New Approaches and Data Session

Discussant Comments

Mark J. Roberts

Pennsylvania State University and NBER

March 2017
Data Contributions

- An Anatomy of Trade Marking by Firms in the U.S.
  - Data matching between trademark applications file and Census Business Register
  - Multiple matches of TM to owners
  - Resulting data set: firms born after 1977 and their TM applications and registrations
  - Value added: Attach firm characteristics to the TM histories. Initially L, payroll, revenue, location, NAICs

- How Innovative are Innovators?
  - Original data survey of U.S firms 2010, manufacturing and services
  - Replicates questions from Community Innovation Survey in EU
  - Information on outcomes of the innovation process - introduce new product (firm or market), sales of new products, investments in K, skills, marketing
  - Value added: Comparison with EU, multiple dimensions of innovation
Trademark Findings

- Relatively few firms use TM - 3% in 2013
- Clear differences w.r.t firm size and age. In 2013, on average:

<table>
<thead>
<tr>
<th>Firm Type</th>
<th>Employees</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>No TM</td>
<td>12.9</td>
<td>11.6</td>
</tr>
<tr>
<td>Hold an existing TM</td>
<td>114.8</td>
<td>16.2</td>
</tr>
<tr>
<td>Apply for a new TM in 2013</td>
<td>193.7</td>
<td>10.8</td>
</tr>
<tr>
<td>First Application in 2013</td>
<td>4.6</td>
<td>0.1</td>
</tr>
<tr>
<td>First App Manufacturing</td>
<td>13.2</td>
<td>0.5</td>
</tr>
<tr>
<td>First App Prof Service</td>
<td>2.9</td>
<td>0.2</td>
</tr>
</tbody>
</table>

First time are extremely small and young (80% have < 20 employees, 75% are < 5 years)
Two groups - established firms that hold and add to TM, brand new firms with first applications
Motivation for Using TM

Is a trademark an output reflecting past success (past innovation) or an input/signal indicating likely future success.

- Older, established firms
  - Extend customer base (goodwill stock, brand loyalty) to new areas
  - Intangible Asset with monetary value
  - Insurance against theft

- Young, first-time applications
  - Insurance against future theft
  - Signal of expected future success

- Evidence: Firms with first application after age 2.
  - Revenue and employment growth increase significantly (20% over 2 years) following application.
  - Largest impact for young and small firms
Evidence: Firms that do one of the activities (TM/Patent/R&D) are more likely to do the other two than the population as a whole.

Question:
- What are the linkages between these three activities?
- Where do trademarks come into the innovation process?
- TM choice should be modeled differently for young and old.
Extending the CDM Model to Incorporate TM

- R&D \rightarrow \text{Innovation} \rightarrow \text{Productivity/Firm Value}
- Value Stage - Profits depend on productivity \( \pi(\omega_{it}) \).
- Productivity evolution process - \( G(\omega_{it+1}|n_{it+1}, \omega_{it}) \). Depends on innovations and past productivity
- Innovation process - \( F(n_{it+1}|r_{it}) \)
- Firm chooses R&D investment to max firm value

\[
V(\omega_{it}) = \pi(\omega_{it}) + \max_{r_{it}}[\beta EV(\omega_{it+1}|\omega_{it}, r_{it}) - c(r_{it})]
\]

\[
EV(\omega_{it+1}|\omega_{it}, r_{it}) = \int_{n,\omega} V(\omega_{it+1})dG(\omega_{it+1}|\omega_{it}, n_{it+1})dF(n_{it+1}|r_{it})
\]

F.O.C. R&D choice

\[
\frac{\partial c(r_{it})}{\partial r_{it}} = \frac{\partial EV(\omega_{it+1}|\omega_{it}, r_{it})}{\partial r_{it}}
\]
Incorporating Trademarks

- Reflects accumulated goodwill stock - Profit function, specifically demand curve.
  - important for older firms
  - scale of TM activity important - number of products, age of TM, need data to estimate firm demand curves

- Insurance motive
  - Protecting $EV(\omega_{it+1}|\omega_{it}, r_{it})$
  - Incorporate probability of theft on future profits - differs by type of product

- Firm’s Decision to Trademark
  - cost is low, filing and legal fees
  - benefit is in future, depends on future firm value
  - Use the TM decision to infer/bound expected future firm value
Dimensions of Innovation

- Relates to the CDM model - innovation function $F(n_{it+1} \mid r_{it})$
- Many dimensions to $n_{it+1}$ - technical novelty, utility, distance, replicability
- CIS was designed to quantify these aspects.
  - technical novelty - patent
  - utility - how important are sales of new products
  - distance - investment in K, skills, marketing needed
  - replicability - number of rivals with similar innovation
  - separate innovators (new to market) and imitators (new to firm, not market)
Dimensions of Innovation

- Important conclusion -
  - mix varies substantially by industry (utility in software),
  - innovation is not important in many industries,
  - need industry-level analysis

- Sources of invention (earlier paper)
  - the value of inventions depends on their source, customers, supplier, tech specialist
  - tech specialists have highest gross benefits
  - customers have highest net benefits

- Indicates that data on sources of innovative inputs - licensing, purchases of new K equip, upgrading labor skills may be very helpful in assessing cost and benefits on investment in innovation.
Incorporating Dimensions of Innovation in CDM Framework

- Patents - direct indicator of an innovation, use with new product/process
- Sales of new products - profit/demand function
- Investment in K, skills, marketing - cost of innovation (more than just R&D)
- Innovations by rivals - profit function to affect payoff, innovation function to capture spillovers