefectural city. The SOE intensity is defined as the number of SOEs divided by the number

Evidence for Proposition Four

- Ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs.

Table 7: Ratio of Foreign Sales to Domestic Sales by MNCs

Regressand: Ratio of foreign sales to domestic sales	(1)	(2)	(3)	(4)
SOE Indicator	-46.03***	-46.54*	-55.27*	-54.33*
	(-2.82)	(-1.84)	(-1.84)	(-1.74)
Log Licence Cost				-0.48***
				(-2.38)
Year-specific Fixed Effects	No	Yes	Yes	Yes
Industry-specific Fixed Effects	No	No	Yes	Yes
Observations	246	246	246	229
R-squared	0.01	0.01	0.01	0.01

Note: The regressand in all columns is the ratio of Chinese foreign affiliates' sales to Chinese parent firm's sales. Data on foreign affiliates' sales are obtained the ORBIS data set. As the amount of sales in the ORBIS data set is in US dollars, we convert it to Chinese RMB using the average exchange rate ($1 = RMB during 2005–08. Log of license cost is used to proxy firm fixed investment cost in destination countries. The findings are consistent with part 1 of Propositi the ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs. The numbers in parentheses are t-values clustered at firm *** (*) denotes significance at the 1 percent (10 percent) level.

Evidence for Proposition Four

- Change in firm size is bigger for private MNC..

Table 8: Change in Firm Size in Response to Investment Liberalization

Regressand:	FDI firms total sales		FDI firm's total capital	
Type of FDI:	(using ORBIS data)		FDI firms	Production FDI
	(1)	(2)	(3)	(4)
Log License Costs	-0.004*	-0.005**	-0.002*	-0.002***
	(-1.79)	(-2.11)	(-1.86)	(-3.17)
Log License Costs× SOE Indicator		0.014*		
		(1.79)		
Log License Costs			0.100*	0.098*
× State-capital Intensity			(1.64)	(1.65)
Year-specific Fixed Effects	Yes	Yes	Yes	Yes
Industry-specific Fixed Effects	Yes	Yes	Yes	Yes
Year × Industry Fixed Effects	Yes	Yes	No	No
Observations	229	229	180	32
R-squared	0.45	0.50	0.04	0.05

regressand in columns (1) and (2) is the sum of Chinese parent firm's sales and its foreign affiliate's sales. Data on foreign affi
)RBIS data set. As the amount of FDI volume is in US dollars, we convert it to Chinese RMB using the average exchange rate

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- Difference in fixed costs?
  - Model can explain extensive margin, but cannot explain intensive margin (i.e., Prop. 4).
- Discrimination in product market?
  - Model would predict selection reversal for both exporting SOEs and multinational SOEs (not true in data).
- Role of capital?
  - Could just replace labor by capital, if we don't assume any adjustment cost.
  - When both factors (as in Bernard Redding and Schott's RES paper) are present, distortion in capital market also affect firm's labor choice (i.e., complements).

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- How distortions affect the share of MNCs, aggregate productivity and welfare after investment liberalization (i.e., f_I goes down).
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  - We put higher weight on the moment related to the share of MNCs.

Moments

- Moments from the Data:

	Data	Parameter
Pareto Shape Parameter	-1.091	k
Ratio of average productivity	1.2	c
Export Intensity	26.28%	τ
Share of exporters	16.11%	f_X
Average employment	265	f_d
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Share of MNCs	0.325%	f_I

- We exclude firms whose export intensity is higher than 70% (processing trade).

