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**Firm Sales and Export Behavior:
Evidence on the Role of Firm Markups, Market Size, and Market Penetration Costs**

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Firm sales and export behaviour: evidence on the role of firm markups, market size and market penetration costs

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Category: Individual research paper presentation, work in progress”

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- Background
 - Overview of Melitz (2003) and extensions
 - Melitz and Ottaviano (2008) – capturing endogenous markups
 - Arkolakis (2010) – capturing market penetration costs
- A unified framework with market penetration and markups
- Model specifications for econometric analysis

$$r(\varphi) = \phi \varphi^{\sigma-1}, \quad \phi = R (P \rho)^{\sigma-1}$$

φ : productivity

$r(\varphi)$: revenue of firm of productivity φ

σ : elasticity of substitution

R : aggregate revenue

P : Aggregate price

$$\rho = \frac{\sigma-1}{\sigma}$$

- the sale revenues can be obtained by monotonically transforming the productivity parameter by the exponent $\sigma - 1$ and scaling it by factor ϕ

- ❑ the literature suggests other source of heterogeneities beyond productivity narrowing the gap between model predictions and empirical observations
- ❑ supply side heterogeneities: the extensions are related to product scope and the emergence of multi-product firms, innovation, and technology adoption,... (Bernard et al. 2011; Atkesen and Burstein 2010; Bustos 2011)
- ❑ on the demand side: endogenous markups (Melitz and Ottaviano 2008) and market penetration cost (Arkolakis 2010)
- ❑ Other extensions introduce dynamic elements and thereby moves away from the concept of stationary equilibrium

Melitz and Ottaviano

$$r(\omega) = \frac{L}{4\gamma} \left[(CD)^2 - \left(\frac{1}{\varphi}\right)^2 \right]$$

CD : choke price

γ : a parameter indexing the degree of product differentiation between varieties

L: market size

Arkolakis (2010):

$$r(\varphi) = n(\varphi) R (\rho P \varphi)^{\sigma-1}$$

$n(\varphi)$: fraction of reachable consumers as function of productivity

$$n(\varphi) = \max \left\{ 1 - \left(\frac{\varphi^*}{\varphi} \right)^{\frac{\sigma-1}{\beta}}, 0 \right\}$$

φ^* : minimum productivity

β : a parameter related to the advertisement technology.

Unified framework: simultaneous consideration of market penetration and endogenous markups

- ❑ Consider multiple countries (i, j, \dots, H)
- ❑ Linear demand system as in Melitz and Ottaviano (2008)
- ❑ Existence of homogenous (produced under CRS) and heterogeneous goods (produced under IRS)
- ❑ Homogenous good uses one unit of labor and is tradable
- ❑ Thus, wages are unity across all countries.

Unified framework : simultaneous consideration of market penetration costs and endogenous markups

□ Firm revenue

$$r_{ij}(\varphi) = \frac{n_{ij}L_j}{4\gamma} (\tau_{ij})^2 [(c_{ij}^m)^2 - (c)^2]$$

□ Firm markup

$$\mu_{ij}(c) = \frac{1}{2} \tau_{ij} [c_{ij}^m - c]$$

τ_{ij} iceberg transport cost
 c_{ij}^m marginal cost of a firm indifferent on entry or exit
 c marginal cost ($\frac{1}{\varphi}$)

Optimal market penetration is determined by relative markups

$$n_{ij}(\mu) = \max \left\{ 1 - \left[\left(\frac{\mu_{ij}^*}{\mu_{ij}} \right) \right]^{\frac{2}{\beta}}, 0 \right\}$$

μ_{ij} markup

μ_{ij}^* markup of zero-profit firm

Compared to the finding of Arkolakis (2010)

$$n_{ij}(\varphi) = \max \left\{ 1 - \left(\frac{\varphi^*}{\varphi} \right)^{\frac{\sigma-1}{\beta}}, 0 \right\}$$

Optimal market penetration is determined by relative markups

$$n_{ij}(\mu) = \max \left\{ 1 - \left[\left(\frac{\mu_{ij}^*}{\mu_{ij}} \right) \right]^{\frac{2}{\beta}}, 0 \right\}$$

