Assortative Matching of Exporters and Importers

Yoichi Sugita$^1$  Kensuke Teshima$^2$  Enrique Seira$^2$

$^1$Hitotsubashi University
$^2$ITAM

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Research Agenda: Buyer-Supplier Relationships in International Trade

- The majority of international trade is buyer-supplier relationships [firm-to-firm or B-to-B].

- Anecdotes tell that not all trading partners are equal:
  - There are “good” and “bad” buyers/suppliers.
  - Trading with “good” buyers/suppliers bring several benefits (complementarity, technology spillover, network, reputation).
  - Both importers and exporters actively search for “good” partners.

- Research questions:
  - Who trade with “good” buyers/suppliers?
  - How do they match?
Today’s talk: Capability Sorting of Exporters and Importers

- There exist large differences in capability (productivity/quality) among exporters and importers.
- Do high capability importers trade with high capability exporters?
  - Positive assortative matching (PAM), negative assortative matching (NAM), or no systematic sorting?

- Capability sorting is important for:
  - Understanding impact of trade liberalization.
  - Understanding consequences of trade frictions.
  - Designing export promotion policies.
Difficulties in Identifying Exporter-Importer Sorting

- A natural approach may be a correlation approach: calculate correlations of some measure of capability of exporters and importers across matches.

- However, this approach is not feasible/difficult for typical trade data:
  - Customs transaction data do not contain domestic sales, employment, or capital.
  - Multi-product firms: Data on product-level capability are rarely available.
  - No established method of estimating capability (e.g. TFP) when sorting exists.
  - Few to few matching: Correlations of size-related variables (e.g. trade volume) of exporters and importers could be mechanically positive.
What This Paper Does

- We examine capability sorting in matching of Mexican exporters and US importers in textile and apparel products.

- A new stylized fact: product-level matching is approximately one-to-one.
  - Evidence of the restriction on the number of partners.
  - which we take as exogenously given.
  - Matching is crucial for firms.
  - Correlation approach is difficult to apply.

- We develop an alternative approach to identifying capability sorting based on a theory and a natural experiment.
Theory: Becker-Melitz model

- “Becker+Melitz” matching model of suppliers (exporters) and final producers (importers)
  - Two-sided heterogeneity of suppliers and final producers a la Becker (73) and firm heterogeneity in capability a la Melitz (03).
  - Exogenous constraints on the number of trading partners (e.g. due to transaction costs) a la Becker (73).
  - Positive assortative matching (PAM) by capability due to complementarity.
    - We allow negative NAM and no systematic sorting.

- A key property: the stable matching depends on the distributions of firms.
  - Matching changes when new exporters enter (rematching).
  - How matching changes differs across PAM, NAM, and no sorting.

- Importantly, this rematching implies a new type of gains from trade.
Natural Experiment

- US removed import quota under the Multifibre Arrangement (MFA) at the end of 2004.

- We compare quota-bound and other products on how US and Mexican firms switch the main partners. We find:
  - US importers switched their Mexican partners to those making greater pre-shock exports.
  - Mexican exporters switched their US partners to those making fewer pre-shock imports.
  - These switches more frequently occurs in quota-bound products

- This pattern is consistent with PAM, but not with NAM or no sorting (under normal circumstances).
Thought experiment: Pre-shock

- Positive assortative matching holds.
Entry of Foreign Suppliers

- Chinese firms enter and some US firms switch.

```
+----------------+           +----------------+           +----------------+
| capability     | Mexican Suppliers | US Final Producers | Chinese Suppliers |
+----------------+           +----------------+           +----------------+
| M1             | U1               | U2               | C1              |
| M2             |                  |                  |                 |
| M3             |                  |                  |                 |
| M4             |                  |                  |                 |
| M5             |                  |                  |                 |
```

Existing Matching Becomes Unstable

- Some exporters are left without partners.
Adjustment to Shock: Re-matching

- Room for re-optimization for matching (re-matching).

