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

Yaghoob Jafari and Thomas Heckelei

Selected Paper prepared for presentation at the International Agricultural Trade Research Consortium's (IATRC's) 2017 Annual Meeting: Globalization Adrift, December 3-5, 2017, Washington, DC.

universitätbonn

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

Yaghoob Jafari and Thomas Heckelei

Category: Individual research paper presentation, work in progress”

Institute for Food and Resource Economics,
University of Bonn, Germany

universitätbonn

Outline

- 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

Background-Melitz 2003

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

$\boldsymbol{\varphi}$: productivity

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

$\boldsymbol{\sigma}$: elasticity of substitution

$\boldsymbol{R}$: aggregate revenue

$\mathbf{P}$: Aggregate price

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

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

Background- Extensions of Melitz 2003

- 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

Background- Extensions of Melitz 2003

Melitz and Ottaviano

$$\mathrm{r}(\omega) = \frac{L}{4\gamma}\,[\,(CD)^2 - (\frac{1}{\varphi})^2\mathrm{l}$$

CD : choke price

$\boldsymbol{\gamma}$: 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

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

φ^*: minimum productivity

β: a parameter related to the advertisement technology.

universitätbonn

Unified framework: simultaneous consideration of market penetration and endogenous markups

- Consider multiple countries (i,j,…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 $\mu_{ij}(c) = \frac{1}{2} \tau_{ij} [c_{ij}^m - c]$

$\boldsymbol{\tau_{ij}}$ iceberg transport cost

$\boldsymbol{c_{ij}^m}$ marginal cost of a firm indifferent on entry or exit

c marginal cost ($\frac{1}{\varphi}$)

Optimal market penetration in the simultaneous framework

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 in the simultaneous framework

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

Difference between exporters and non exporters in marketing technology

Do Exporters Have Different Marketing Penetration?

$$Ln\, n_{it} = \delta_0 + \delta_1 e_{it} + \boldsymbol{b}'_{it}\sigma + v_{it}$$

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

Export Entry and Market Penetration Dynamics

$$Ln\, n_{it} = \gamma_0 + \gamma_1 Entry_{it} + \gamma_2 Exit_{it} + \gamma_3 \text{Always}_{ij} + \boldsymbol{b}'_{it}\sigma + v_{ij}$$

- $Entry$ 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

$$Lnr_{ij} = \delta_0 + \delta_1 Ln\, n_{ij} + \delta_2 \ln L_j + \delta_3 Ln\, \mu_{ij} + \delta_4\, Ln\, h_{ij} + \boldsymbol{b}'_{it}\sigma + v_{ij}$$

$\boldsymbol{r_{ij}}$: total sale revenues

$\boldsymbol{n_{ij}}$: marketing expenditure

$\boldsymbol{L_j}$: market size

$\mu_{\boldsymbol{ij}}$: firm markup

$\boldsymbol{c_{ij}}$: inverse of productivity

$\boldsymbol{\tau_{ij}}$: 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

$$e_{ij} = \delta_0\, Ln\, n_{ij} + \delta_2 Ln\, \mu_{ij} + \delta_2\, Ln\, \grave{h}_{ij} + \boldsymbol{b}'_{it}\sigma + v_{ij}$$

$$EI_{ij} = \delta_0\, Ln\, n_{ij} + \delta_2 Ln\, \mu_{ij} + \delta_2\, Ln\, h_{ij} + \boldsymbol{b}'_{it}\sigma + v_{ij}$$

$\boldsymbol{e_{ij}}$: export participation (dummy variable)

$\boldsymbol{EI_{ij}}$: export intensity

Data and variable measurements

- 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 …)**

Conclusion and questions to discuss

- 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 ?*