ORGANIZATIONS AND TRADE

Pol Antràs and Esteban Rossi-Hansberg

December 2008

Introduction

- Three building blocks in traditional and new trade theory:
    1. consumer preferences;
    2. factor endowments;
    3. production technologies.
- Limitation: this specification of technology treats the mapping between factors of production and final goods as a black box.
- In practice, this mapping is determined by the decisions of agents in organizations (Organizational Economics).

Our Approach

- Although understanding microeconomic decisions may be intellectually interesting in its own right...
- .... studying these organizational decisions also provides valuable insights for the *aggregate* workings of the world economy.
- Microfounding the origin and properties of production functions is crucial to fully understand the effects of changes in the economic environment
  - such as falling trade or communication costs or improvements in contract enforcement.
- Classical, reduced-form approach to production technologies misses endogenous response of organizations to these shocks.
- We will illustrate the importance of this omission through a few examples.

Our Focus

- Our "organizational problem" includes only the decisions that shape *how* a product is produced (not *what* is produce).
- This includes the decisions of:
    - where to locate the different parts of the production process;
    - what type of agents and capital to employ, and
    - whether to produce things in one single firm or outsource part of the production process.
- These dimensions will guide the ordering of the literature that we propose below.
- We omit a discussion of the emerging literature on multi-product firms and international trade.

Why Should Organizational Economists Care?

- Because aggregate implications of their theories are interesting.
- Data on international transactions is particularly accessible: more data on FDI, multinational firms, related party trade, etc. is becoming available every day.
- This makes the international dimension of the organization decisions of firms a good candidate to empirically explore the predictions of organizational theories, and gain insights into their aggregate importance in the economy.

Road Map

1. Fragmentation in Otherwise Neoclassical Models

2. Matching and Factor Heterogeneity

3. Contractual Frictions and Multinational Firm Boundaries

4. Contractual Frictions and Other Organizational Decisions

Fragmentation in Otherwise Neoclassical Models

- In recent years have witnessed a remarkable increase in intermediate input trade and offshoring.
  - the share of imported inputs increased from 5.3% of total U.S. intermediate purchases in 1972 to 11.6% in 1990.
- The possibility of performing different stages of production in different countries affects the mapping between the factors of production and final goods.
- The possibility to 'trade' these tasks or perform the stages in a different location can have important effects on:
  - the measured productivity of firms (Jones and Kierkowski 2001);
  - the industries in which countries have comparative advantage (Dixit and Grossman 1982);
  - the implications of trade liberalization or reductions of trade costs on factor prices (Grossman and Rossi-Hansberg 2008a).

Grossman and Rossi-Hansberg (2008a)

- Heckscher-Ohlin model would lead you to believe that increased trade integration with unskilled abundant countries reduces the real wage of unskilled workers in skill abundant countries.
- Grossman and Rossi-Hansberg (2008a) show that reductions in the average cost to offshore tasks performed by a given factor have analogous effects to factor-augmenting technological change in that factor.
  - so reductions in the cost of offshoring low-skilled tasks can lead to gains for *all* factors of production.
- Low skilled workers become more 'productive' in the skill abundant country, because they combine their output with the cheaper tasks produced by foreigners.

Matching and Factor Heterogeneity

- In standard trade models, the number of factors is small, normally two.
- Choosing among heterogenous factors is an important part of the organizational problem.
  - a firm can decide to produce using a few very talented individuals and many not untalented ones, or it can hire workers with similar talents;
  - which option dominates will depend on technology (sub vs. super-modularity) and on the distribution of talent.
- The key requirements on technology for the distribution of skills in the population to matter for the organization of production is for it to exhibit (1) skill complementarity, (2) imperfect substitutability between workers' skill, and (3) differential sensitivity to the skill of different workers.

Kremer and Maskin (2003)

- They consider a model with two countries and one consumption good. The "North" has workers with two skill levels A and B, while the South has workers with two different skill levels C and D. It is assumed that $A \geq B \geq C \geq D$.

- There are many competitive firms that have access to a technology that transforms worker skills into output.

- Production follows from performing a managerial (or skill-sensitive) task and an assistant (or skill-insensitive) task:

$$F(H, L) = H^2 L.$$

- This technology is supermodular and satisfies $F(H, L) > F(L, H)$ for $H > L$.

Kremer and Maskin (2003)

- For the case of two workers with skill H and two workers with skill L, we have that

$$F(H, H) + F(L, L) > 2F(H, L)$$

only if $\frac{H}{L} > \frac{1}{2}\left(1 + \sqrt{5}\right)$.

