

Impact of Trade Liberalization on Technical Efficiency of Vietnamese Manufacturing Firms

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VIETNAM: BASIC INDICATORS

- Population (2008): 86.2 million.
- GDP (million current US\$, 2008): 90,705
- GDP (million current PPP US\$, 2008): 240,093
- Trade per capita (US\$, 2005-2007): 1,145
- Trade to GDP ratio (2005-2007): 159.4

| Annual % change | 2008 | 2000-2008 | 2007 | 2008 |
|-----------------------|------|-----------|------|------|
| Real GDP (2000=100) | 179 | 8 | 8 | 6 |
| EGS(volume, 2000=100) | 342 | 19 | 21 | 18 |
| IGS(volume, 2000=100) | 371 | 21 | 31 | 24 |

Source: WTO.

Overall and Sectoral GDP growth of India and Vietnam

| India | Total | Agricult. | Industry | Services |
|---------|-------|-----------|----------|----------|
| 1970-80 | 3.3 | 2.3 | 3.8 | 4.5 |
| 1980-90 | 5.9 | 4.4 | 6.9 | 6.4 |
| 1990-00 | 5.5 | 2.8 | 5.9 | 7.4 |
| 2000-05 | 5.8 | 2.0 | 6.5 | 7.5 |
| Vietnam | Total | Agricult. | Industry | Services |
| 1970-80 | 7.9 | 4.6 | 10.9 | 8.6 |
| 1980-90 | 6.6 | 4.0 | 7.8 | 7.3 |
| 1990-00 | 4.8 | 2.1 | 6.2 | 5.1 |
| 2000-05 | 5.2 | 3.6 | 5.1 | 6.1 |

- Vietnam has followed China in moving from a centrally planned to a market oriented economic system under communist political regime.
- The country has taken several major economic and trade reforms since 1986 and has become the 150th member of WTO on 11 January 2007.
- Relevant questions here are whether trade liberalization has facilitated Vietnam's manufacturing sector to achieve their production potentials or technical efficiency fully. If not, what are the factors that constrain the sector from achieving its potential?

- One of the most important dimensions of the trade and productivity relationship is technical efficiency.
- A central hypothesis to be tested in this paper is that trade liberalization had positive impacts on the technical efficiency of the manufacturing sector in Vietnam.
- How does one measure technical efficiency, as the neoclassical production function assumes that firms are technically efficient and produce on their production frontiers?

Summary Statistics of Key Variables: Average indicators

| Variables | Unit | 2000 | 2001 | 2002 | 2003 |
|---------------------------------|----------|----------|----------|----------|----------|
| Output (VA) | mill VND | 12,935.2 | 13,160.7 | 15,731.1 | 16,712.6 |
| Number of employees (L) | persons | 331.6 | 351.7 | 386.9 | 402.5 |
| Capital stock (K) | mill VND | 25,743.1 | 25,829.6 | 25,122.1 | 25,287.8 |
| Capital-labour ratio (KL) | mill VND | 92.6 | 88.4 | 80.8 | 75.7 |
| | percent | | | | |
| Share of skilled labour (SKILL) | | 9.0 | 8.9 | 8.6 | 8.7 |
| Firm age (AGE) | years | 7.3 | 8.3 | 9.3 | 10.3 |
| Effective protection (ERP) | percent | 65.9 | 58.8 | 54.0 | 49.0 |
| Nominal protection (NRP) | percent | 22.6 | 20.8 | 20.4 | 18.6 |
| Import share (IM) | - | 0.858 | 0.765 | 0.772 | 0.903 |
| Herfindalh Index (HF14) | - | 0.0813 | 0.1001 | 0.0734 | 0.0621 |

Empirical Model

- A balanced panel of 1,312 observations for the period 2000-03 is chosen for the empirical analysis.

$$\ln Y_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \frac{1}{2} \beta_3 [\ln L_{it}]^2 + \frac{1}{2} \beta_4 [\ln K_{it}]^2 + \beta_5 [\ln L_{it} \ln K_{it}] \\ + \beta_6 T + \frac{1}{2} \beta_7 T^2 + \beta_8 \ln L_{it} T + \beta_9 \ln K_{it} T + v_{it} - u_{it}$$

$$\mu_{it} = \delta_0 + \delta_1 KL_{it} + \delta_2 SKILL_{it} + \delta_3 AGE_{it} + \delta_4 PRIV_{it} + \delta_5 JOINS_{it} + \delta_6 FDI_{it} + \delta_7 ERR(NRP,IM)_{it} \\ + \delta_8 HFA_{it} + \delta_9 MED_{it} + \delta_{10} BIG_{it} + \delta_{11} Y2001 + \delta_{12} Y2002 + \delta_{13} Y2003 + \varpi_{it}$$

