Trade, FDI, and the International Organization of Production

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Background

Old trade theory: cross-country differences drive trade (technology, endowments); emphasis on intersectoral trade flows (intersectoral specialization); factor content.


- large volumes of trade between similar countries
- variations in the share of intra-industry trade and intra-firm trade
- conditions for horizontal and vertical FDI
Background (Cont.)

The theory was developed for trade in final goods and intermediate inputs. Nevertheless, within sectors, firms are symmetrically structured (for the most part).

- In the data: a lot of within industry heterogeneity (Tybout, 2003).
- Participation in trade is related to firm characteristics (labor productivity of exporters is 39% higher than non-exporters, of multinationals is 54% higher).
- Boundaries of the firm is unsatisfactorily modelled – common failure to model internalization.
Main Questions

How do firms choose to organize production? What are their global sourcing strategies? Choice between:

- domestic vs. foreign production of intermediate inputs
- domestic vs. foreign assembly
- intra-firm vs. arm’s length purchase of intermediate inputs

Are these decisions interrelated?

How do they depend on industry characteristics? Firm characteristics? Country characteristics?
Main Questions (Cont.)

Answers to these questions should help in explaining recent trends:

- growing international specialization
- FDI and trade growing faster than GDP, and FDI in particular
- bias towards arm’s length relations in the composition of trade (and also in the composition of U.S. manufacturing), i.e., fragmentation of production
Backbones of the Approach

Recent developments have emphasized:

Backbones of the Approach (Cont.)

• *The organization of production.*

  – Incomplete contracts (Grossman and Helpman, 2002; Grossman and Helpman, 2003; Antràs, 2003a,b; Antràs and Helpman, 2004; Grossman and Helpman, 2004a; Feenstra and Hanson, 2003)

  – Managerial incentives (Grossman and Helpman, 2004b; Puga and Trefler, 2003; Marin and Verdier, 2003a,b; Lin and Thomas, 2004)

• *Heterogeneity with the organization of production.*
Structure of the Presentation

• Within sectoral heterogeneity and its impact on the servicing of foreign markets (variations across firms).

• Organizational forms that emerge as a result of contract incompleteness and their effects on the form of international trade (variations across industries).

• Integration of heterogeneity and contract incompleteness: relative prevalence of organizational forms and their impact on the form of international trade (joint variation across firms and industries).

• Alternative approaches and other issues.
Basics

Preferences across sectors: constant expenditure shares or quasi-linear.

CES preferences over brands within a sector.

Every variety requires primary inputs or specialized intermediate inputs.

Monopolistic competition in final-good markets.
Within Sectoral Heterogeneity

Melitz: one input, labor (let $w = 1$); firms pay a fixed entry cost $f_E$ and draw a productivity level $\theta$ (output per unit labor).

Fixed cost of serving the home market, $f_D$; fixed cost of serving a foreign market via exports, $f_X$.

Profits from serving the home market and the foreign market are depicted in the following figure:
The diagram illustrates the export decision process. The axes represent different variables, with the horizontal axis denoted as $\theta^{\alpha/(1-\alpha)}$ and the vertical axis denoted as $\theta^{\alpha/(1-\alpha)}$. The lines $\pi_D$ and $\pi_X$ represent different decision margins or boundaries. The points $-f_D$ and $-f_X$ indicate specific values along the axes, and the line segments $\theta_D^{\alpha/(1-\alpha)}$ and $\theta_X^{\alpha/(1-\alpha)}$ highlight critical thresholds or decision points in the export decision process.
Export versus FDI

Helpman, Melitz and Yeaple add the option of horizontal FDI
Exports versus FDI (Cont.)

Suppose $\theta$ is distributed Pareto. Then the size distribution of firms is also Pareto. Fits the data well.

*Result:* *in sectors with more dispersion, exports are lower relative to subsidiary sales.* Holds in U.S. data.
Integration versus Outsourcing

Grossman and Helpman, 2002: Every final good requires a specialized intermediate input. If the input is produced by a specialized supplier, $\theta = 1$. If in-house, $\theta < 1$.

No heterogeneity *within* industries.

Fixed costs of vertical integration may be higher than the joint fixed costs of independent firms.

No contractual problems with integration, $V$; no contracts with outsourcing, $O$.

With $O$, independent supplier bears the cost of the inputs, and the two parties share the revenue from sales of the final product.
Integration versus Outsourcing (Cont.)

When the matching function between upstream and downstream firms exhibits constant returns to scale, the equilibrium is unique; V or O. When the matching function exhibits increasing returns to scale, multiple equilibria are possible; either V or O, but not V and O.

