

# Technical Efficiency and Governance: The Case of China

by

Giovanni Ferri – University of Bari, Italy

Li-Gang Liu – ANZ Banking Group, Hong Kong

Camilla Mastromarco - University of Salento, Italy

*Workshop: The Chinese Economy*

*Venice International University - Venice, 26 Nov 2010*



QuickTime™ e un  
decompressore  
sono necessari per visualizzare quest'immagine.





## Objectives

- China's development model may be unsustainable: need a focus shift from the extensive margin to the intensive margin
- Are there efficiency differences across firms' ownership modes?
- Build a representative sample of China Inc.
- Adopt a flexible functional form
- Empirically test the link between efficiency and ownership modes



## Main findings

- Compared to private mainland China-owned companies of similar quality inefficiency is:
  - systematically larger at the SOEs;
  - systematically smaller for Chinese enterprises featuring some form of foreign ownership
- Among the foreign participated firms, ownership from Hong Kong, Macau, and Taiwan proves to have slightly lower inefficiency than ownership from other economies



## Background – TFP & inefficiency

- Several authors contend that China's economic success is not based on strong TFP growth:
  - Chow (1993);
  - Chow & Li (2002);
  - Fujihara & Watanabe (2002);
  - Islam and Dai (2005).
- Other authors conclude that China is making an inefficient use of capital (e.g. Dollar & Wei, 2007).



## Our research questions

- Does the degree of inefficiency:
  - depend on ownership/governance?
  - intensify at SOEs?
  - differ between true FDI (from abroad) and capital coning from Greater China (Hong Kong, Macau, Taiwan)?



## Empirical strategy – sample

- A representative sample of corporate China: 1) acceptable sampling error; 2) stratification; 3) open and closed component.
- Sampling error  $< 2\%$  with 5,000 units out of the population of 211,181 firms (year 2001);
- Divide initial population into 14,250 strata by: 30 provinces; 5 ownership classes (SOE; Cooperatives; Private; Firms with Capital from Hong Kong, Macau, Taiwan; Foreign Owned Enterprises); 19 SITC Sectors; 5 employment size classes (0-99 Employees; 100-299; 300-499; 500-999;  $> 1000$  Employees);
- Superimpose (50%) open sample component to help further minimize sampling error.

# Empirical strategy – sample cont'd

- Ex ante and ex post sample:

	<i>A PRIORI COMPOSITION OF THE SAMPLE</i>		<i>EX POST COMPOSITION OF THE TOTAL SAMPLE</i>				
	<i>BASE CLOSED SAMPLE</i>	<i>TOTAL SAMPLE</i>	2001	2002	2003	2004	2005
<i>By Ownership Class</i>	<i>% Share</i>	<i>% Share</i>	<i>% Share</i>	<i>% Share</i>	<i>% Share</i>	<i>% Share</i>	<i>% Share</i>
SOE (110+141+143+151)	9.1	16.2	15.1	14.4	13.8	15.8	11.4
Private (from 159 to 190)	64.2	59.0	54.8	56.0	57.6	59.8	62.2
Hong Kong, Macau, Taiwan (from 200 to 240)	13.1	12.0	14.6	14.2	13.8	12.1	13.1
Foreign Owned (300 or larger)	13.1	12.0	13.0	13.1	13.0	12.3	13.1
Cooperatives (120+130+140+142+149)	0.5	0.8	2.6	2.3	1.8	0.0	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<i>Total number of enterprises</i>	<i>5000</i>	<i>7500</i>	<i>6814</i>	<i>7165</i>	<i>7790</i>	<i>5597</i>	<i>9276</i>



## Empirical strategy

- We construct the ***efficient frontier*** without imposing strong assumptions on the functional form by allowing it to be stochastically generated according to a ***translog*** production function.
- We then obtain, for each firm ***i*** and time ***t***, a measure of inefficiency, technological change and scale effect.
- Finally, we analyze the possible determinants.