![Diagram showing relationships between Mexican Suppliers (M1, M2, M3, M4, M5), US Final Producers (U1, U2, U3, U4, U5), and Chinese Suppliers (C1).]
Post-shock: Partner Upgrading and Downgrading

- Re-matching: partner upgrading for US and partner downgrading for Mex.
Data
Data

- Mexico’s customs records for textile/apparel (HS50-63).
  - The identities of Mexican exporters and US importers, transaction value, product code (HS 6 digit).

- Excluded:
  - Exports by individuals and courier companies (e.g. FedEx).
  - Exporters who do not report importers for more than 80% of exports (mostly duty free zone trade, Maquiladora/IMMEX).
  - Transactions from January to May since data start from June 2004.

- US quota information.
  - Indicators on whether Chinese exports in each HS 6 product faced binding quotas by the US (created from the indicators by Brambilla et al.(10)).
Finding 1: Approximately One-to-one Matching
Main-to-Main Share

- Main-to-main match for a given product.
  - the exporter is the largest (main) seller for the importer of the product.
  - at the same time, the importer is the largest (main) buyer for the exporter of the product.
- Main-to-main share.

\[
\text{Main-to-main share} = \frac{\text{Trade volume of main-to-main matches}}{\text{Aggregate trade volume}}
\]

- If this main-to-main share is close to one, we call matching is approximately one-to-one.
### Main-to-Main Share: Aggregate Textile/Apparel

<table>
<thead>
<tr>
<th>Year</th>
<th>All</th>
<th>Processing</th>
<th>Trade</th>
<th>Trade Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Maquila</td>
<td>Non-Maquila</td>
<td>MFA</td>
</tr>
<tr>
<td>2004</td>
<td>0.77</td>
<td>0.77</td>
<td>0.78</td>
<td>0.78</td>
</tr>
<tr>
<td>2005</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
<td>0.82</td>
</tr>
<tr>
<td>2006</td>
<td>0.80</td>
<td>0.80</td>
<td>0.83</td>
<td>0.81</td>
</tr>
<tr>
<td>2007</td>
<td>0.83</td>
<td>0.83</td>
<td>0.83</td>
<td>0.84</td>
</tr>
</tbody>
</table>
Finding 2: Systematic Re-matching
The End of the Multi-Fibre Arrangement

- The US removed import quotas on certain textile/apparel products from non-NAFTA countries in January 1, 2005.
- The increase in Chinese exports reduced other countries’ exports to the US (Brambilla, Khandelwal and Schott 10; Harrigan and Barrows 09).

The increase is driven by new Chinese exporters who have various capabilities (Khandelwal, Schott and Wei, 13) \(\Rightarrow dM_C > 0\) in our model.
Upgrading and Downgrading Dummies

For HS6 product, we rank exporters and importers by their pre-shock (2004) trade volume with the main partners, respectively.

For firm $i$, HS6 product $g$ and country $c \in \{US, Mex\}$, we construct the following dummies:

- $Upgrading_{ig}^c = 1$ if the 2007 main partner of product $g$ for firm $i$ in country $c$ has a higher rank than the 2004 main partner.
- $Downgrading_{ig}^c = 1$ if the 2007 main partner of product $g$ for firm $i$ in country $c$ has a lower rank than the 2004 main partner.

Note: these dummies are zero if a firm does not change the main partner between the two periods.
For firm $i$, HS6 product $g$, chapter (HS 2 digit) $s$, our specification is

\[
\begin{align*}
\text{Upgrading}_{igs}^{US} &= \beta_1 \text{Binding}_{gs} + \lambda_s + \varepsilon_{i gs}^u \\
\text{Downgrading}_{igs}^{US} &= \beta_2 \text{Binding}_{gs} + \lambda_s + u_{i gs}^u \\
\text{Upgrading}_{igs}^{Mex} &= \beta_3 \text{Binding}_{gs} + \lambda_s + \varepsilon_{i gs}^m \\
\text{Downgrading}_{igs}^{Mex} &= \beta_4 \text{Binding}_{gs} + \lambda_s + u_{i gs}^m.
\end{align*}
\]

