

Local or Global: Financial Constraints and the Expansion Path of Potential Exporters

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Disclosure: The views expressed are those of the authors and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

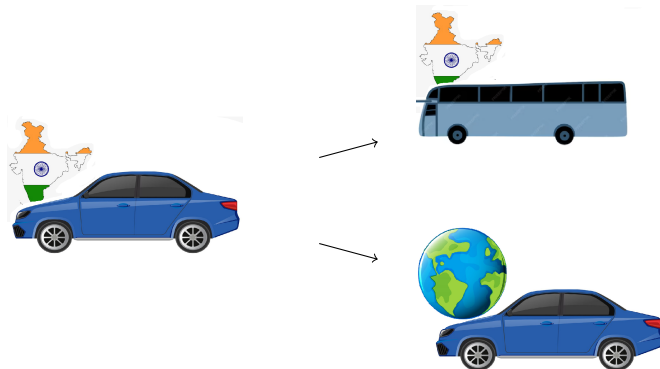
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Motivation

- Multiple product firms dominate the export market.
 - ▶ In the US: Bernard et al.(2006)
 - ▶ In France: Mayer and Ottaviano (2008)
- Many firms, especially those that are young, are financially constrained.
 - ▶ Banerjee and Duflo (2014) for India, Muuls (2008) for Belgium, Caggese and Cunat (2013) for Italy, and Manova (2012) for a panel of countries.
 - ▶ In developing countries firms are reliant on self-financing to grow.
 - ★ The World Bank Enterprise survey

Research Question

- *How do firms grow to be multiple product exporters?*
 - ▶ What is the impact of financing constraints on patterns of export and expansion in the domestic market?



source: freepik.com

Preview of Findings

Using data from India's manufacturing sector 2005-2018

Stylised facts:

- Given productivity, firms with higher assets are more likely to enter new markets
- For high productivity firms, their sequence of entry into global and new domestic markets depends on their initial wealth

Structural GE model of heterogeneous firms with financing constraints:

- Analytical result:
 - ▶ Firm productivity determines export status
 - ▶ Initial assets determine the *path* to becoming an exporter → those with high assets export before local expansion.
- Estimating the model: removing financing constraints improves welfare by 3.8% in consumption equivalent terms.

Outline

- Data and Stylised Facts
- Overview of the Model
- Proposition
- Results and welfare analysis

Data

- Indian Annual Survey of Industries (ASI), 2005 to 2018
 - ▶ Census of manufacturing firms with 100+ employees
 - ▶ Survey of all other registered factories
- We focus on cohorts of firms born between 2005-2009
- Multiple-product plants
 - ▶ Firm-product dis-aggregated sales at 5-digit product classification
 - ▶ Export share of total sales: from 2008
- Initial wealth
 - ▶ Cash, bank deposits and other short-term assets

Stylised Fact:

Initial Wealth and Market Entry Decisions

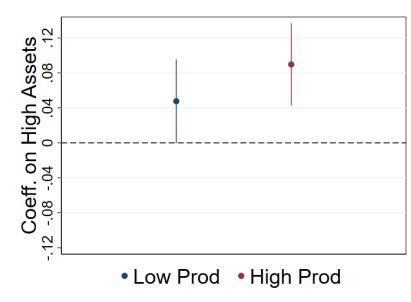
Controlling for initial productivity, higher initial wealth is associated with a higher probability of entry into new markets (both domestic and foreign).

	(1) Global Expansion	(2) Global Expansion	(3) Local Expansion	(4) Local Expansion
Labour productivity	0.024*** (0.003)	0.029*** (0.003)	0.037*** (0.004)	0.043*** (0.004)
Initial assets		0.032*** (0.005)		0.046*** (0.006)
Observations	7,938	7,938	7,938	7,938
Sector Controls	Y	Y	Y	Y
Birth Year Controls	Y	Y	Y	Y

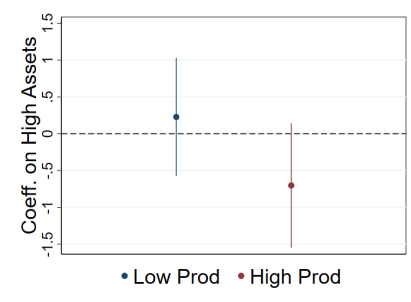
Stylised Fact:

Initial Wealth and the Sequence of Market Entry

For high productivity firms, high initial wealth is associated with a higher probability of entering foreign markets prior to domestic expansion.



