Session 2: New-New Trade Evidence and Theory

Larry D Qiu

Outline
- Brief history of international trade theory
- New empirical findings
- New theories of international trade and FDI
- Summary

A brief history: old
- Adman Smith and David Ricardo
  - Observation: Portuguese wine and England cheese
  - Theory: Comparative advantage and trade

A brief history: not too old
- Heckscher and Bertil Ohlin
  - Observation: Technology similar cross country
  - H-O Theory: Two-factor endowment model
  - Stolper-Samuelson Theorem: implication of trade on income distribution

A brief history: recent
- Traditional trade theory
  - Perfect competition
  - Constant returns to scale technology
  - Inter-industry trade
  - Free trade the best policy

- Grubel and Lloyd
  - Observation: Intra-industry trade
  - Paul Krugman, Elhanan Helpman, etc
  - New Trade Theory
New trade theory
- Product differentiation, imperfect competition,
- increasing returns to scale technology
- Intra-industry trade
- Strategic trade policy

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A brief history: very recent
- Observation: Bernard, Jensen, et al 1995-
- Theory: Melitz, Helpman, Antras, et al., 2000-

New-New trade theory
- Firm heterogeneity
- Product differentiation
- Monopolistic competition
- Policy?

Observation I: Export and FDI
- International trade and FDI have been among the fastest growing economic activities around the world
- Sales by foreign affiliates of MNEs expanded much faster than exports
- Trade and FDI in services expand even faster

Observation II: Outsourcing
- Remarkable changes in the nature of trade and FDI
  - Trade in intermediate inputs, within and across the boundaries of the firms (intrafirm vs. arm’s length trade)
  - The growth of international vertical specialization and fragmentation of production

Do we know more about export, FDI, outsourcing, for individual firms?
The New Empirical Literature
How did this literature start?

- Andrew Bernard and Bradford Jensen
- A series of questions
  - Why some firms export while some others in the same industry don’t?
  - How do exporters and non-exporters in the same industry perform differently?
  - How does trade policy (free trade, FTA, etc) affect different firms in the same industry differently?
- Empirically, we don’t know
- Theory?
  - Not in traditional trade theory
  - Not in new trade theory

How are exporters different?

- Data
  - 1976-1987, annual survey of manufactures, 56,000 firms
  - Performance information
  - Exporting information
  - Plant-level information, varies within the same industry: firm heterogeneity
- Result: export and performance

Table 4. Plant Characteristics, 1987

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Exporters</th>
<th>Nonexporters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total employment (workers)</td>
<td>254</td>
<td>58</td>
</tr>
<tr>
<td>Total value of shipments</td>
<td>44,180,000</td>
<td>6,814,640</td>
</tr>
<tr>
<td>Wage per worker</td>
<td>24,370</td>
<td>20,420</td>
</tr>
<tr>
<td>Wage per production worker</td>
<td>20,670</td>
<td>18,620</td>
</tr>
<tr>
<td>Wage per nonproduction worker</td>
<td>33,270</td>
<td>29,050</td>
</tr>
<tr>
<td>Benefits per worker</td>
<td>5,720</td>
<td>4,310</td>
</tr>
<tr>
<td>Total value of shipments per worker</td>
<td>146,230</td>
<td>107,000</td>
</tr>
<tr>
<td>Value added per worker</td>
<td>71,540</td>
<td>51,530</td>
</tr>
<tr>
<td>Capital per worker</td>
<td>40,840</td>
<td>27,630</td>
</tr>
<tr>
<td>Investment per worker</td>
<td>3,480</td>
<td>2,310</td>
</tr>
<tr>
<td>Nonproduction workers as a share of total workers (percentage)</td>
<td>33</td>
<td>26</td>
</tr>
<tr>
<td>Multiple establishment (percentage)</td>
<td>61</td>
<td>51</td>
</tr>
</tbody>
</table>

Findings

- Most firms do not export
- Compared to non-exporters, exporters are
  - Larger, in employment and production
  - More productive
  - More capital intensive
  - Pay higher wages
  - Grow faster
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Export: cause, effect, or both?
- Question:
  - Do good firms become exporters, or does exporting improve firm performance?
- Policy implication:
  - e.g., subsidizing exports?
- Analysis:
  - Considering the structure and performance of the firm before, during and after exporting

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Good firms and exporters
- Data:
  - Longitudinal Research Database of the Bureau of the Census
  - 1984-1992, long enough to analyze behavior before and after exporting
  - 50,000 – 60,000 plants in each year
- Results:
  - Good firms become exporters
  - Future exporters already have most of the desirable performance characteristics several years before they enter the export market
  - Firms that become exporters grow faster, initially
  - Exporters do not have higher productivity growth
  - Exporters have better surviving chance