- Notice that with self-matching the wages of workers satisfy:

$$w_i = \frac{1}{2}i^3 \text{ for } i = H, L.$$

while with cross-matching, we have that

$$w_H + w_L = H^2 L.$$

- But so long as the number of workers of each type are not identical, there will be some self-matched agents in equilibrium, which will pin down the wages of both types of agents.

Kremer and Maskin (2003)

- Kremer and Maskin (2003) find that whenever
  $\frac{B}{C} < \frac{1}{2}\left(1 + \sqrt{5}\right)$ and $\frac{B}{D} > \frac{1}{2}\left(1 + \sqrt{5}\right)$,

Proposition

Globalization (weakly) increases inequality in the poor country, in the sense that w_C (weakly) rises and w_D (weakly) falls. Furthermore, there is a broad range of parameters for which the increase in inequality is strict.

- **Key:** Southern workers with skill D stand to gain nothing from international team formation (globalization marginalizes them), while the opportunities of southern workers with skill C have expanded, in the sense that they can now be hired by Northern managers.

Antràs, Garicano and Rossi-Hansberg (2006)

- Antràs et al. (2006) provide an alternative setup in which international offshoring is the outcome of the assignment of heterogeneous agents into international hierarchical teams.
- Our model, however, is novel in four key dimensions:
  1. One-to-many matching. where a manager is endogenously matched with a potentially large number of workers.
  2. The identity of managers and workers is endogenous: occupational choice decision.
  3. Skill complementarities are endogenous to the specialization of agents in different aspects of the process.
  4. Our analysis places **knowledge** at the center stage and the relation between the skill of the manager and that of the worker.

Contractual Frictions and Multinational Boundaries

- In developing their global sourcing strategies, firms not only decide on where to **locate** the different stages of the value chain, but also on the extent of **control** to exert over them.

- This is nothing more than the classical 'make-or-buy' decision in industrial organization, but it naturally also applies in an international context.

- For example, when in 1997, Intel Corporation decided to offshore part of its production of microprocessors to a $300 million manufacturing plant in Costa Rica, it also decided to keep full control over that facility, which it wholly owns.

- Conversely, Nike also relies on offshore manufacturing but instead subcontracts the production of its products to independent producers.

Some Stylized Facts

- A growing body of empirical work documents that the internalization decision of multinational firms is very far from random, in the sense that the relative prevalence of foreign insourcing versus foreign outsourcing is systematically related to certain firm, industry and country characteristics.

- The share of intrafirm trade in world trade is quite large (roughly 1/3): for the case of the United States, it represents close to 50% of imports and over one-third of exports.

- The share of intrafirm trade in total trade varies substantially across industries and countries, and that a significant share of this variation can be explained by certain key characteristics.
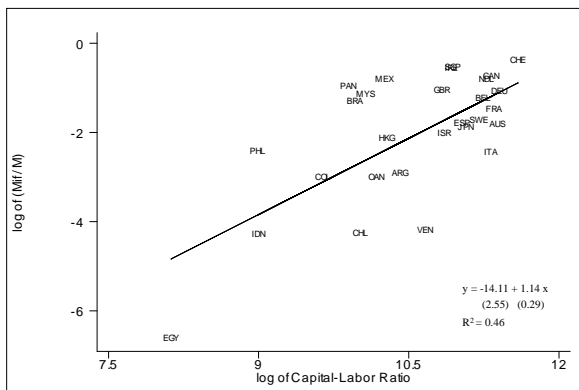
Example #1
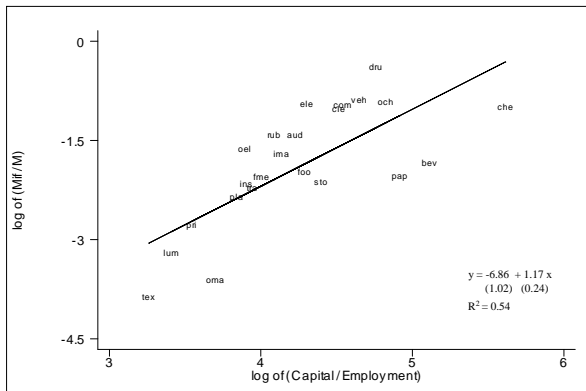
Notes: The Y-axis corresponds to the logarithm of the share of intrafirm imports in total U.S. imports for 23 manufacturing industries averaged over 4 years: 1987, 1989, 1992, 1994. The X-axis measures the average log of that industry's ratio of capital stock to total employment, using U.S. data. See Table A.I. for industry codes and Appendix A.4. for data sources.