Estimation results of the stochastic production frontier

| Variables | ERP | | NRP | | IM | |
|---------------------------------------|-------------|-------|-------------|-------|-------------|-------|
| | Coefficient | s.e. | Coefficient | s.e. | Coefficient | s.e. |
| Stochastic production frontier | | | | | | |
| Constant | 0.567*** | 0.041 | 0.577*** | 0.038 | 0.546*** | 0.045 |
| $\ln L$ | 0.542*** | 0.022 | 0.540*** | 0.021 | 0.539*** | 0.018 |
| $\ln K$ | 0.535*** | 0.014 | 0.538*** | 0.015 | 0.532*** | 0.014 |
| $0.5(\ln L)^2$ | -0.006 | 0.021 | -0.009 | 0.020 | -0.014 | 0.020 |
| $0.5(\ln K)^2$ | 0.083*** | 0.008 | 0.084*** | 0.008 | 0.082*** | 0.009 |
| $\ln L \ln K$ | -0.059*** | 0.012 | -0.058*** | 0.012 | -0.056*** | 0.012 |
| T | -0.041** | 0.017 | -0.044** | 0.021 | -0.055** | 0.023 |
| $0.5T^2$ | 0.078** | 0.038 | 0.056* | 0.029 | 0.097* | 0.056 |
| $T \ln L$ | -0.021* | 0.013 | -0.024* | 0.013 | -0.023* | 0.013 |
| $T \ln K$ | 0.020** | 0.009 | 0.019* | 0.010 | 0.021** | 0.009 |

Technical Inefficiency model estimation

| Technical inefficiency model | | | | | | |
|-------------------------------------|-----------------|--------------|-----------------|--------------|------------------|--------------|
| Constant | -7.215*** | 1.163 | -7.026*** | 1.347 | -4.682*** | 0.996 |
| Capital labor ratio (KL) | 0.978*** | 0.115 | 0.972*** | 0.127 | 0.942*** | 0.125 |
| Skilled labor (SKILL) | -6.545*** | 1.053 | -7.666*** | 1.169 | -9.163*** | 1.257 |
| Age (AGE) (ln) | -1.003*** | 0.136 | -1.079*** | 0.152 | -1.006*** | 0.142 |
| Private (PRIV) | -0.106 | 0.178 | -0.121 | 0.169 | -0.288 | 0.184 |
| Join stock (JOINS) | -6.453*** | 0.936 | -6.067*** | 0.877 | -6.201*** | 0.822 |
| Foreign invested (FDI) | -2.269*** | 0.311 | -2.302*** | 0.344 | -2.197*** | 0.344 |
| Trade policy measures | 0.016*** | 0.002 | 0.055*** | 0.007 | -0.109*** | 0.024 |
| Herfindalh index (HFI4) | 4.938*** | 0.725 | 4.123*** | 0.838 | 5.218*** | 0.927 |
| Medium firm (MED) | -0.418*** | 0.144 | -0.484*** | 0.153 | -0.637*** | 0.149 |
| Big firm (BIG) | -1.406*** | 0.259 | -1.444*** | 0.241 | -1.871*** | 0.226 |
| Y2001 | -1.354*** | 0.197 | -1.508*** | 0.217 | -1.953*** | 0.274 |
| Y2002 | -2.040*** | 0.254 | -2.253*** | 0.267 | -3.095*** | 0.368 |
| Y2003 | -2.243*** | 0.295 | -2.299*** | 0.309 | -2.943*** | 0.346 |

Major results

- Trade liberalization has an expected positive and robust impact on firm technical efficiency across three models with alternative trade policy measures.
- The significant effects of different proxies of exposure to foreign competition at the industry level, not at the firm level seem to confirm the hypothesis of competition effects of trade liberalization, which is assumed to create both incentives and challenges for firms to be more active in utilizing better available resources and reducing managerial slack to survive in the domestic market with increasing foreign competition.
- The significant and robust coefficients on all time dummies indicate that the technical efficiency of manufacturing firms has increased over time.

- A higher skilled labour share considerably increases technical efficiency.
- Older firms are more efficient than younger firms. This result seems to support the learning-by-doing hypothesis that older firms have accumulated more managerial and market experience.
- Both joint-stock (JVEs) and foreign-invested (FIEs) enterprises perform better than SOEs. In addition, the joint-stock enterprises seem to outperform the FDI enterprises.

Mean efficiency level (%) by trade orientation

| Trade-orientation | 2000 | 2001 | 2002 | 2003 | Average | Change ^(a) |
|-------------------|------|------|------|------|---------|-----------------------|
| Less-traded | 56.0 | 60.9 | 65.5 | 65.8 | 62.0 | 9.7 |
| Export-oriented | 52.2 | 59.0 | 61.6 | 62.8 | 58.9 | 10.6 |
| Import-competing | 57.1 | 61.1 | 62.9 | 63.5 | 61.2 | 6.5 |
| Overall | 55.0 | 60.3 | 63.1 | 63.8 | 60.5 | 8.8 |

Mean efficiency level by ownership and trade orientation

| Trade orientation | State-owned | Private | Joint-stock | FDI | Overall |
|-------------------|-------------|-------------|-------------|-------------|-------------|
| Less-traded | 64.0 | 57.0 | 72.9 | 67.4 | 62.0 |
| Export-oriented | 58.0 | 58.2 | 70.3 | 60.3 | 58.9 |
| Import-competing | 63.1 | 57.0 | 73.8 | 62.6 | 61.2 |
| Overall | 62.2 | 57.5 | 72.8 | 62.7 | 60.5 |

Policy Implications

- While more trade liberalization is conducive to better performance, increasing the share of skilled labour is the key for firms to achieve higher potential output in the long term, rather than using more unskilled labour because it is relatively more abundant in Vietnam.
- Therefore, more attention should be paid to providing incentives and support for enterprises for training their workforce (such as on-the-job training) as well as creating more opportunities for workers to upgrade their skills by themselves.