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Summary of empirical findings I
- Using newly available firm-level data to find
  - Exporting plants and firms represent a small fraction of the total in the net exporting sector
  - There are substantial sunk costs of entry into export markets
  - Firms engaged in exporting have positive performance characteristics (including higher productivity, larger size, greater capital intensity, etc)
  - Exporting firms pay higher wages than domestic counterparts
  - Globally engaged firms undertake more innovation

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Summary of empirical findings II
- New questions and findings (e.g., Bernard, Jensen and Schott, 2005, “Importers, exporters and multinationals: a portrait of firms in the US that trade goods”, working paper)
  - How many products firms trade
  - How many countries firms transact with
  - What are the characteristics of those countries
  - How do firms concentrate on trade
  - Are firms both import and export
- Most of the comparisons between exporters and non-exporters also hold for those between FDI firms and exporters

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The new-new trade theory
- The new trade theory assumes away the recent empirical finding about differences among firms within the same industry: Bernard, Eaton, Jensen, Kortum, Schott, Tybout, etc.
- New-New Trade Theory in recent years
- Pioneers: Antras, Eaton, Helpman, Kortum, Melitz, Yeaple, etc.
Central questions

- International entry decision
  - 1. Exclusive domestic producers
  - 2. Exporters
  - 3. Foreign direct investors
- Internalization decision
  - 1. Outsourcing
  - 2. Integration

Outline

- Brief history of international trade theory
- New empirical findings
- New theories of international trade and FDI
  - International entry decision: export vs. FDI
  - Internalization decision: insourcing vs. outsourcing
- Summary

The models

- Two models
  - Marc Melitz (2003, Econometrica), "The impact of trade on intra-industry reallocations and aggregate industry productivity": monopolistic competition
  - Bernard, Eaton, Jensen and Kortum (2003, AER), "Plants and productivity in international trade": Bertrand competition

The interaction between productivity differences across firms and fixed costs of exporting

The Helpman-Melitz-Yeaple model

- The world consists of 2 countries that use labor to produce goods in M+1 sectors.
- One sector produces a homogenous good z, which we take as the numeraire, while the remaining M sectors produce a continuum of differentiated products.

The Melitz Model and

Helpman, Melitz and Yeaple (2004) "Export versus FDI with heterogeneous firms", AER 94(1), 300-316.

Demand. A representative consumer with preference

\[ U = \left(1 - \sum_{m=1}^{M} \delta_m \right) \log z + \sum_{m=1}^{M} \delta_m \log \left( \int p_m (z)^{\gamma_m} \, dz \right), \quad 0 < \delta_m < 1. \]

\[ z_m (v) \text{ is consumption of variety } v \text{ in sector } m, Y_m \text{ denotes the measure of available products in that sector, and } \delta_m = 1/(i - \delta_0) \text{ is the elasticity of substitution across varieties.} \]

Demand for each variety in a given sector

\[ z_i (v) = \int_{z_{m_i}}^{z_{m_i}^{*}} p_i (z)^{-\gamma_i} \, dz, \quad i = H, F. \]
**Supply.** Both countries have access to an identical constant-returns-to-scale technology for producing good \( z \). By choice of units, producing one unit of good \( z \) requires exactly one worker.

The differentiated-good sectors are characterized by monopolistic competition. Each variety is produced by a single firm and there is free entry into the industry.

**Firms produce varieties under a technology that features:**
1. A fixed cost of entry of \( f_1 \) units of labor.
2. A fixed overhead costs of \( f_2 \) units of labor if the firm produces a positive amount.
3. A fixed cost of exporting of \( f_3 \) units of labor per foreign market where the firm exports.
4. A fixed cost of FDI of \( f_4 \) units of labor per foreign market served through a plant in that foreign market.
5. A marginal cost that varies across firms and is denoted by \( a \). As in Melitz (2003), it is assumed that firms face ex-ante uncertainty on their productivity, and that the actual marginal cost \( a \) is drawn, upon paying the fixed cost of entry, from a distribution \( G(a) \).

After observing this productivity level, the producer decides whether to exit the market immediately or incur \( f_5 \) (and perhaps \( f_6 \) and \( f_7 \) ) and start producing.

Goods that are exported are subjected to iceberg costs by which \( \tau^V > 1 \) units of the good need to be shipped from country \( i \) for each unit actually delivered in country \( j \).