A: Prioritising Exports



B: Local-to-Global Entry Lag (years)

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Model Environment

▸ Demand

Consumers:

- CES preferences
- Symmetric N-country world

Firms:

- Increasing returns production technology with labour as only input
- Firms can produce/export multiple products
- Producing/exporting new products has upfront costs
- Firms use their assets to finance these costs

GE model

- Market clearing for labour and output

Production

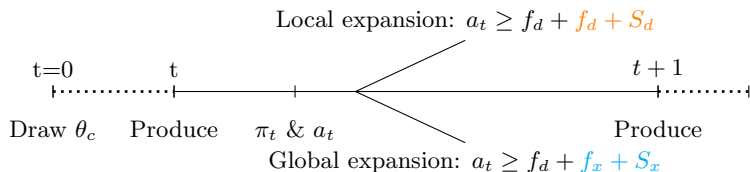
- Firms can produce multiple products indicated by i
- Heterogeneous in their core competency (firm-productivity) θ_c
 - ▶ As firms grow they increase their product scope
 - ▶ **Product-specific productivity** depends on firm-productivity:

$$\theta_{ci} = C^{i-1}\theta_c \quad i \in N, \quad C < 1$$

- ▶ Efficiency declines at rate C as firms introduce new products
- Production technology: Melitz (2003) extended to multiple-products
 - ▶ Labour as the only factor of production
 - ▶ Fixed cost of local f_d and global production f_x per product
 - ▶ Sunk cost of entry to local S and global market S_x per product

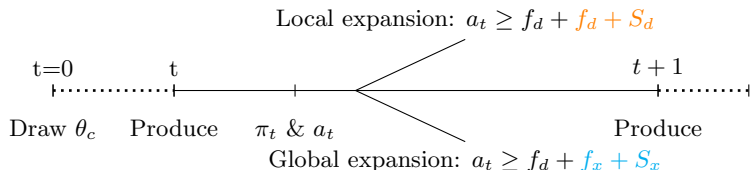
▶ Augmented production function

Value Function



Decision: time of entry into new markets (local and global)

Value Function



Decision: time of entry into new markets (local and global)

Value function:

$$\begin{aligned}
 V(\theta_c, a, n_D, n_X, \epsilon) = & \underbrace{\sum_{i \in N} J_i \pi^D(\theta_i)}_{\text{Domestic Profits}} + \underbrace{\sum_{i \in N} J_i^X \pi^X(\theta_i)}_{\text{Foreign profits}} - \underbrace{\sum_{i \in N} D_i S_d}_{\text{Domestic expansion cost}} \\
 & - \underbrace{\sum_{i \in N} X_i S_x}_{\text{Foreign expansion cost}} + \underbrace{(1 - \delta) \max\{0, EV(\theta_c, a', n'_D, n'_X, \epsilon')\}}_{\text{Continuation value}}
 \end{aligned}$$

Subject to: demand, asset accumulation, financing constraints, incentive compatibility

Steady State Equilibrium

- An aggregate price P , aggregate quantity Q and time-invariant distribution of firms on on their productivity levels and asset levels and cost shocks such that:
 - ▶ Consumers maximise their utility subject to budget constraint
 - ▶ Firms are maximizing their value functions $V(\theta_c, a, n_D, n_X, \epsilon)$ choosing, prices, quantities, and time of entry into new markets subject to
 - ★ asset accumulation
 - ★ financing constraints
 - ★ incentive compatibility
 - ★ product-specific productivity
 - ★ new entrants satisfy free entry condition
- Market clearing for labour and goods

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Proposition

Proposition *There exists a strictly positive productivity cutoff θ_x^* such that:*

- ① *Firms with productivity $\theta_c \leq \theta_x^*$ find it optimal to only produce for the domestic market.*
- ② *Firms with productivity $\theta_c > \theta_x^*$ find it optimal to export. There exists an asset threshold for each firm such that:
 - ① *for $a_{t-1} \leq a_{seq}(\theta_c)$, firms first expand in the domestic market.*
 - ② *for $a_{t-1} > a_{seq}(\theta_c)$, firms first expand in the foreign market (export).**

