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Entry Costs and Heterogeneous Characteristics of Firms in the Decision to Export: Empirical Evidence from Firm-Level Data in Vietnam

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Research Motivations

New strand of international trade study

"New" new trade theory

(Heterogeneous-firm trade theory)

-Starting: mid-90s [Bernard & Jensen (1995)]

-Getting popular: early 2000s [Melitz (2003)]

Firms in trade theories?

Standard (classical, neoclassical or new) trade theories: representative firm; identical or homogeneous firms.

In the real world of int'l trade

+ In almost every industry/sector, there are firms involving in export/ import activities.

+ In an industry:

  - Not all firms export/ import

  - Firms that export/import are different from those who do not

  - Even among trading firms, there are differences in many aspects

➔ “New” new trade theories

+ **New trade theory**:

- National economy:
a system of interaction between firms
- Monopolistic competition
- Product differentiation
- Increasing returns to scale

+ **“New”:**

Firms are not homogenous

but heterogeneous.

If firm heterogeneity treated, what can be expected?

+ Explain in more detail (especially the mechanism) what have been explained by classical, neoclassical and new trade theories (trade patterns and trade welfare effects).
+ Explain what have not been explained by previous theories (firm dynamics in international trade and new contributions in trade pattern and welfare analysis).

Two recent concerns:

(i) International trade & growth: Trade may induce reallocation of scarce resources toward the most efficient use.

+ Trade-induced cross-industry reallocation

  ← Standard trade theories

+ Trade-induced within-industry reallocation

+ Trade-induced within-firm improvement

  ← "New" new trade theories

(ii) Firm-oriented trade policies

Trade promotion policies…

What already observed in the literature?

"Exceptional export performance" or "superiority of exporters": At a moment in time, exporters are "superior" to non-exporters

- Higher productivity
- Larger size (employment, capital, output)
- Higher wage and labor quality
- Higher technology intensity, capital intensity
- Member of multi-plant network, etc.

[In developed countries & some developing countries].

Causality? Two hypotheses:

(1) **Self-selection**:

Better firms self-select into export markets.

(2) **Learning-by-exporting**:

Exporting makes firms better.

Research Objectives

+ To contribute an evidence from a developing country to the self-selection hypothesis of the new strand of study in international trade with firm heterogeneity.
+ To examine exporting behaviors of firms in Vietnam
+ To contribute some hints for trade policy implications in Vietnam

Empirical literature on self-selection

(productivity-exporting relation for illustration)

*** Self-selection exists:**

Roberts & Tybout (1997):	Colombia
Aw et al. (1997, 2000):	Taiwan
Baldwin & Gu (2003):	Canada
Arnold & Hussinger (2005):	Germany
Alvarez & Lopez (2005):	Chile
Van Biesebroeck (2005):	9 countries in sub-Saharan Africa

*** No evidence for self-selection:**

Clerides et al. (1998):	Mexico
Castellani et al. (2002):	Italy
Bernard & Jensen (2004):	USA
Hansson & Lundin (2004)	Sweden
Bigsten et al. (2004):	Cameroon, Ghana, Kenya, Zimbabwe

Theoretical support

Roberts and Tybout (1997) [Partial equilibrium analysis]

Melitz (2003) [General equilibrium analysis]

Helpman et al. (2007)

Bernard et al. (2007)

…

With firm heterogeneity and trade costs, exposure to trade will induce

- only the most productive firms to enter the export market

- some less productive firms to continue to produce only for domestic customers

- the least productive firms to exit

Theoretical background for estimation

Dynamic model of exporting with <u>entry costs</u>

[Roberts and Tybout (1997)]:

Profit from exports of firm *i* at time *t*

$$\tilde{\pi}_{it}(X_t, Z_{it}, q^*_{it-1}) = p_{it}q^*_{it} - c_{it}(X_t, Z_{it}, q^*_{it-1} \mid q^*_{it}) - N(1 - Y_{it-1})$$

q^*_{it} :Profit-maximizing level of exports
p_{it} :Export price
c_{it} :Variable cost
X_t, Z_{it} :Factors affecting costs
Y_{it} :Export status; equal to 1 if export and 0 otherwise
N :Entry cost

+ sunk entry costs ➔ heterogeneity becomes important

+ sunk entry costs ➔ dynamic in making decision

Theoretical background for estimation (cont.):

Firm chooses $\{q_{is}^{*}\}_{s=t}^{\infty}$ *to maximize*

$$\Pi_{it}(X_t, Z_{it}) = E_t\left(\sum_{s=t}^{\infty} \delta^{s-t}(\tilde{\pi}_{is} Y_{is})\right)$$

The value function of the firm

$$V_{it}(.) = \max_{q_{it}^{*}}\left(\tilde{\pi}_{it} Y_{it} + \delta E_t[V_{it+1}(.) \mid q_{it}^{*}\right)$$