Assume \( f_1 > (\tau^V)^{-1} f_2 > f_3 \)

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**Demand for firm \( j \)'s brand**

\[ x(j) = \lambda_p(j)^{-\tau} \]

Firm \( j \)'s product is a function of its productivity and fixed entry cost

\[ \pi(j) = \theta(j)^{-\tau} \beta - c_f \]

---

**Export**

Fixed export costs and variable export costs

\[ \pi_X^i(\theta) = \lambda^{1-\tau} \theta \beta^1 - c_f^X \]

Assumption

\[ c_f^D < c_f^X \]
Horizontal FDI

- Larger fixed cost, lower production cost, but no variable cost of exports

\[ z_I(\theta) = \theta B_{I} - C_fI \]

with

\[ f_I > f_X \]

Comparative statics analysis and implications

- Based on the figure, we can calculate the ratio of a country’s export to FDI sales, which is
  - decreasing in transport costs;
  - increasing in plant-level economies of scale:
    \( f_I - f_X \);
  - decreasing in productivity dispersion.
- Empirical study in the paper supports the above and other predictions

Other applications of the model

- Turnover
- Trade liberalization
- Technology adoption
- Complex integration strategies
- Variable markups
- Factor proportions
- Gravity equation of trade flows

See Helpman’s survey article in JEL (2006)
Literature review 2: Internalization decision

- The previous section is about trade and FDI in final products.
- The importance of trade in components, domestically and internationally
- Questions
  - Whether to outsource or insource
  - Whether to offshore or not
  - Four possibilities

Organization of the firm: The make-or-buy decision

- A MNE can wholly own the subsidiary
- It can have a joint-venture with a firm in the host country
- It can sub-contract production to a local firm
- It can license the technology/brand name to a local firm
- What determine the choice?
  - The Transaction-Cost Approach
  - The Incomplete-Contract Approach

Brief literature of organization of the firm

- Why do firms outsource?
  - For an economist, the answer is simple: to capture the gains from specialization.
- What to outsource?
  - Difficult to answer
- Resolve three basic problems for specialization
  - Provide incentives for individuals to specialize in the activities at which they have a comparative advantage;
  - Provide incentives for individuals to produce goods/services in the "appropriate" amounts; and;
  - Ensure that trade takes place in such a way that goods get in the hands of those individuals that "value the goods" the most.

A. Transaction-cost approach

- Ronald Coase’s original idea (1937):
  - The existence of firms due to that there are costs involved with making transactions on the markets, and when these costs become too high, the activities should be internalized within the firm.
- Oliver Williamson’s contribution (1985):
  - He further elaborates this idea and introduces the twin concepts: Asset specificity, Holdup problem
  - Example
  - Its application to international trade is very new: McLaren (AER, 2000), Grossman and Helpman (QJE, 2002), Spencer and Qiu (IER, 2001)
"Globalization" and Vertical Structure

John McLaren (AER, 2000)

McLaren: Aim and summary

- The idea:
  - One vertical integration exerts a negative externality on the others by thinning the market for inputs
  - Opening trade thickens the market for inputs, leading to a more disintegrated industrial system
  - Multiple equilibria: different industry systems in different countries

The model (closed economy)

- There are n upstream and n downstream firms.
- There are three stages in the game.
  - Merger stage (1st)
  - Production stage (2nd)
  - Market stage (3rd)

Merger stage

- Each DSFi is given the option of making a take-it-or-leave-it offer to USFi.
- Accept: integration (IFi), cost K and L
- Reject: USFi selling input to the market

Market stage

- DSF’s place bids on the inputs produced by the different USF’s, and USFi sells the input to the highest bidder.

McLaren: Analysis of the biding game

- Proposition 1. In any subgame perfect equilibrium, no IF sells its input, and each independently produced input is sold to its originally intended buyer.

- Proposition 2. In a subgame perfect equilibrium of the full game, any integrated firm will choose the maximally specialized technology.

- Proposition 3. The equilibrium price of any maximally specialized good (input), including the input produced by an integrated firm, is equal to zero.

McLaren: Analysis of industry equilibrium: utter homogeneity

- Definition
- Expected price of input i

- Proposition 5. The function μ is increasing in N(F)
- Proposition 6. In a small closed economy (n < \( \pi \)) with utter homogeneity of firms, the only equilibrium is complete vertical integration. In a large economy (n > \( \pi \)), there are two equilibria: complete integration and universal use of independent suppliers.

