

# Outbound FDI by software companies

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## Part I

# Trade, FDI and international business organization of firms

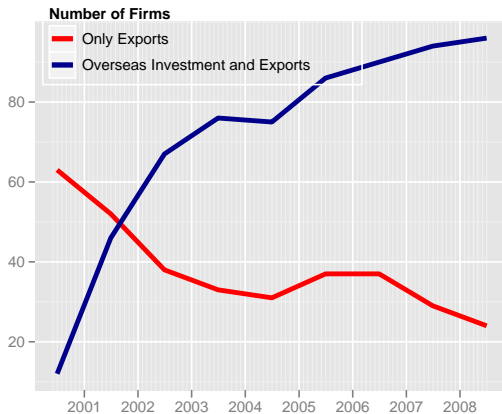
- Exporting firms and firms engaged in outbound FDI are not a random sample of the population of firms in an industry
- Firm specific characteristics define how firms choose to serve foreign customers
- Productivity differences across firms is seen to be a key determinant

Why do some firms export and others undertake Outbound FDI?

- Firms self-select on the basis of:
  - differences in cost in serving domestic and foreign markets
  - differences in transport costs and set-up costs
- Least productive firms serve the domestic markets, more productive firms undertake exports and the most productive firms engage in outbound FDI.

- Long had strong export orientation
- Strict capital controls till 1999 did not allow for outbound FDI
- Soon after lifting restrictions, a sharp jump in outbound FDI can be witnessed
- This episode in India is a natural experiment because of the sudden relaxation of capital controls

# Firms engaging in outbound FDI overtime



- Unique features:
  - Near-zero transport costs ==> *Discourages outbound FDI*
  - Non-commoditised nature of software services ==> *encourages outbound FDI*
- Need for a model to understand firm behaviour in software services industry

- Consumer's perceived risk about quality of service exported is higher than for service bought from foreign firm situated at home (Lee and Tan, 2003)
- Demand faced by firm

$$q(i) = \begin{cases} 0 & \text{with prob } \gamma_j \\ Dp(i)^{-\sigma}, \sigma = 1/(1 - \epsilon) > 1 & \text{with prob } 1 - \gamma_j \end{cases} \quad j = X, I$$

- $\gamma_X > \gamma_I$
- No transport cost
- demand realized after production
- $F_X < F_I$  as in HMY

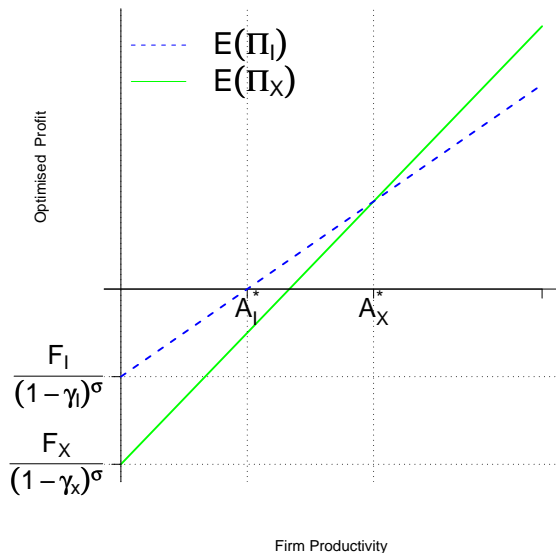


- Risk neutral firm maximises expected profit
- Cut-off productivity level such that export and FDI firms just break even

$$A_X^{*\sigma-1} = \frac{F_X(\sigma-1)\left(\frac{\sigma}{\sigma-1}\right)^\sigma}{D(1-\gamma_X)^\sigma}, \quad A_I^{*\sigma-1} = \frac{F_I(\sigma-1)\left(\frac{\sigma}{\sigma-1}\right)^\sigma}{D(1-\gamma_I)^\sigma}$$

- Since exporters face greater risk compared to FDI firms, threshold productivity of exporters to break even is higher than FDI firms

# Productivity ranking of export and FDI firms



- Less productive firms choose to undertake outbound FDI
- More productive firms remain as exporters

*This goes against the HMY Hypothesis*

# Testing our Hypothesis

- Need for productivity estimation
- Several methods have been proposed to estimate productivity
- No one method is perfect
- We estimate:
  - Efficiency effect Stochastic Frontier Analysis
  - Fixed effect dummy regression Analysis
  - Time variant Stochastic Frontier Analysis