- $\text{Binding}_{gs}$ is a dummy variable on whether Chinese exports of product $g$ to the US faced a binding quota in 2004.
- $\lambda_s$ is a HS 2 digit fixed effect; $\varepsilon_{i gs}^u, u_{i gs}^u, \varepsilon_{i gs}^m, u_{i gs}^m$ are error terms.
- The model predicts that $\beta_1 > 0$, $\beta_2 = 0$, $\beta_3 = 0$, $\beta_4 > 0$. 
US Importer’s Partner Changes

\[
\begin{align*}
Upgrading_{igs}^{US} &= \beta_1 Binding_{gs} + \lambda_s + \varepsilon_{igs}^u \\
Downgrading_{igs}^{US} &= \beta_2 Binding_{gs} + \lambda_s + u_{igs}^u
\end{align*}
\]

<table>
<thead>
<tr>
<th></th>
<th>( Upgrading^{US} (\beta_1) )</th>
<th></th>
<th>( Downgrading^{US} (\beta_2) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linear Prob.</td>
<td>Probit</td>
<td>Linear Prob.</td>
</tr>
<tr>
<td>Binding</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
</tbody>
</table>
|                | \begin{align*}
0.052** \\
(0.021)
\end{align*} & \begin{align*}
0.052*** \\
(0.020)
\end{align*} & \begin{align*}
-0.017 \\
(0.027)
\end{align*} & \begin{align*}
-0.017 \\
(0.024)
\end{align*} |
| HS2 FEs        | Yes                            | Yes             | Yes                             | Yes             |
| Obs.           | 718                            | 707             | 718                             | 707             |

significance: *** 1%; ** 5%; * 10%; SE clustered at HS6

- Average probability of upgrading in sample = 0.03.
Mex Exporter’s Partner Change

\[
\begin{align*}
Upgrading_{\text{Mex}} &= \beta_3 Binding_{gs} + \lambda_s + \varepsilon_{igs}^m \\
Downgrading_{\text{Mex}} &= \beta_4 Binding_{gs} + \lambda_s + u_{igs}^m.
\end{align*}
\]

<table>
<thead>
<tr>
<th></th>
<th>Linear Prob.</th>
<th>Probit</th>
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<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Binding</td>
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<td>-0.003</td>
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<tr>
<td>(0.020)</td>
<td>(0.044)</td>
<td></td>
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<tr>
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<td>Yes</td>
</tr>
<tr>
<td>Obs.</td>
<td>601</td>
<td>522</td>
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<table>
<thead>
<tr>
<th></th>
<th>Linear Prob.</th>
<th>Probit</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Binding</td>
<td>0.127***</td>
<td>0.150***</td>
</tr>
<tr>
<td>(0.035)</td>
<td>(0.019)</td>
<td></td>
</tr>
<tr>
<td>HS2 FEs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Obs.</td>
<td>601</td>
<td>601</td>
</tr>
</tbody>
</table>

significance: *** 1%; ** 5%; * 10%; SE clustered at HS6

- Average probability of downgrading in sample = 0.15.
Robustness Checks and Additional Analysis

- Alternative ending periods.
- Alternative ranking based on total trade volume and unit price.
- Additional controls (Maquiladora share, initial ranks, locations, material types).
  - No differential background trend between the treatment and control.
- The paper does additional analysis to reject alternative explanations:
  - Survival bias+repeated random matching.
  - Segment switching.
  - Negative assortative matching.
Summary

- Natures of trade data make it difficult to directly document capability sorting of exporters and importers.

- We have developed an alternative approach for identifying capability sorting: Becker-Melitz model with a natural experiment.
  - Rematching in response to a shock to increase the mass of suppliers.

- The rematching pattern of the Mexico-US apparel trade at the end of the Multi-Fibre Arrangement we have found:
  - Exporter-importer matching is positive assortative on capability.
  - This suggests that trade liberalization improves matching of firms in the world.
Implications of Our Findings

- Importance of matching for firms.
  - We confirm the premise of the literature on information frictions causing mis-matching (e.g. Casella & Rauch, 02; Rauch & Casella, 03; Rauch & Trindade, 03).
  - Investing the roles of friction in the light of matching will be important future research.

- “Good buyers” and “bad buyers” (e.g. Chaney, 14).
  - Every exporter prefers to trade with high capable importers, but only high capable exporters can do so.