The condition of exporting decision

$$Y_{it} = \begin{cases} 1 \text{ if } p_{it} q_{it}^{*} + \delta E_t[V_{it+1}(.) \mid q_{it}^{*} > 0] - \delta E_t[V_{it+1}(.) \mid q_{it}^{*} = 0] \\ \geq c_{it}(X_t, Z_{it}, q_{it-1}^{*} \mid q_{it}^{*}) + N(1 - Y_{it-1}) \\ 0 \text{ otherwise} \end{cases}$$

Empirical framework

Estimating the effects of sunk entry costs and firm characteristics on the probability of a firm to be an exporter (the decision to or not to export); export intensity not treated

➔ **Binary choice non-structural approach**

$$Y_{it} = \begin{cases} 1 \text{ if } \gamma X_t + \beta Z_{it} - N(1 - Y_{it-1}) + u_{it} \geq 0 \\ 0 \text{ otherwise} \end{cases}$$

Z_{it} : Vector of firm-specific characteristics

X_t : Vector of exogenous factors

u_{it} : Error term

Data

+ "Productivity & the Investment Climate Enterprise Survey of Vietnam" (PICS) in 2005 of the World Bank.

+ 1,150 firms of manufacturing sector (17 industries)

+ Face-to-face interviews with managers, employees, …

General information (ownership, establishment year, industry, location); sales and supplies (revenue, direct export share, year first exported); labor relations (employee number and compensation); production, expenses and assets

+ Retrospective basis ➔ panel data of 2002 to 2004

+ 5.6% of 20.5 thousands manufacturing firms in 2004

+ Exporters (direct exports of >=10% of total sales): 34%

Estimation Specification

(1) **Exporter's superiority**: Derive differences between exporters and non-exporters: exporter premium in revenue, productivity, size, input intensity, labor skill and age.

Exporter premium $\equiv [(Z_{it}^{*exporter} - Z_{it}^{*non-exporter}) / Z_{it}^{*non-exporter}] * 100$

(i) Simple exporter premium $\equiv (e^{\alpha_1} - 1) * 100$

via estimating $\ln Z^*_{it} = \alpha_1 Y_{it} + u_{it}$

(ii) Conditional exporter premium $\equiv (e^{\beta_1} - 1) * 100$

via estimating $\ln Z^*_{it} = \beta_1 Y_{it} + \beta_2 Z_{it} + \beta_3 T + \beta_4 D + v_{it}$

Estimation Specification (cont.)

(2) **Determinants of the decision to or not to export:**

Some considerations before choosing specifications

(i) **Binary dependent variable** ➔ logit, probit or linear probability models

(ii) **Three main issues in the model of export decision**:

- Significant effects of unobserved characteristics ➔ unobserved effects
- Persistence in export decision due to sunk costs ➔ lagged dependent variable
- Two-way relationship between export decision and firm characteristics ➔ simultaneity problem

(iii) **Short panel data**

Estimation Specification (cont.)

Estimation equation:

$$Y_{it} = \lambda_1 \mathrm{Y}_{\mathrm{it\text{-}1}} + \lambda_2 Z_{it-1} + \lambda_3 T + \lambda_4 D + \varepsilon_i + \eta_{it}$$

Three specifications:

+ Probit model in pooled data set, ignoring unobserved effects
+ Heckman's (1981) random effects dynamic probit model (preferred model)
+ Random effects probit model in no-status-switch sub-sample

Variables

Table 2 ***VARIABLE DEFINITION***

Variable	Definition
Exporter	1 if exporter (>=10% of total sales exported), 0 if non-exporter
Revenue	Total sales
TFP	Total factor productivity
Labor	Total number of permanent & adjusted temporary employees
Labor Productivity	Value added/Labor
Capital	Total net-book value of machinery and equipment
Wage	Total labor payment/Labor
Age	Number of years in business, (2004 minus foundation year)
Age Squared	Age squared
Capital Intensity	Ratio of total net-book value of machinery and equipment to total employees
Foreign	Foreign-owned firm, (>=10% of foreign capital)
Dummies	Industry, location and year dummies

Variables (cont.)

Total factor productivity (TFP):

Approaches to choose from: Parametric (OLS), semi-parametric [Levinsohn and Petrin's (2003) or Olley and Pakes' (1996)] and non-parametric (DEA) estimators.

Levinsohn and Petrin's (2003) approach employed:

+ Elimination of "transmission bias" caused by "simultaneity" [TFP is unobservable to econometricans but not to firm's managers (at least part of this knowledge). This knowledge may influence the choice of inputs];

+ Availability of intermediate inputs, used as proxy for the knowledge of the firm about productivity;

Two-stage estimation of production function (Cobb-Douglas)

$$\hat{TFP}_t = \exp(v_t - \hat{\beta}_l l_t - \hat{\beta}_k k_t)$$

Table A.1: ***COEFFICIENTS OF PRODUCTION FUNCTION***

Industry	Labor	Capital	Obs.
Food and Beverage	0.40***	0.24*	489
Textiles	0.51***	0.52**	185
Garments	0.68***	0.32**	183
Leather	0.40**	0.74**	64
Wood & Wood Products	0.45***	0.30*	348
Paper	0.32**	0.51**	164
Chemical & Chemical Products	0.79***	0.54**	175
Rubber, Plastic and Non-metallic Products	0.48***	0.39	183
Metals and Metal products (50 employees or less)	0.48***	0.46	119
Metals and Metal Products (over 50 employees)	0.56***	0.27*	176
Machinery and Equipment	0.42***	0.54*	175
Construction Materials	0.48***	0.30***	248
Others	0.49***	0.38***	322

Variables (cont.)

