# EC 791 - International Trade
# The Proximity-Concentration Trade-Off: Theory and Empirics

Stefania Garetto

# The Proximity-Concentration Trade-Off

- **Horizontal FDI:** a firm **gives up concentration** of production, as the foreign plant is a duplicate of the domestic one, but **achieves proximity** to the foreign market via the foreign production facility.

- **Export: production is concentrated** in one (domestic) plant, but the firm **gives up proximity** of the producing plant and the foreign market.

# Brainard (1997): Reduced-Form Empirical Evidence

Hypothesis to test:

Firms are more likely to choose FDI over exports the higher transport costs and trade barriers, and the lower the investment barriers and the size of scale economies at the plant level relative to the corporate level.

- Transportation costs and trade barriers imply that exporting is relatively more costly.

- Investment barriers imply that FDI is relatively more costly.

- Scale economies at the plant level favor concentration of production in one plant only (exports more convenient than FDI).

- Scale economies at the corporate level imply that having more than one production plant does not prohibitively increases costs.

# The Data

- Data on the Operations of U.S. Multinational Firms (Bureau of Economic Analysis, 1989 survey by industry and country) + U.S. Census trade (exports) data:

  - Affiliate (FDI) sales appear to be concentrated among industrialized countries.

  - Affiliate (FDI) sales appear to be concentrated among a few industries (chemicals, computers, motor vehicles and equipment).

  - Data allow to distinguish between horizontal FDI (local sales of foreign affiliates of U.S. based firms) and vertical FDI (imports of U.S. based firms from their foreign affiliates).

- Use freight factors from the U.S. Census as estimates of trade costs and data on tariffs from GATT.

- Data from the U.S. Census, Annual Survey of Manufactures, to construct measures of scale economies:

  - Number of production workers in median plant by value added as a measure of plant-level scale economies.

  - Number of non-production workers in average U.S.-based firm as a measure of corporate-level scale economies.

# The Empirical Framework

$$
\begin{aligned}
EXSH_i^j \quad = \quad & \alpha_0 + \alpha_1 FREIGHT_i^j + \alpha_2 TARIFF_i^j + \alpha_3 PWGDP_i + ... \\
... \quad & \alpha_4 TAX_i + \alpha_5 TRADE_i + \alpha_6 FDI_i + ... \\
... \quad & \alpha_7 PSCALE^j + \alpha_8 CSCALE^j + \varepsilon_i^j
\end{aligned}
$$

where:

- $EXSH_i^j$ = exports/(exports +FDI) from the U.S. to country $i$ in industry $j$

- $PWGDP_i$ = GDP per worker in the U.S./ GDP per worker in country $i$

- $TAX_i$ = corporate income tax in country $i$

- $TRADE_i$ and $FDI_i$ are measures of "openness" to trade and FDI for country $i$

- $PSCALE^j$ and $CSCALE^j$ are measures of plant-level and corporate-level scale economies for industry $j$.

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**Proximity-concentration hypothesis:**
$\hat{\alpha}_1 < 0$, $\hat{\alpha}_2 < 0$, $\hat{\alpha}_5 > 0$, $\hat{\alpha}_6 < 0$, $\hat{\alpha}_7 > 0$, $\hat{\alpha}_8 < 0$.

# Helpman, Melitz and Yeaple (2004): Theory and Empirics

- Extend the Melitz' model to explain both export and horizontal FDI:

  - Firms have to decide whether to sell abroad and how (via export or via FDI).

- The modeling of the choice between exports and FDI is consistent with the proximity-concentration trade-off:

  - exports entail "low" fixed costs and "high" variable costs;

  - FDI entail "high" fixed costs and "low" variable costs.

- Like in Melitz (2003), only the most productive firms sell abroad. Among the firms selling abroad, the most productive serve foreign markets via FDI, the least productive via export.

  - The sorting by productivity is confirmed by the empirical evidence: multinational corporation have higher productivity than exporters and firms selling only in their domestic markets.

# Predictions of the Model

- Export sales as a share of total foreign sales[1] are decreasing in trade costs:

  - The model with heterogeneous firms and endogenous mode of entry is consistent with the proximity-concentration hypothesis.

# Predictions of the Model

- Export sales as a share of total foreign sales[1] are decreasing in trade costs:

    ○ The model with heterogeneous firms and endogenous mode of entry is consistent with the proximity-concentration hypothesis.

- Export sales as a share of total foreign sales are lower in sectors characterized by "high" productivity dispersion.

    ○ Novel testable prediction.

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[1] Total foreign sales = exports + FDI sales.

# The Data

- Data on the Operations of U.S. Multinational Firms (Bureau of Economic Analysis, by industry and country) + Feenstra trade (export) data.

- CIF/FOB import prices as measure of transportation costs (from Feenstra).

- Tariffs data from the Bureau of Economic Analysis.

- Country-industry fixed effect as proxy for fixed cost of exporting.

- Number of non-production workers per establishment (from the U.S. Census of Manufactures, by industry) as proxy for the fixed FDI costs.

- Compute productivity dispersion parameter by regressing firm rank (by sales) on firm sales, consistent with the assumption of the productivity distribution being a Pareto distribution.

# The Empirical Framework

$$\ln\left(\frac{s_{Xh}^{uj}}{s_{Ih}^{uj}}\right) = \alpha + \beta_1 disp_h^j + \beta_2 \ln(f_{Ih}) + \beta_3 \ln(\tau_h^{uj}) + f_X^j + \nu_h^{uj}$$

where:

- $s_{Xh}^{uj}$ = U.S. exports to country $j$ in industry $h$

- $s_{Ih}^{uj}$ = U.S. FDI sales in country $j$ in industry $h$

- $disp_h^j$ = productivity dispersion in industry $h$ in country $j$

- $f_{Ih}$ = fixed cost of FDI in industry $h$

- $f_X^j$ = fixed cost of export in country $j$

- $\tau_h^{uj}$ = iceberg cost of export from the U.S. to country $j$ in industry $h$.

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**Proximity-concentration hypothesis + new prediction:**
$\hat{\beta}_1 < 0, \hat{\beta}_2 > 0, \hat{\beta}_3 < 0, \hat{f}_X^j < 0.$