- Firm level data on software industry from CMIE (Prowess)
- Break sample into two time ranges
  - 2000-2008: 9 years of data
  - 2000-2002: 3 years of data

# Result of efficiency effect SFA

Coefficient	Estimate	Standard error
(Intercept)	0.73033646***	0.084
Log Wages	0.24184873***	14.89
Raw material expenses	0.00031834	0.0004
Log total assets	0.72458337***	0.021
Energy expenses	0.00432048	0.003
FDI dummy	-0.41695749*	0.193
$\sigma_u^2 + \sigma_v^2$	1.46623764***	0.131
$\frac{\sigma_u^2}{\sigma_u^2 + \sigma_v^2}$	0.85717722***	0.026

Figure: Technical efficiency difference between DX and DXI firms in 2000

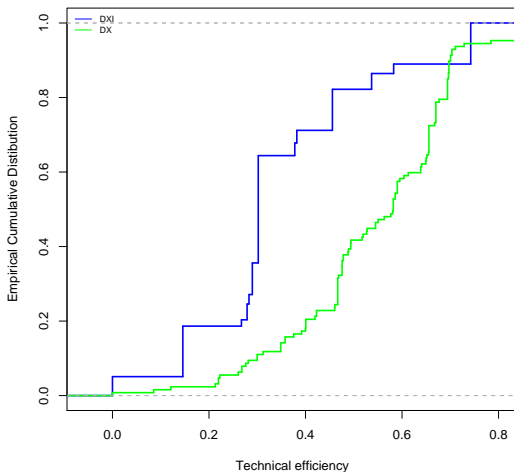


Figure: Technical efficiency difference between DX and DXI firms in 2001

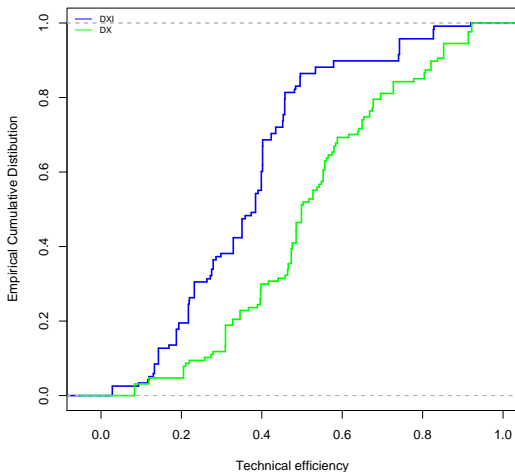
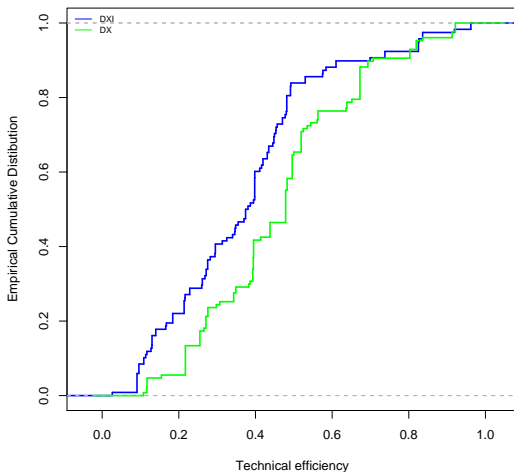




Figure: Technical efficiency difference between DX and DXI firms in 2002



# Fixed effects dummy regression

- Coefficient of outbound FDI dummy in fixed effects regression model is -0.3724 with a standard error of 0.1716
- Efficiency effect SFA results for a truncated sample of three years also gives similar result, although outbound FDI dummy is not significant
- Fixed effect regression model for both large sample and truncated sample support our hypothesis

<b>Method (Longer Sample)</b>	<b>Result</b>
Efficiency effect Stochastic Frontier Analysis	Yes
Time variant Stochastic Frontier Analysis	Yes
Fixed effect dummy regression	Yes

<b>Method (Shorter Sample)</b>	<b>Result</b>
Efficiency effect Stochastic Frontier Analysis	Not clear
Time variant Stochastic Frontier Analysis	Yes
Fixed effect dummy regression	Yes

**Exporting firms are more productive than firms participating in  
outbound FDI**

Thank you