Parameter Values

- Calibrated parameters:

	Value	Sources
σ	4	Bernard et al. (2003)
$\varphi_{min,SOE}$	1	normalization
$\varphi_{min,private}$	1	normalization
f_e	1	normalization
k	3.273	Calculated
c	1.2	Calculated
τ	1.41	Calculated
f_X	8.975	Calibrated
f_d	4.809	Calibrated
f_I	1215.26	Calibrated

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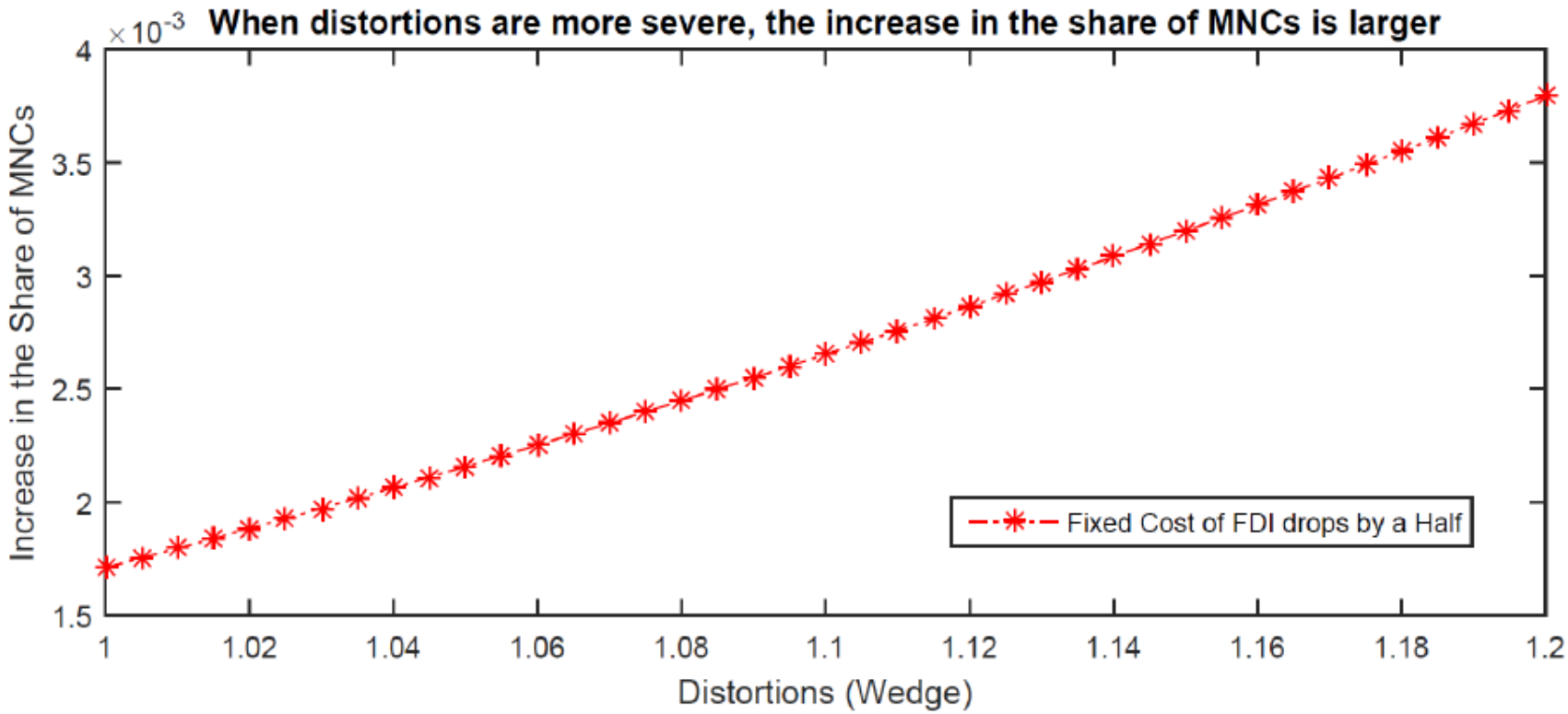
- Increase in the share of MNCs is larger when the distortions are more severe in the domestic market.
- Quantitative magnitude is high.