# Stochastic Frontier

- Production technology:

$$Y_{it} = f(\mathbf{X}_{it}) \tau_{it} \exp v_{it}$$

- Production efficiency:

$$\tau_{it} = \frac{Y_{it}}{f(\mathbf{X}_{it}) \exp v_{it}}$$

$\tau_{it}$  : *technical efficiency* ( $0 \leq \tau_{it} \leq 1$ )

$\tau_{it} = 1$  : *full efficiency*

$$y_{it} = x'_{it} \beta + v_{it} - u_{it}$$

$$u_{it} = -\ln \tau_{it}$$



# Stochastic Frontier Model

$$Y_{it} = \Theta_{it} K_{it}^{\beta_1} L_{it}^{\beta_2}, \quad i = 1, \dots, 5497; \quad t = 2001, \dots, 2005.$$

- Translog production function to take into account not constant elasticity of substitution:

$$y_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 l_{it} + \beta_3 \frac{1}{2} k_{it}^2 + \beta_4 \frac{1}{2} l_{it}^2 + \beta_5 l_{it} k_{it} + \beta_6 t - u_{it} + v_{it}$$

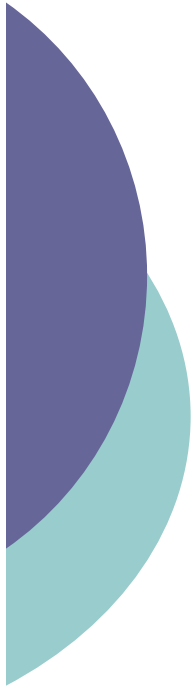
- $TFP = \Theta_{it} = A_{it} \tau_{it} \nu_{it}$
- $E(u_{it}) = \mathbf{z}_{it} \delta$

# Efficiency Model

- We analyze the possible determinants of inefficiency estimating the following:

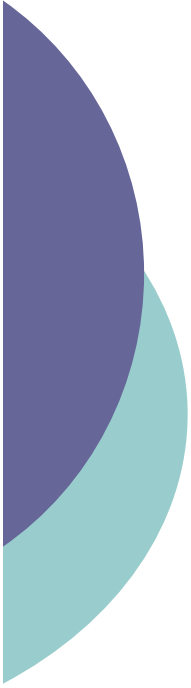
$$u_{it} = \delta_0 + \delta_1 R \& D_{it} + \delta_2 staffeduc_{it} + \delta_3 SOE_{it} + \delta_4 hkmtw_{it} + \delta_5 fork_{it} + \\ + \delta_6 intrate_{it} + \delta_7 ROA_{it} + \delta_8 dimen_{it} + \delta_9 gdpprSOE_{it} + \\ + \delta_{10} gdpprhkmtw_{it} + \delta_{11} gdpprfork_{it} + \varepsilon_{it}$$

# Growth Decomposition



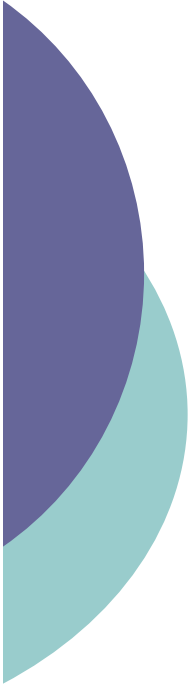
QuickTime™ e un  
decompressore  
sono necessari per visualizzare quest'immagine.

# TEST



QuickTime™ e un  
decompressore  
sono necessari per visualizzare quest'immagine.

# Hypotheses



QuickTime™ e un  
decompressore  
sono necessari per visualizzare quest'immagine.



# Test Results

QuickTime™ e un  
decompressore  
sono necessari per visualizzare quest'immagine.



## Results 1: Efficiency, Scale, Technological Change

- Main results are that:
  - TFP is important in explaining the performances of Chinese manufacturing firms;
  - As to output growth decomposition, efficiency is the most important element up to 2002; after 2002 TFP prevails

QuickTime™ e un  
decompressore  
sono necessari per visualizzare quest'immagine.



## Results 2: Ownership effects on efficiency

### Estimation results for the ownership variables

Variable	Parameter	Estimate	Std. Err.	-Ratio
SOE		1.003	0.137	(7.681)
HKMTW		-0.671	0.158	(4.243)
Foreign		-0.624	0.103	(6.021)

○ Thus:

- SOEs are more inefficient than private firms;
- Both HKMTW and Foreign are less inefficient than private firms;
- HKMTW are slightly less inefficient than Foreign firms.



## Conclusions

- Several observers question the sustainability of China's development model
- We find that:
  - TFP is important ingredient;
  - But manufacturing firms suffer pervasive inefficiency, particularly at the SOEs;
  - Inefficiency is lower for foreign capital firms
  - HKMTW capitals are slightly more conducive to reduce inefficiency than are truly foreign capitals
- This has important policy implications