- Difference between exporters and non exporters in advertisement expenditure
- Difference between exporters and non exporters in marketing technology
- Difference in advertisement expenditure and marketing technology across group of exporters

Do Exporters Have Different Marketing Penetration?

$$\ln n_{it} = \delta_0 + \delta_1 e_{it} + \mathbf{b}'_{it} \sigma + v_{it}$$

- n_{it} marketing expenditure
- e_{it} firm status (exporter =1, non-exporter=0)
- \mathbf{b} vector of control variables

Export Entry and Market Penetration Dynamics

$$\ln n_{it} = \gamma_0 + \gamma_1 \text{Entry}_{it} + \gamma_2 \text{Exit}_{it} + \gamma_3 \text{Always}_{ij} + \mathbf{b}'_{it} \sigma + v_{ij}$$

- Entry exporting dummy
- Exit exit dummy
- Always always exporting dummy

- ***Control for markups to see the differences in marketing technology***

Empirical specification of the model: what determines firms sale and their export status

- Reminder : Firm performance measures in unified framework

- revenue
$$r_{ij}(\varphi) = \frac{n_{ij} L_j}{4\gamma} (\tau_{ij})^2 [(c_{ij}^m)^2 - (c)^2]$$
- Markup
$$\mu_{ij}(c) = \frac{1}{2} \tau_{ij} [c_{ij}^m - c]$$

- Revenue function can be re-written as

- revenue
$$r_{ij}(c) = \frac{n_{ij} L_j}{\gamma} \mu_{ij}(c) h_{ij}$$
- constructed variable
$$h_{ij} = \mu_{ij}(c) + \tau_{ij} c_{ij}$$

Empirical specification of the model: Factors determining firm total sale

- Revenue function can be re-written as

- revenue

$$r_{ij}(c) = \frac{n_{ij} L_j}{\gamma} \mu_{ij}(c) h_{ij}$$

- Empirical Specification – impacts on firm total sale

$$\ln r_{ij} = \delta_0 + \delta_1 \ln n_{ij} + \delta_2 \ln L_j + \delta_3 \ln \mu_{ij} + \delta_4 \ln h_{ij} + \mathbf{b}'_{it} \sigma + v_{ij}$$

r_{ij} : total sale revenues

n_{ij} : marketing expenditure

L_j : market size

μ_{ij} : firm markup

c_{ij} : inverse of productivity

τ_{ij} : transport costs

Empirical specification of the model: Factors determining firm export participation and export intensity

Revenue:

$$r_{ij}(c) = \frac{n_{ij} L_j}{\gamma} \mu_{ij}(c) h_{ij}$$



- Empirical specification-impacts on export participation and export intensity

$$e_{ij} = \delta_0 \ln n_{ij} + \delta_2 \ln \mu_{ij} + \delta_2 \ln \hat{h}_{ij} + \mathbf{b}'_{it} \sigma + v_{ij}$$

$$EI_{ij} = \delta_0 \ln n_{ij} + \delta_2 \ln \mu_{ij} + \delta_2 \ln h_{ij} + \mathbf{b}'_{it} \sigma + v_{ij}$$

e_{ij} : export participation (dummy variable)

EI_{ij} : export intensity

- We use an unbalanced panel of data at plant level from the annual Colombian Manufacturing census
- **Productivity measurement.** We rely on the productivity estimates of Fernandes (2007) in her indirect approach to estimate a production function equation whose residual measure plant productivity.
- **Markups measurement.** We follow the method introduced by Loecker and Warzynski (2012) to estimate markups using plant-level production data

$$\mu_{it} = \theta_{it} (\alpha_{it})^{-1}$$

θ_{it} : Input's output elasticity (for firm i firm in time t)

α_{it} : Inputs share in production (for firm i firm in time t)

- **Results and discussions (to be completed ...)**

- ❑ Market penetration cost is determined by markup differences
- ❑ *Exporters and non exporters are different in their “advertisement costs” and “marketing technology”*
- ❑ *Database that includes both firm advertisement expenditure and destination specific exports ?*
- ❑ *Use of dummy variables for market size and iceberg transport cost ?*