Share of MNCs



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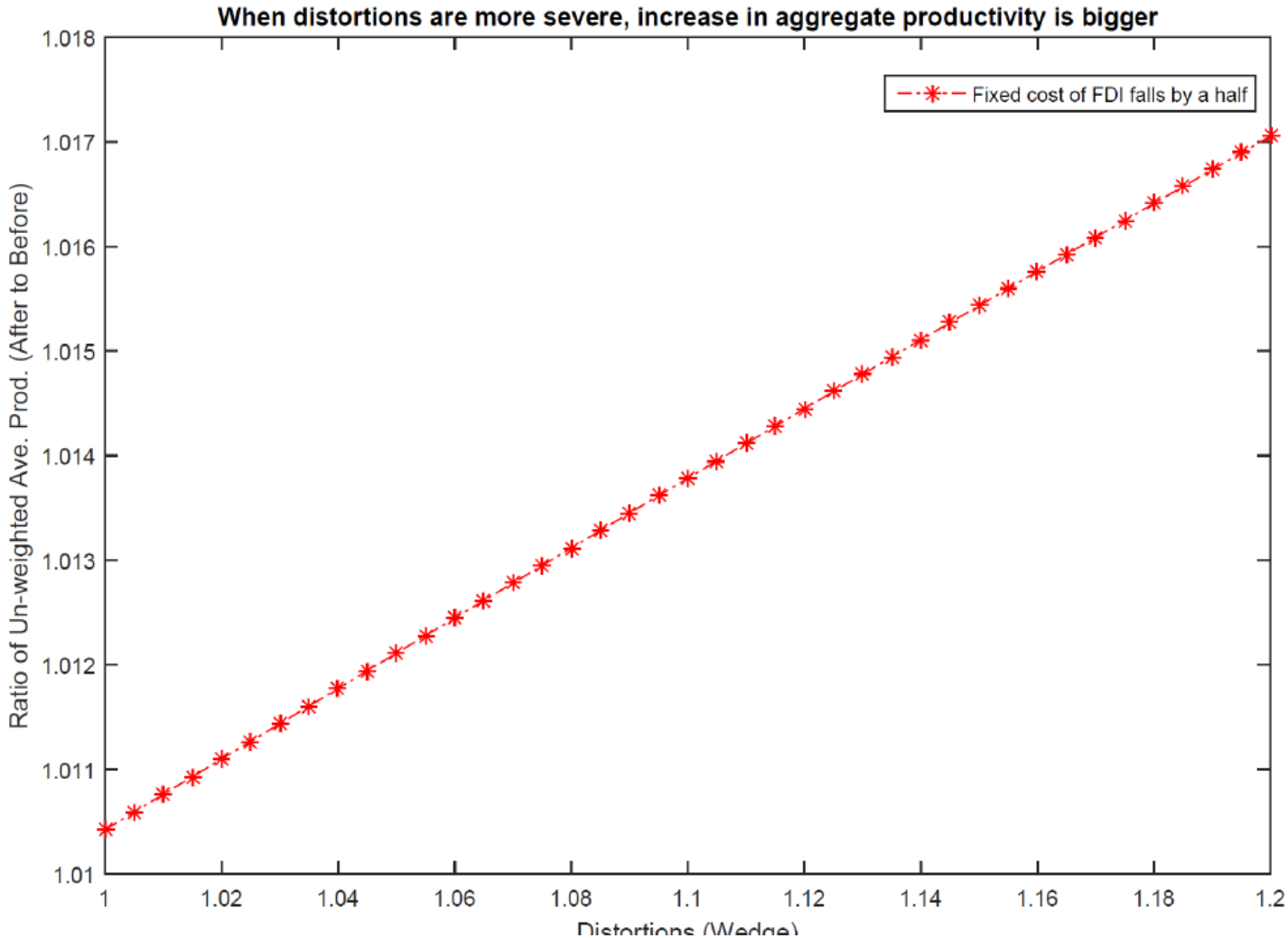
- Increase in aggregate productivity is larger when distortions are more severe, since more private firms circumvent domestic distortions by going abroad after reduction in f_I.
  - Reduction in mass of active firms.
  - Gains in aggregate productivity (i.e., reduction in ideal price index).

