Firms in International Trade

Volker Nocke
University of Oxford, CESifo and CEPR

Prepared for
GEP Annual Research Retreat
12 May 2009
Introduction

- I will report on some recent and ongoing work (of others and mine) on “firms in international trade”.

- Arguably, the most influential paper in international trade in the last ten (or, indeed, twenty) years is Melitz (ECMA, 2003).

- Melitz provides a very tractable model of firm heterogeneity and introduces a new margin (in addition to the “intensive” margin): the “extensive” margin.

- In Melitz’s model, trade liberalization has industry-level productivity effects, but only through selection effects.
• But we now from work by Trefler, Pavcnik and others that trade liberalization has also firm-level and plant-level productivity effects.

• This is just one of many reasons as to why it is fruitful to study “richer” firm/industry models in international trade.
Multiproduct Firms in International Trade

- Some facts about US manufacturing:
  - 39% of firms are present in more than one 5-digit SIC industry; these firms account for 87% of shipments.
  - 10% of firms are present in more than one 2-digit SIC sector; these firms account for 66% of output.
  - Across 5-year census intervals, 54% of surviving firms alter their 5-digit “product” mix; 25% both add and drop 5-digit “products”.

- These facts suggest that firms’ product scope (and product mix) is an important “margin of adjustment”.
It is interesting to study how this new margin of adjustment is affected by trade costs.
The model is an extension of Melitz (ECMA, 2003) to a continuum of industries and multiproduct firms.

Utility of consumer in country $j = 1, \ldots, n + 1$:

$$U_j = \left[ \int_0^1 C_{jk}^\nu dk \right]^{1/\nu}, \quad 0 < \nu < 1,$$

where $k$ indexes products.
\( C_{jk} \) is a consumption index that also takes CES-form:

\[
C_{jk} = \left[ \int_0^{n+1} \int_\omega [\lambda_{ijk}(\omega)c_{jk}(\omega)]^\rho d\omega di \right], \quad 0 < \rho < 1,
\]

where \( i \) and \( j \) index countries, \( \omega \) indexes varieties of product \( k \) from country \( i \) to country \( j \), and \( \lambda_{ijk} \) captures the strength of the representative consumer's tastes for firm variety \( \omega \).

- All countries and products are symmetric.

- Upon entry (which requires incurring a fixed setup cost), a firm gets a random draw of its productivity parameter \( \varphi \) (as in Melitz) and, for each product \( k \), of the demand parameter \( \lambda_{jk} \).
• Since there is a continuum of symmetric products, the aggregate distribution of $\lambda_j$ is deterministic.

• In addition to firm-level fixed costs, there are product-level fixed costs.

• In all other respects, the model closely follows Melitz (ECMA, 2003).

• The decision of which products to produce involves a product-by-product break-even condition.

• Because of the firm-level productivity parameter $\varphi$, more efficient firms will produce more products.
Result  *The opening of the closed economy to trade results in within-firm resource allocation: all surviving firms drop products with low values of consumer tastes from the domestic markets. In addition, high-productivity surviving firms begin to export, and therefore add products with high values of consumer tastes in the export market.*
Result  A reduction in variable trade costs:
(a) increases aggregate exports through the share of products exported to a given country by incumbent exporters (within-firm product extensive margin),
(b) increases aggregate exports through the share of countries to which a given product is exported by incumbent exporters (within-firm country extensive margin),
(c) increases aggregate exports through the share of firms that export (across-firm extensive margin),
(d) has an ambiguous effect on aggregate exports through average exports per firm-product-country (intensive margin).
Nocke and Yeaple: “Globalization and the Size Distribution of Multiproduct Firms” (Mimeo)

• Representative consumer has linear-quadratic utility function:

\[ U = \int x(k) dk - \int [x(k)]^2 dk - 2\sigma \left[ \int x(k) dk \right]^2 + H, \]

where \( \sigma > 0 \), \( x(k) \) is consumption of product \( k \), and \( H \) is consumption of Hicksian composite commodity.

• Mass \( M \) of firms that differ in organizational capabilities, indexed by \( \theta \).

• Each firm can choose to manage \( n \geq 1 \) products.
For each product, firm incurs fixed cost.

Firm faces (i) a fixed cost per product and (ii) a constant marginal cost of production \( c(n; \theta) \) for each product.

There are decreasing returns to span of control at firm level: marginal cost \( c(n; \theta) \) increasing in number of products (Schoar, 2002). Firm’s organizational capability \( \theta \) is inverse of elasticity of marginal cost with respect to number of products. Marginal cost of a firm with organizational capability \( \theta \) that manages \( n \) products:

\[
c(n; \theta) = c_0 n^{1/\theta}.
\]
• A firm faces a trade-off in increasing firm scope:
  
  – Benefit: net profit of additional product;
  
  – Cost: production costs of inframarginal products increase.