Results and Welfare Analysis

- Model estimated to match moments of India's manufacturing sector in 2013
- **Simulations and firm dynamics:** ▶ Firm Dynamics
 - ▶ Exporter's assets, on average, grows faster than non-exporters.
 - ▶ Among young exporters, the asset growth rate is increasing and levels off as they age and become unconstrained.
 - ▶ The probability of exporting is increasing in age, but only for young firms.
- **Welfare analysis: relaxing financing constraints**
 - ▶ Measure of welfare: consumption defined by $\frac{w}{P}$
 - ▶ Aggregate productivity increases by 3.8%
 - ▶ Total number of varieties increases:
 - Share of local multiple-product producers increases from .40 to .64
 - Share of exporters increase from 0.09 to 0.15

Conclusions

- We study the impact of financing constraints on firms' expansion strategies in India through empirical analysis and a heterogeneous firms model
- **Export vs. Domestic Expansion:** Among highly productive firms, those with greater initial assets are more likely to export before expanding their product range in the domestic market
- Eliminating financing constraints leads to a 3.8% increase in aggregate productivity and more firms entering new markets

Thank You!

Demand

- Aggregate demand for the industry:

$$Q = P^{1-\eta} \quad (1)$$

- η is the industry price elasticity of demand
- Aggregate price index and the associated quantity:

$$P = M^{\frac{1}{\sigma-1}} \left[\int_{\omega \in \Omega} p(\omega)^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \quad (2)$$

- M is the number of firms, and $\sigma > 1$ is the elasticity of substitution.

$$Q = M^{\frac{1}{1-\sigma}} \left[\int_{\omega \in \Omega} q(\omega)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad (3)$$

- Demand for a variety with price $p_i(\omega)$:

$$q(\omega) = \frac{P^{\sigma-\eta}}{p(\omega)^\sigma} \times \frac{1}{M} \quad (4)$$

- variety i price is a markup over marginal cost:

$$p_i = \frac{\epsilon}{\epsilon - 1} w / \theta_{ci}$$

- Symmetric N-country world, with iceberg costs τ :

$$p_x = \tau p$$

Production

- Production technology as in Melitz (2003) extended to allow for producing/exporting multiple products:

$$\ell(\theta_c) = \ell^D(\theta_c) + \ell^X(\theta_c) = \sum_{i \in N} J_i [f_d + \frac{q^D(\theta_{ci})}{\theta_{ci}}] + \sum_{J_i^X \in J_i} J_i^X [f_x + \frac{q^X(\theta_{ci})}{\theta_{ci}}] \quad (5)$$

- J_i indicator variable equal to 1 if the firm is active in market i .
- f_p fixed cost of production.
- f_x fixed cost of exporting.
- J_i^X indicator variable equal to 1 if the firm exports i .
- Firms' profits are subject to a two-state symmetric Markov process: $\{+\epsilon, -\epsilon\}$.

$$f_d = \bar{f}_d + \epsilon_d \text{ and } f_x = \bar{f}_x + \epsilon_x$$

Asset Accumulation and Financing Constraints

- Asset Accumulation:

$$a_{t+1} = (1 + r)[a_t - \sum_{i \in N} D_{i,t} S_d - \sum_{i \in N} X_{i,t} S_x] + \sum_{i \in N} J_i \pi_t^D(\theta_i) + \sum_{i \in N} J_{i,t}^X \pi^X(\theta_i) \quad (6)$$

- Financing constraint:

$$a_t \geq \sum_{i \in N} J_{i,t} f_p + \sum_{i \in N} D_{i,t} S_d + \sum_{i \in N} J_{i,t}^X f_x + \sum_{i \in N} X_{i,t} S_x \quad (7)$$

- r interest rate.
- $D_{i,t} = 1$ if the firm enters domestic market i at time t and 0 otherwise.
- $X_{i,t} = 1$ if the firm enters export market i at time t and 0 otherwise.

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Entry Decision

- Firms pay a sunk cost of entry S_e and draw core competency θ_c from a Pareto distribution
- The free entry condition ensures that the expected value of entry equals S_e :

$$E_{\theta_c, \epsilon}[V(\theta_c, a_0, n_D, n_X, \epsilon)] = S_e$$

- Financing constraints imply that the net present value of profits depends on the firm's assets, affecting entry timing and market participation.

