EC 791 - International Trade
The Melitz Model: Variations on a Theme

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The Impact of the Melitz' Model for the Field

The Melitz model initiated a large, recent literature exploring the implications of firm heterogeneity for a number of questions in international economics. Here is a non-exhaustive list:

- **Chaney (2008)**, on the elasticity of trade flows to trade barriers;

- **Arkolakis (2008)**, on the role of marketing costs to match the behavior of small firms;

- **Melitz and Ottaviano (2008)**, on the effects of trade and market size for competition;

- **Eaton, Kortum and Kramarz (2008)**, an evaluation of an "augmented" Melitz model using firm-level data;

- **Helpman, Melitz ad Rubinstein (2008)** develop a framework to incorporate the extensive margin in the gravity equation, and account for selection in the estimates;

- **Helpman, Melitz and Yeaple (2004)**, an extension of Melitz (2003) to trade and FDI;

- **Helpman, Itskhoki and Redding (2010)** merge the Melitz model with an analysis of the labor market.

... and more.

Chaney (2008)

Start from Krugman (1980), with only variable costs of exports and homogeneous firms.

Exports from country j to country i can be written as:

$$X_{ij} = \left(\frac{\tau_{ij} p_j}{P_i} \right)^{1-\eta} X_i$$

where a "high" η implies a large impact of trade barriers τ on trade flows.

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When $\tau \downarrow$, we have two effects:

1. INTENSIVE MARGIN: existing exporters increase their volumes of exports; and

2. EXTENSIVE MARGIN: new firms start exporting.

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Why?

- New entrants are on average less productive than the incumbents.

- When η is "high", these less productive firms get a "small" market share, so the extensive margin is not that important.

- When η is "low", these less productive firms get a "relatively large" market share, so the extensive margin is more important.

When the firms' productivity distribution is a Pareto, the extensive margin dominates, and the elasticity of trade volumes to trade barriers is decreasing in the elasticity of substitution (opposite of Krugman's prediction).

Arkolakis (2008)

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Arkolakis (2008) "augments" the Melitz framework to account for these facts as well, by adding a **theory of marketing** to the model:

- No fixed costs;

- A firm enters a market if the profits of reaching ONE consumer are positive;

- A firm pays increasing marginal costs to reach additional consumers (endogenous costs).

Large departure from the standard model in case of "small" firms; isomorphic to the standard model in case of "large" firms that choose to sell to all the consumers.

Arkolakis (2008) (contd.)

The model still features selection and limited participation in the export market, plus a number of other facts:

- Firms selling to more markets have larger domestic sales.

- There are more firms selling in larger markets.

- Following a trade liberalization, small exporters increase sales more than proportionally:

  ○ large role of the "new consumers margin" compared to the "new firms margin" in a trade liberalization;

  ○ fastest growth of trade for goods with little previous trade ($\equiv$ for smallest exporters).

Melitz and Ottaviano (2008)

Melitz and Ottaviano develop a model of trade with heterogeneous firms and **linear demand**.

The model generates the predictions of the standard Melitz model plus:

1. Trade and market size affect the **"toughness" of competition** across markets (= number and average productivity of active firms);

2. Trade and market size affect **average mark-ups**.

$\Downarrow$

Larger, more integrated markets exhibit higher average productivity and lower mark-ups.

The link between trade liberalization and mark-ups is referred to as the **"pro-competitive effect of trade liberalization"**.

Melitz and Ottaviano (2008): Preferences

Preferences developed in Ottaviano, Tabuchi and Thisse (2002):

$$U = q_0^c + \alpha \int_{i \in \Omega} q_i^c di - \frac{1}{2}\gamma \int_{i \in \Omega} (q_i^c)^2 di - \frac{1}{2}\eta \left(\int_{i \in \Omega} q_i^c di \right)^2$$

Implications:

- Marginal utility is bounded from above: there exists a "choke price" p_{max} such that $q_i^c = 0 \ \forall p \geq p_{max}$, hence consumers may not consume all goods.

- The number of goods produced and consumed in equilibrium is endogenous (like in Melitz), but there is no need of fixed costs: the selection mechanism is demand-driven.

- Linear demand $\Rightarrow$ variable markups.

Melitz and Ottaviano (2008): Production

- Firms pay a sunk cost of entry f_E, and receive a cost draw $c \sim G(c)$, $G(c) : [0, c_{max}] \rightarrow [0, 1]$.

- Each firm chooses its profit-maximizing price $p(c)$ as a function of N (number of firms in the economy), $\bar{p}$ (average price), and model parameters.

- If $p(c) > p_{max}$, demand for the good is zero, hence the firm exits; otherwise, it stays and produces (exit is driven by linear demand, not by fixed costs).

- Let $c_D \equiv \{c_D \in [0, c_{max}] : p(c_D) = p_{max}\}$. Then all firms with $c \leq c_D$ stay and produce (c_D analogous to the threshold φ^* in Melitz).

- Like in Melitz, lower cost firms set lower prices and have higher revenues and profits.

- Unlike in Melitz, lower cost firms charge higher mark-ups.

Melitz and Ottaviano (2008): Results in the Closed Economy

1. **Average productivity** is higher:

    - the lower the sunk cost f_E;

    - when goods are more substitutable (γ "low")

    - in bigger markets (L "high")

    In all these cases, c_D will be lower.

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3. In **larger markets**, there is tougher selection (higher average productivity, lower prices), and firms have larger sales, larger profits, smaller mark-ups. Larger market size increases competition (mark-ups $\downarrow$) and drives selection towards the more productive firms (mark-ups $\uparrow$); the effect of competition dominates.

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   - in Melitz and Ottaviano (2008), opening to trade implies that the price elasticity of demand increases, the choke price drops, and the least productive firms cannot afford lower prices and exit.

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2. **Trade reduces average prices and mark-ups**: tougher competition more than offsets the fact that surviving firms are more productive and charge higher mark-ups (equivalent to an increase in L in the closed economy).

3. **Trade induces welfare gains** via higher productivity (selection), increased product variety and lower mark-ups (pro-competitive effect, novel of this framework).