- Implications
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McLaren: Globalization and equilibrium structure

- Tow identical countries
- Proposition 7. In the case of utter homogeneity of firms, a sufficient globalization between medium-sized countries will make the more efficient arm’s length equilibrium possible in both economies. It would not be possible in either economy without globalization.
- Proposition 8. Whenever the size of the economies concerned, in the case of utter homogeneity of firms, with a sufficient globalization any equilibrium will involve complete convergence of the vertical structure of the two economies.
- Gain from openness

B. Incomplete-contract approach

- Grossman, Hart and Moore: specific investment and ownership

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Global Sourcing

Antras and Helpman (QJE, 2004)

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Introduction

- It incorporates intraindustry heterogeneity of the Melitz (2003) type in a property-rights model of the multinational firm.
- Motivation
- Deliver testable results

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Model: demand

- Two countries, one factor
- Representative consumer
  \[ U = z_2 + \frac{1}{\theta} \sum_j X_j^0, \quad 0 < \theta < 1 \]
- Aggregate consumption in sector j
  \[ X_j = \int x_j(t) p(t) \, dt, \quad 0 < \alpha < 1 \]
- Resulted demand
  \[ p_j = \left( \frac{\theta (1 + \alpha)}{\alpha} \right)^{\frac{1}{\alpha}} X_j^0. \]

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Model: technology

- As in Melitz (2003), producers needs to incur sunk entry costs \( w^j f_k \), after which they learn their productivity \( \theta \sim G(\theta) \).
- Final-good production combines two specialized inputs according to the technology:
  \[ x_j(t) = \theta \left( \frac{\theta (1 + \alpha)}{\alpha} \right)^{\frac{1}{\alpha}} \left( \frac{\theta (1 + \alpha)}{\alpha} \right)^{\frac{1}{\alpha}} \]
- \( h \) is controlled by a final-good producer (agent H), \( m \) is controlled by an operator of the production facility (agent M).
- Sectors vary in their intensity of headquarter services \( \eta_j \).
- Furthermore, within sectors, firms differ in productivity \( \theta \).
Model: organization cost and contract

- If an organizational form is $k \in \{V, O\}$ and $\ell \in \{N, S\}$, these fixed costs are $u^k f^\ell$ and satisfy
  \[ f_N^k > f_S^k > f_N^O > f_S^O. \]
- Incomplete contracting, Nash bargaining

<table>
<thead>
<tr>
<th>North</th>
<th>South</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2^N = \beta$</td>
<td>$2^S = \beta$</td>
</tr>
<tr>
<td>$\beta = (\beta^N)^\gamma + \delta[1 - (\beta^N)^\gamma]$</td>
<td>$\beta = (\beta^S)^\gamma + \delta[1 - (\beta^S)^\gamma]$</td>
</tr>
</tbody>
</table>

Notice that
\[ \beta^N > \beta^S > \beta^O = \beta. \]

Analysis: equilibrium

Let $R$ be potential sales revenue. $H$ then solves:

\[
\begin{align*}
\max_{\theta, N, O} & \quad R(h(\theta_N), m(\theta_N)) \\
\text{s.t.} & \quad h(\theta_N) = \arg\max_k R(h(\theta_N), m(\theta_N)) = \theta^N h \\
& \quad m(\theta_N) = \arg\max_k (1 - \delta^N) R(h(\theta_N), m(\theta_N)) = \theta^N m
\end{align*}
\]

This program simplifies to

\[
\max_{\theta, N, O} R(\theta, N, O) = X^{\theta_N}(1-\theta_N)R(\theta, O, m) - u^N f_N^O
\]

Two types of trade-offs

- In terms of the location decision, variable costs are lower in the South, but fixed costs are higher there. It is clear that a firm’s productivity $\theta$ will turn out to affect crucially the participation in international trade (e.g., the purchases of inputs from the South).

- In terms of the integration decision, integration improves efficiency of variable production when the intensity of headquarter services is high, but involves higher fixed costs. This decision will thus crucially depend on $\eta$ but also on $\theta$.

Result

Empirical implications

- Foreign outsourcing is more prevalent in countries with lower (efficiency-adjusted) wages and in industries with higher productivity dispersion and lower headquarter intensity.

- Foreign outsourcing increases when transport costs fall.

- A fall in the relative wage in the South or in trading costs, raise the share of imported inputs and also raise outsourcing relative to integration in every country. The paper discusses empirical evidence consistent with these trends.
In industries with more productivity dispersion, the share of imported inputs is higher and integration is higher relative to outsourcing in every country.

In sectors with higher headquarter intensity, the share of imported inputs is lower and integration is higher relative to outsourcing in every country.

Keiretsu and Relationship-specific Investment: A barrier to trade?