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Value of the firm

A liquidity constrained firm begins exporting variety m' if:

- Exporting $m' + 1$ generates more value for the firm than adding variety $m + 1$ to the domestic market:

$$V^X(\theta, c, a_t)|_{X_{m'+1,t}=1} > V^X(\theta, c, a_t)|_{D_{m+1,t}=1} \quad (8)$$

- Exporting $m' + 1$ generates higher value for the firm than not exporting it:

$$V^X(\theta, c, a_t)|_{X_{m'+1,t}=1} \geq V^X(\theta, c, a_t)|_{X_{m'+1,t}=0} \quad (9)$$

- Similar conditions for the decision to expand in the domestic market:

$$V^X(\theta, c, a_t)|_{D_{m+1,t}=1} \geq V^X(\theta, c, a_t)|_{X_{m'+1,t}=1} \quad (10)$$

$$V^X(\theta, c, a_t)|_{D_{m+1,t}=1} \geq V^X(\theta, c, a_t)|_{D_{m+1,t}=0} \quad (11)$$

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Asset Accumulation and Financing Constraints

- **Financing constraints:**

- ▶ Firms need to pay sunk costs of entry and fixed costs of production upfront
- ▶ If they do not have enough assets they will go bankrupt (exit)

- **Asset accumulation:**

- ▶ Firms are born with a certain level of initial assets and productivity
- ▶ They accumulate profits to increase their assets

▶ Characterisation

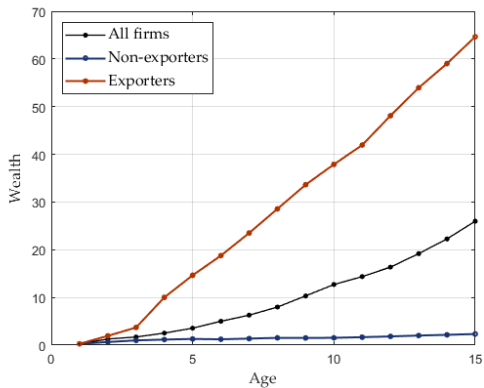
Stylised Fact:

Initial Wealth and the Sequence of Market Entry

For high productivity firms, initial wealth explains firms' entry sequence.

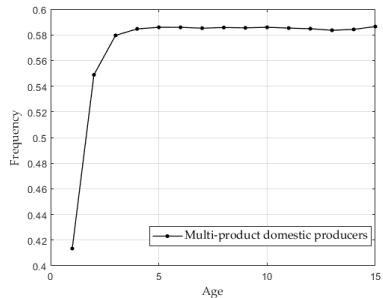
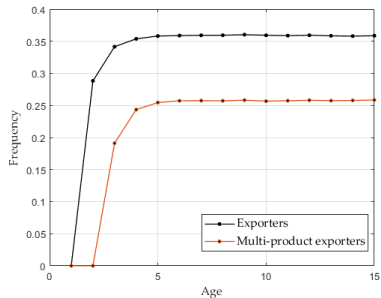
	(1)	(2)	(3)	(4)
	Global First	Global First	Local to Global Lag	Local to Global Lag
	Low Prod	High Prod	Low Prod	High Prod
Asset High	0.048* (0.024)	0.090*** (0.024)	0.228 (0.407)	-0.702 (0.431)
Observations	1,275	1,798	309	478
Two Digit Sector Controls	Y	Y	Y	Y
Birth Year Controls	Y	Y	Y	Y

Simulation Results



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Simulation Results



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Calibration - parameters

Calibrated to match the Indian manufacturing sector in 2013

Externally calibrated		
Parameter	Value	Description
σ	4	Elasticity of substitution between varieties
η	1.5	Elasticity of substitution - industry
R	.067	Interest rate
τ	1.2	Iceberg costs
δ	.05	death shock
N	4	number of trading partners
ρ	.8	Auto-correlation of fixed cost shocks
ϵ_d/f_d	.02	Volatility of domestic fixed costs
ϵ_x/f_x	.01	Volatility of exporting fixed costs

Structurally estimated		
Parameter	Value	Description
S_x	.54	Sunk cost of export
S_d	.07	Sunk cost of adding a new domestic product
f_x	.41	Fixed cost of export
f_d	.12	Fixed cost of domestic production
S_e	.87	Sunk cost of entry
λ	1.7	Parameter of entry distribution
C_i	.83	Productivity step

Calibration - Moments

Table: Targeted moments

	Data	Simulated
Share of multiple product firms	0.42	0.40
Share of exporters	.08	0.09
Average domestic fixed costs over total costs	0.18	0.14
Output share of single product firms in the domestic market	.30	0.63
Domestic sales of exporters to non-exporters	1.6	1.6
Average productivity of exporter to non-exporter	1.45	1.83
Sales of core product (domestic) to total domestic sales	0.91	0.88

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