+ Values of Z_{it} presented in level relative to industry mean to alleviate industrial heterogeneity, after adjusted to real 2002 terms by appropriate price indices
+ All industry, region and year dummies included
+ Export status in 2002 derived from export experience by 2002
+ Lagged export status as an dependent variable to estimate the role of entry costs.
+ Capital as a proxy for firm size
+ Average wage as a proxy for labor skill
+ Both age and square of age included to test deterioration of experience

Results and discussion

Table 3 ***DIFFERENCES BETWEEN EXPORTERS & NON-EXPORTERS***

Variable	Simple Exporter Premium (%)	Standard errors and t-stat.	Conditional Exporter Premium (%)	Standard errors and t-stat.
Revenue	285.38	0.0669***	51.55	0.0384***
TFP	28.66	0.0613***	16.39	0.0408***
Labor Productivity	-1.91	0.0418	-11.52	0.036***
Labor	313.80	0.0496***	158.56	0.0521***
Wage	3.29	0.0281	4.50	0.0283
Capital	227.52	0.0736***	150.58	0.0726***
Capital Intensity	-20.05	0.0556***	-44.68	0.0405***
Age	33.17	0.0466***	14.57	0.0527**

Note: ****, **, and * indicate significance at 1%, 5%, and 10% levels, respectively;*

"Superiority" of exporters in manufacturing sector in Vietnam

Exporters:

- Larger in size (revenue, employment and capital)
- More experienced in business
- More productive (in term of TFP)

Exporters' production:

- More labor-intensive
- Lower in value added per employee

No statistically significant evidence for the difference in average wage (proxy for labor skill)

Table 4 ***PROBABILITY MODEL OF EXPORTING (Dependent: Z-score)***

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Exporter$_{t-1}$	3.26***	1.99***		3.23***	1.87***	
Ln(TFP$^{a}_{t-1}$)	-0.13*	-0.12	0.12			
Ln(Labor Productivity$^{a}_{t-1}$)				-0.18**	-0.65***	-0.18
Ln(Capital$^{a}_{t-1}$)	0.12***	0.38***	0.80***	0.14***	0.79***	0.85***
Age$^{a}_{t-1}$	0.08	-0.06	0.40**	0.07	0.37*	0.43**
Age Squared$^{a}_{t-1}$	-0.06	-0.01	-0.20*	-0.06	-0.23**	-0.21**
Capital Intensity$^{a}_{t-1}$	-0.12**	-0.31***	-0.76***	-0.09**	-0.36***	-0.76***
Wage$^{a}_{t-1}$	0.05	0.12	0.14*	0.07	0.32**	0.20**
Foreign	0.24	1.70***	2.39***	0.28	2.39***	2.60***
Industry dummies	*included*	*included*	*included*	*included*	*included*	*included*
Region dummies	*included*	*included*	*included*	*included*	*included*	*included*
Year 2004	0.45***	0.50***	-0.16	0.46***	0.57***	-0.16
Constants	-1.96***	-2.04***	-0.61	-2.00***	-2.52***	-0.82
Observations	1601	3051	1526	1635	3051	1558

Entry costs and firm characteristics in the decision to export

(1) Lagged export status: (+)

➔ Exporting last year is a good predictor of exporting this year; important role of sunk costs; relevant in the case of Vietnam;

(2) Lagged TFP: Not statistically significant

➔ No evidence of self-selection in term of TFP; (Facts in emerging economy? or diversification of markets and products?)

(3) Lagged value added per employee: (-)

➔ Characteristics of export processing service?

Entry costs and firm characteristics in the decision to export (cont.)

(4) Firm size: (+)

➔ Larger firms are more advantageous in exporting;

(5) Capital intensity: (-)

➔ Labor-intensive producers have higher probability to be exporters;

(6) Average wage: (+)

➔ Firms with more skilled labor have higher export probability

(7) Age: (+); and age squared: (-)

➔ Experienced firms are more likely to export, but experience deteriorates over time

Entry costs and firm characteristics in the decision to export (cont.)

(8) Foreign ownership: (+)

➔ Foreign firms are more likely to be exporters;

(9) More export-oriented industries: Garments, Leather, Textiles, Food and Beverages, Wood and Wood Products

Less export-oriented industries: Paper and Paper Products, Chemical and Chemical Products; Metal and Metal Products;

(10) More chances for firms to export in 2004 than in 2003

Concluding remarks

A contribution of evidence in the study of international trade with firm heterogeneity from a developing country with fast track of trade liberalization;

An interpretation of real situation in export activities in Vietnam.

Policy implications.

For further research: Determinants of export extent decisions; export behaviors in different foreign market structure or export products; or learning-by-exporting?

Thank you for your attention!