The integration of countries into a single world market has no effect on the equilibrium organizational form when the matching function exhibits constant returns to scale, but it makes the outsourcing equilibrium more likely when the matching function exhibits increasing returns to scale.
Factor Proportions

Antràs, Antràs and Helpman: Suppose there are two inputs, $h$ and $m$, which produce a variety of a final good with a Cobb-Douglas production function.

$\eta$ is the elasticity of output with respect to $h$.

Every input is variety specific, not contractible.

- $h$ is supplied by the final-good producer.
- $m$ requires an operator of the component facility, inside or outside the firm.
Factor Proportions (Cont.)

In an outsourcing relationship $h$ and $m$ are chosen non-cooperatively, then revenue is shared according to $\beta_O = \beta$ and $1 - \beta_O$ (zero outside options).

In an integrated firm $h$ and $m$ are chosen non-cooperatively, then revenue is shared, except that the final good producer can appropriate $m$ in the event of a disagreement (ownership advantage, as in Grossman and Hart, 1986).

If the final-good producer seizes $m$, he can produce with $h$ and $m$ only a fraction $\delta$ of the output.
Factor Proportions (Cont.)

Given $\eta$ profits are largest when $\beta_k = \beta^*(\eta)$. 
Factor Proportions (Cont.)

Antràs (two-sector Helpman-Krugman model): Let $h$ be capital intensive (only $K$) and let $m$ be labor intensive (only $L$). And let one sector have a low $\eta$, the other a high $\eta$.

$$\Rightarrow \text{Integration in the capital intensive sector, outsourcing in the labor intensive sector}$$

$$\Rightarrow \text{Intra-firm trade in the capital intensive sector, arm’s length trade in the labor intensive sector.}$$

Supported by evidence: the share of U.S. intra-firm trade is positively correlated with capital intensity. Also: more U.S. intra-firm imports in total imports from capital-rich countries.
Integration and Outsourcing with Heterogeneity

Antràs and Helpman: Add within industry heterogeneity; a distribution of $\theta$.

$h$ is supplied by the final-good producer. $\eta$ varies across sectors. Fixed costs are higher in the South; higher for integration than for outsourcing; $\delta$ is higher in the North.
Integration and Outsourcing with Heterogeneity (Cont.)

Comparison of component- and headquarter-intensive sectors:
Integration and Outsourcing with Heterogeneity (Cont.)

Relative prevalence: measured by the share of products produced in various organizational forms (V or O, in N or S).

A fall in the relative wage in the South or in trading costs

- raise the share of imported inputs in all sectors.

In h-intensive sectors

- O rises relative to V in North and South.
Integration and Outsourcing with Heterogeneity (Cont.)

In sectors with more productivity dispersion

- the share of imported inputs is higher;
- in h-intensive sectors $V$ is higher relative to $O$ in every country.
Managerial Incentives

Grossman and Helpman: Motivated by Holmstrom and Milgrom.

There is a continuum of tasks on which the operator of the component facility can exert effort.

$O$ does not allow monitoring, $V$ does on a fraction of tasks.

This fraction is higher in the North. So the advantage of $V$ in the North is better monitoring, in the South it is lower costs.

$O$ allows more shifting of fixed costs to the operator.
Managerial Incentives (Cont.)

Outsourcing for large and small hotels is supported by Lin and Thomas for some brands. For others, there is $O$ for small hotels and $V$ for large ones.
Complementary FDI

Grossman, Helpman, Szeidl: Production function, $\theta F(m, a)$. Fixed costs of FDI: $g$ and $f$. Three countries: 2 Northern countries, one low cost South.

Three types of complementarity: Unit-costs, source-of-components (transport of final goods), and agglomeration (transport of $m$).
Complementary FDI (Cont.)

- Both the unit-cost complementarity and the agglomeration complementarity imply that in industries with higher fixed costs of FDI in intermediate goods, there is a lower share of firms engaged in assembly abroad.

- The source-of-components complementarity implies that for a range of transport costs of final goods, higher fixed costs of FDI in components are associated with a higher fraction of firms that perform assembly in the North.
Complementary FDI (Cont.)

Unit-cost complementarity (no transport costs):

\[ \theta^{\alpha/(1-\alpha)} \]

\[ \alpha \theta - \frac{1}{HH, SS, SH, HS} \]
Summary

• The integration of organizational economics into trade theory expands our ability to address new issues.

• It is particularly powerful in dealing with the impact of firm characteristics and sectoral characteristics on international trade and investment.

• It is designed to link firm-level data to trade and FDI, and it has already been useful in empirical studies.

• More detailed data is needed to advance this research. Particularly severe is the lack of data on sourcing strategies.