Aggregate Productivity

Figure 3: Distortions and Gains in Aggregate Productivity



Concluding Remarks

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- Future work:
  1. Explore difference in behavior and motives of firms (from developing countries) that go abroad: Brand-building motive?
  2. At micro-level, how do these differences impact firm-level R&D?
  3. At macro-level, how do these differences affect calculation of misallocation?

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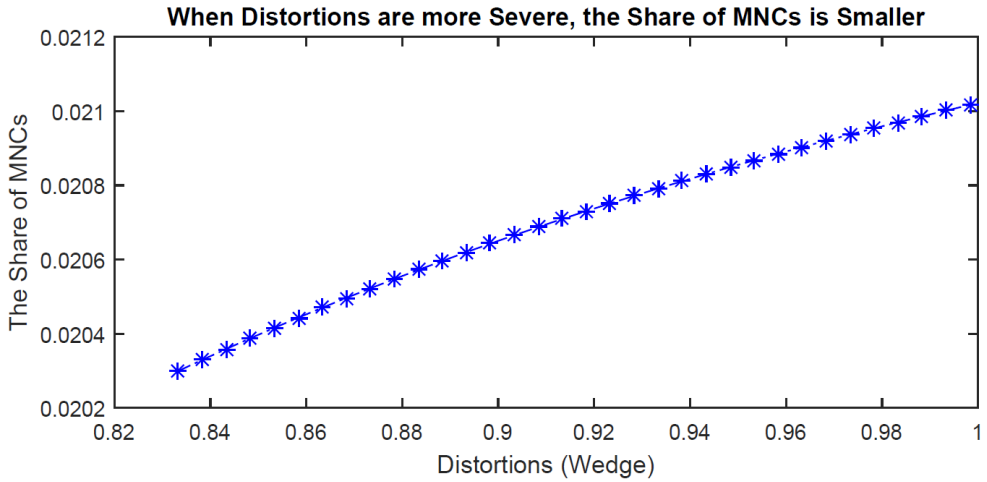
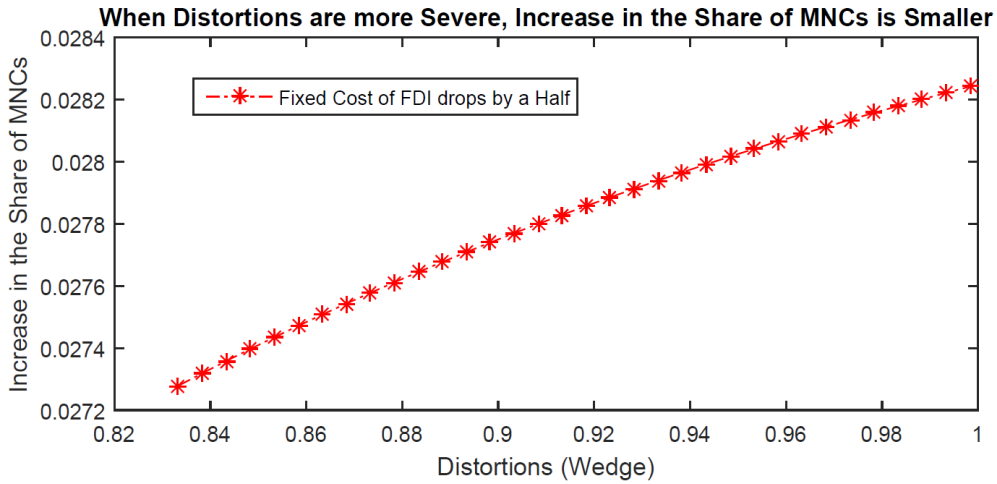
- Different implications for aggregate productivity and welfare. Go back

Share of MNCs





Welfare and Aggregate Productivity