Do Firms Learn from International Trade?

Megan MacGarvie
Boston University and NBER

Sloan Industry Studies Conference 2007
Cambridge, MA
4/26/2007
Do firms gain access to foreign technological knowledge through trade?

- Exporters have higher TFP than non-exporters, after controlling for other characteristics

- Does enhanced access to foreign technological knowledge explain this productivity advantage?

- This paper uses patent citations as an indicator of a firm's access to information about foreign technology
Empirical Approach

- European Patent Office patents and citations matched to administrative data on the universe of French firms

- Customs data
  - New data on French firms’ cross-border sales and purchases by country, product and year 1986-92

- Balance-sheet information
  - Sales, capital stock, employment, wages, etc.

- Innovation survey
Mean Backward Citations per Patent ($b_{ist} / P_{it}$),
by Country and Export Status

- Non-Exporters
- Exporters

Country:
- Germany
- Benelux
- Italy
- Japan
- Switzerland
- UK & Ireland
- USA

Export Status:
- Exporters
- Non-Exporters
Mean Backward Citations per Patent ($b_{ist}/P_{it}$), by Country and Import Status

- Germany
- Benelux
- Italy
- Japan
- Switzerland
- UK & Ireland
- USA

Non-Importers
Importers
**Neg. Bin. regression of backward citations on trade & investment variables**

<table>
<thead>
<tr>
<th></th>
<th>Random Effects</th>
<th>Fixed Effects</th>
<th>F. E., restricted sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(Exports)</td>
<td>0.042</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.060)</td>
<td></td>
</tr>
<tr>
<td>D(Imports)</td>
<td>0.312***</td>
<td>0.264***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.060)</td>
<td>(0.069)</td>
<td></td>
</tr>
<tr>
<td>ln(Exports)</td>
<td></td>
<td>-0.012***</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.004)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>ln(Imports)</td>
<td></td>
<td>0.059***</td>
<td>0.058***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.008)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>D(Parent)</td>
<td>0.223**</td>
<td>0.308***</td>
<td>0.335***</td>
</tr>
<tr>
<td></td>
<td>(0.099)</td>
<td>(0.103)</td>
<td>(0.103)</td>
</tr>
<tr>
<td>D(Subsidiary)</td>
<td></td>
<td>-0.009</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.077)</td>
<td></td>
</tr>
<tr>
<td>D(JV)</td>
<td></td>
<td>-0.101</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.093)</td>
<td></td>
</tr>
</tbody>
</table>

Observations: 127656  127656  127656  12208

- Exporters do not cite significantly more foreign patents; Importers *do* cite approx. 30% more foreign patents
- Subsidiaries of foreign parents cite more foreign patents
- The elasticity of citation with respect to importing is small
Auxiliary Evidence from the Community Innovation Survey (CIS-1)

- 4,000 firms responded to questions about acquisitions of new technology by geographic origin and by channel of acquisition (i.e. R&D collaboration, employee mobility, consulting, etc.)

- Importers learn through several channels; most important are “communication with foreign suppliers”, and “contract/collaborative R&D”

- Exporters report more limited knowledge acquisition through “communication with foreign buyers”, as well as by “analyzing competing products”.
Limitations of this research

• The focus on patent citations means only a narrow part of “knowledge diffusion” is captured.

• We'd like to know the extent to which trade and FDI speed diffusion to lower-wage countries, and which policies make this more likely.

• We’d also like to know what effect the diffusion of knowledge from U.S. firms to foreign firms has on the U.S.
How can Industry Studies Help?

• What is the nature of the technological knowledge exchanged by buyers and suppliers?

• What role does this knowledge play in the movement up quality ladders?

• Data on the use of specific production processes and techniques in different countries?

• Comparisons of similar firms in countries with different policies regarding technology transfer?
Evidence from the Community Innovation Survey (1993)

Table C1.—Acquisitions of foreign technology, by source

<table>
<thead>
<tr>
<th>Channel</th>
<th>( \log(Exports) )</th>
<th>( \log(Imports) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D outsourcing</td>
<td>0.058 (0.041)</td>
<td>0.263*** (0.074)</td>
</tr>
<tr>
<td>Collaborative R&amp;D</td>
<td>0.015 (0.036)</td>
<td>0.130** (0.055)</td>
</tr>
<tr>
<td>Patents and licenses</td>
<td>0.017 (0.029)</td>
<td>0.249*** (0.053)</td>
</tr>
<tr>
<td>Analyzing competing products</td>
<td>0.047** (0.022)</td>
<td>0.086*** (0.028)</td>
</tr>
<tr>
<td>Equipment purchases</td>
<td>0.037 (0.038)</td>
<td>0.187*** (0.066)</td>
</tr>
<tr>
<td>Hiring employees</td>
<td>0.000 (0.052)</td>
<td>0.025 (0.076)</td>
</tr>
<tr>
<td>Foreign suppliers</td>
<td>0.055 (0.037)</td>
<td>0.338*** (0.065)</td>
</tr>
<tr>
<td>Foreign buyers</td>
<td>0.226*** (0.071)</td>
<td>0.042 (0.027)</td>
</tr>
<tr>
<td>Mergers and acquisitions</td>
<td>−0.027 (0.049)</td>
<td>0.251*** (0.098)</td>
</tr>
<tr>
<td>Joint ventures and alliances</td>
<td>0.068 (0.061)</td>
<td>0.139** (0.070)</td>
</tr>
</tbody>
</table>

- Importers learn through a variety of channels; most important is “communication with foreign suppliers”
- Exporters report knowledge acquisition through “communication with foreign buyers”, as well as by “analyzing competing products”.