Spencer and Qiu (IER, 2001)

Introduction

- How did we start this paper?
- Japan-US trade debate, especially in the auto industry
- Japanese special industry group: keiretsu
- Issue: is keiretsu a barrier to trade?
- There is no formal economic model on keiretsu: combine Aoki's insight on quasi-rent and the IO literature on specific investment
- Keiretsu is a special type of outsourcing: between standard make-and-buy.

The model of relationship-specific investment

- The final good, car, is produced in both Japan and the U.S. based on Cournot competition in the world market.
- Demand: \( P = P(Y) \) where \( Y = y^t + y^u \)
- N parts are required to produce an auto, one unit for each part. Marginal cost of parts production
- Cost shares \( c^t \) and \( c^u \)
- \( \sigma = c^t / C(N) \) for \( C(N) = \int c^t di \)

The game

- Relationship-specific investments take place at arm's length. Bargaining over the price takes place after investment has been made. Holdup problem presents.
- Long-term relationship overcomes the holdup problem
- Nash bargaining vs. take-it-or-leave-it offer of incomplete contracts

Keiretsu part supplier i’s investment \( k^i \) results in rent to the J-maker, where \( w^i \) is the initial assembly cost per unit of cars and \( \theta \) is the productivity of keiretsu investment

\[
 r^i = w^i \sigma \theta \left( k^i \right) 
\]

Thus, the J-maker’s assembly cost per auto is

\[
 w = w^i - \int c^i di 
\]

Let \( p^i \) be the price paid to supplier i, the J-maker’s MC for part i is given by

\[
 \gamma^i = p^i - r^i \text{ or } \min\{c^t, c^u\} 
\]
Stage 1: each supplier i commits to its investment $k_i$; simultaneously, the J-maker and A-maker decide their respective outputs $y^J$ and $y^A$.

Stage 2: the J-maker engages in simultaneous Nash bargaining over price $p_i^J$ with each supplier i remaining in the market. If bargaining breaks down, the J-maker will purchase the corresponding part from the market, domestic or import.

Analysis: closed economy

Proposition 1. Assume parts cannot be imported into Japan.
- There exists $Z$, for $i > Z$, suppliers invest positive amount $k_i > 0$ and for $i < Z$, zero investment.
- Higher cost shares $\sigma_i$ are associated with greater levels of $k_i$, $r^i$ and $\phi^i$.

Analysis: opening the Japanese market

Assume $\delta(i) = c(i) - c^*(i)$, $\delta(0) > 0$ and $\delta(E) = 0$.

Focus on the case where $Z < E$. Let $T$ denote the marginal part just produced by the keiretsu.

Proposition 2. There exists $T$, such that $Z < T < E$.
Especially, parts $i$ for $T < i < E$ are not imported although foreign costs are lower.

A barrier to trade?

Propositions. Yes, but for efficiency reason... In addition, given that the rents from relationship-specific investment are unobservable to potential US exporters, they might expect that parts for which the US has a cost advantage would all be imported at free trade.

From standard models, one would expect that the removal of protection or a reduction in import prices for intermediate goods would reduce domestic costs and that the associated increase in domestic final-good production would raise intermediate-good imports.

By contrast, we have shown that relationship-specific investment can cause this line of reasoning to break down at two places.
- First, it is possible that the J-maker’s cost is increased by the opening of trade.
- Second, an increase in the J-maker’s output causes the range of intermediate-good imports to fall, reducing the total value of these imports if $\theta$ is sufficiently large.
Barbara Spencer's (CJE, 2005) survey article

- International outsourcing to lower cost countries such as China and India can best be understood through the enrichment of trade models to include concepts from industrial organization and contract theory that explain the vertical organization of production.
- The combination of trade with the choice of organizational form represents an important new area for both theoretical and empirical research.
- This survey paper provides a perspective on this new literature so as to gain insights into the forces driving international outsourcing.
- The paper focuses on relationship-specific investment, incomplete contracts, and also search and matching, as fundamental concepts that explain outsourcing decisions.

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- Brief history of international trade theory
- New empirical findings
- New theories of international trade and FDI
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History of International Trade

- Traditional (old) trade theory
  - Ricardian model
  - Heckscher-Ohlin model
- New trade theory
  - Empirical evidence on intra-industry trade
  - Increasing returns to scale
  - Product differentiation
  - Imperfect competition
- New-New trade theory
  - Empirical evidence on heterogeneous firm performance in export and FDI
  - Fixed cost and firm heterogeneity
  - Incomplete contract, etc.

Q&A