Share of Intrafirm U.S. Imports and Relative Factor Intensities

Example #2

Notes: The Y-axis corresponds to the logarithm of the share of intrafirm imports in total U.S. imports for 28 exporting countries in 1992. The X-axis measures the log of the exporting country's physical capital stock divided by its total number of workers. See Table A.2. for country codes and Appendix A.4. for details on data sources.

Share of Intrafirm Imports and Relative Factor Endowments

Towards Explaining These Facts

- These and other stylized facts have motivated a recent wave of theoretical work attempting to shed light on the internalization decision of multinational firms.

- The main unifying theme of this literature is the departure from the classical assumption of complete contracting.

- This new literature has borrowed from the theoretical literature on firm boundaries and incomplete contracts (c.f., Williamson 1975, 1985; Grossman and Hart 1986), and has embedded them in general equilibrium models.

- These developments have proved fruitful in explaining the observed systematic patterns in the intrafirm component of trade.

The Property Rights Approach

- In Antràs (2003) and Antràs and Helpman (2004; 2008), we envision an incomplete-contracting world in which final-good producers and suppliers (who may be located in a different country) undertake non-contractible, relationship-specific investments that enhance value.

- This leads to a double-sided hold-up and underinvestment by both parties.

- As in Grossman and Hart (1986), vertical integration does not affect the space of contracts: it simply entails a stronger bargaining power for the final-good producer in its negotiations with the supplying division.

The Property Rights Approach (II)

- Key partial equilibrium result: vertical integration is *only* optimal when the elasticity of output (or sales) with respect to the final-good producer's noncontractible investments is large relative to the supplier's.

- In other words, integration dominates outsourcing in 'headquarter-intensive' industries, but the converse is true in industries with low-headquarter intensity.

- Relative contractibility of inputs can also affect integration decision Antràs and Helpman (2008).

The Property Rights Approach (III)

- Antràs (2003) embeds this structure in a GE model of international trade featuring IRS, product differentiation and monopolistic competition (c.f., Helpman and Krugman 1985).

- He argues that, in practice, non-contractible investments carried out by final-good producers are likely to be more capital-intensive than those undertaken by supplying firms (see his paper for evidence).

- As a result, the model delivers a positive association between capital intensity and the attractiveness of integration (i.e., the share of intrafirm trade)

- In general equilibrium, the model also predicts a positive correlation between a country's relative capital abundance and the share of intrafirm exports.

The Property Rights Approach (IV)

- Antràs and Helpman (2004) develop a property-rights theory of the multinational firm that allows for intraindustry heterogeneity in productivity and for differential fixed costs across different organizational models
    - as in Melitz (2003) or Helpman, Melitz, and Yeaple (2004).
- As a result, our model delivers equilibria featuring multiple organizational forms within an industry.
- We study the relative prevalence of different organizational forms and derive several predictions for how the share of intrafirm trade varies with the environment.
- This has opened the door for more complete empirical studies of the characteristics of the international organization of production.

More Implications of Contractual Frictions

- How do contractual frictions affect the other organizational choices of firms?
- And how do these choices interact with international trade? The available literature has only provided tentative answers to these questions.
- Antràs (2005) argues that the incomplete nature of contracts governing international transactions can also limit the extent to which the production process can be fragmented across borders.
- This leads to comparative advantage (and thus the location decision) being partly driven by the quality of contracting institutions.
- See also Acemoglu et al. (2007), Costinot (2007), Levchenko (2007), and Nunn (2007), who also provides evidence.

More Implications of Contractual Frictions

- Another important organizational decision of firms concerns the allocation of decision rights among employees.

  - managers face a trade-off between granting decision rights to workers (good for initiative) or keeping these to themselves (good for control).
  - Puga and Trefler (2002) and Marin and Verdier (2008a, b) have studied general equilibrium versions of these models.

- Holmstrom (1982) and Holmstrom and Milgrom (1994) have emphasized the role of contingent rewards in influencing workers' incentives.

  - a much less understood question is how trade liberalization affects the 'slope' of this incentive scheme (see Grossman and Helpman, 2004 and Vogel, 2007)

Concluding Remarks

- Some gaps in the literature:
  1. Most of the literature on organizations and trade is static. Many interesting dynamic questions have not been explored.
  2. A few alternative theories of organizations are still awaiting a general equilibrium implementation. Important to study *robust* economic predictions.
  3. Very little work has been devoted to structurally estimate the models we have discussed in this survey.
  4. Little concern for normative and policy implications of changes in the international organization of production (though see Antràs and Staiger, 2008).