**Result** The optimal choice of firm scope is such that the induced marginal cost $c(\theta)$ is increasing in the firm’s organizational capability $\theta$. 
• Suppose firms have a fixed capital share in production costs.

**Result** A firm’s market-to-book ratio (Tobin’s Q) is inversely related to various measures of firm size: sales, book value, and market value.

• In standard models with heterogeneous firms, firms differ in their constant marginal costs, which are exogenous. Firms with low marginal costs choose to be large. Low marginal costs are reflected in high market-to-book ratios. Hence, these models predicts a positive relationship between firm size and market-to-book ratio.
• In this model, marginal costs are not exogenous. Intrinsically more efficient firms choose to manage a much larger number of products, which implies that these firms have higher marginal costs and larger sales. Hence, our model predicts a negative relationship between firm size and market-to-book ratio.

• That is, the model can explain the size-discount puzzle in the corporate finance literature: the market-to-book ratio is increasing with firm size.
The diagram illustrates the relationship between ln(Tobin’s Q) and ln(firm sales) with a scatter plot. The data points represent various observations, and the linear trend line indicates the correlation between the two variables.
Result A multilateral trade liberalization induces a flattening of the domestic size distribution of firms through a scope effect (large firms downsize by dropping products that are acquired by small firms) and a competition effect (the induced increase in the intensity of competition magnifies underlying differences in marginal costs).
Other Recent Work on Multiproduct Firms

- Eckel and Neary (REStud, forthcoming).
  - A firm’s marginal cost of its $n$th product is higher than that of its $(n + 1)$th product.
  - Large, oligopolistic firms internalize the cannibalization effect of an additional product.
  - No firm heterogeneity.

- Melitz and Ottaviano (work in progress).
  - Extends their 2008 REStud paper to multiproduct firms.
Foreign Direct Investment

- By now, the “standard” model of (horizontal) FDI with heterogeneous firms is Helpman, Melitz and Yeaple (AER, 2004) [HMY].

- The model in HMY is a straightforward extensions of Melitz (ECMA, 2003): by paying a fixed cost, a firm can move production abroad to serve the foreign market, and thus save all trade costs.

- HMY is about greenfield FDI.

- But most FDI between developed countries is in the form of cross-border acquisitions rather than greenfield FDI.
Nocke and Yeaple (REStud, 2008) document the following facts:

1. U.S. MNEs engaging in greenfield FDI are more efficient than those engaging in cross-border acquisitions.

2. U.S. MNEs are more likely to choose cross-border acquisition over greenfield FDI the more developed is the host country.

3. U.S. MNEs are less likely to choose cross-border acquisition over greenfield FDI the closer is the geographical proximity of the host country to the U.S.
The Nocke-Yeaple Approach to FDI

- I have two related recent papers on FDI:
  


- In both papers, a firm is a “bundle” of heterogeneous corporate assets such as (i) entrepreneurial ability and (ii) country-specific marketing abilities (JIE paper) or property rights over the production of goods with heterogeneous quality (REStud paper).
• The different types of assets are complementary in generating profits.

• Cross-border mergers and acquisitions allow firms to combine these assets so as to benefit from complementarities.

• In contrast, greenfield FDI is about bringing the firm’s own capabilities abroad.

• The two papers differ in their economic environments (and in their results):
1. JIE 2007 paper
   - Horizontal FDI (motivated by savings on trade costs).
   - Some assets (capabilities) are more internationally mobile than others.
   - One-sided heterogeneity.
   - Results depend critically on the “source” of firm heterogeneity.

2. REStud 2008 paper
   - Vertical FDI (no trade costs). Countries differ in wage costs.
   - General two-sided heterogeneity: optimal assignment.
   - Model generates the three empirical findings mentioned above.
The list of people currently working on FDI/cross-border mergers in international trade is too long for this short overview!

In my work with Stephen Yeaple, we implicitly assume that contracting problems prevent arm’s-length relationships. But there is an exciting and growing literature on (domestic and international) outsourcing and joint ventures.

At this point, more serious empirical work is needed.

An interesting avenue for theoretical research would be to study the effects of the various modes of serving a foreign market on that country. From the viewpoint of developing host countries, what is the optimal “industrial policy” towards trade and the various modes of FDI?
My Current Projects in International Trade

1. "Organizational Structure of Firms and International Trade" (with Stephen Yeaple)

2. "Antitrust Policy in International Markets" (with Michael Whinston)

3. "FDI and Foreign Takeovers in Indonesia" (with Beata Javorcik)
The End