EC2212 Industrial Growth
and Competition

Lecture 2

Small Firms Can Be Innovative!
(and Some Ways to Help)
Is New Technology Ever from Small Firms?

• Yes:
• Jewkes, Sawers, & Stillerman (1959), *The Sources of Invention*
• Inventions often from small firms, individuals
• Small firms: cellophane tape, Terylene; individuals: self-winding watch, penicillin
• True for invention, less for innovation
Small Firms Are Inventive

• Large and small firms have similar R&D spending per employee (possible exception: among very small firms, spending might be low)

• Small firms average more patents per R&D dollar spent

• Literature review: Cohen (1995)
Helping Small Firms Innovate

• Use heterogenous skills
• Fit industry-specific needs
• Look for innovative ideas outside firms
• Use regional networks of innovators
Heterogeneous Skills

• Firms differ in employee skills, resources
• Harness the skills & resources
• E.g., radio manufacturers entering TV set production: innovated 5+ x as much, 60% lower annual exit, higher market share (Klepper & Simons, 2000 SMJ)
• E.g., automobile makers in early 1900s
Industry-Specific Needs

• Amounts & kinds of R&D needed vary by industry

% of firms conducting R&D (1000-4999 employees)

Food & kindred products       50%
Petroleum                     69.2%
Aircraft & parts              89.5%

(Jewkes, Sawers, Stillerman, 1959, p. 192)
Innovative Ideas Outside Firms

• Innovative ideas often originate outside companies
• Johnston & Gibbons (1975), von Hippel (1988)
• E.g., in NMR spectrometers 79% of major innovations from users
• Other innovations from suppliers
Sources of Innovations

<table>
<thead>
<tr>
<th>Technology</th>
<th>User</th>
<th>Manuf.</th>
<th>Supplier</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific instruments</td>
<td>77%</td>
<td>23%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Semiconductor &amp; PCB process</td>
<td>67%</td>
<td>21%</td>
<td>0%</td>
<td>12%</td>
</tr>
<tr>
<td>Pultrusion process</td>
<td>90%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Tractor-shovel related</td>
<td>6%</td>
<td>94%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Engineering plastics</td>
<td>10%</td>
<td>90%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Plastics additives</td>
<td>8%</td>
<td>92%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Industrial gas-using</td>
<td>42%</td>
<td>17%</td>
<td>32%</td>
<td>8%</td>
</tr>
<tr>
<td>Thermoplastics-using</td>
<td>43%</td>
<td>14%</td>
<td>36%</td>
<td>7%</td>
</tr>
<tr>
<td>Wire termination equipment</td>
<td>11%</td>
<td>33%</td>
<td>56%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Von Hippel (1988, p. 4)
Regional Networks

• Clusters of firms in an industry Marshall (1890) points out classic benefits:
  – intermediate goods supply
  – labor supply
  – knowledge spillover

• Patents (etc.) reflect clustering benefits

• E.g., tire makers: 89% in Akron (66% not) produced cord tires in 1920, yielding 3x less chance of exit (Klepper & Simons, 2000 JPE)
Successful Innovation in Agglomerations

Silicon Valley successes (Saxenian, 1994):

• Interchange of ideas by managers, engineers
• Rapid job change
• Successful investors fund start-ups
• Links with university research, education
• Local government - executive cooperation
• Firms sharing resources
You Have Learned

• Small firms are inventive
  – Evidence from case studies, cross-section data
  – True for invention, less for innovation
• Tailor R&D work to firm skills, industries
• Get ideas from suppliers and customers too
• Use innovative networks; make innovative networks successful
Cities Thrive on Innovation
Cities as Loci of Innovation

• Jacobs (1969), *The Economy of Cities*

• “one kind of work leads to another” (p. 51)
  – Brassieres - created by Mrs. Ida Rosenthal, custom seamstress in a small shop in New York City, early 1920s

• Skills of multiple trades singly and in combination yield new kinds of work
Example: Cities and Agriculture

• Theory of agricultural primacy
  – Agricultural improvements yielded excess food; then some people could live in cities

• Jacobs’ view: city primacy
  – Cities always existed; trading centers that distributed food
  – Cities sources of innovation, including spread of new agricultural techniques
Growth and Decline of Cities

• **Diversity** of industry allows continued growth
• One-industry cities (Manchester, spinning & weaving) grow while industry grows
• Many-industry cities (Birmingham and London) survive setbacks
  – People find other trades & skills
  – Diversity of approaches spurs innovation
You Have Learned (extra part)

- Cities spread knowledge, yielding work and new kinds of work
- One-industry cities - danger of stagnation
- Many-industry cities - recover more easily: innovation creates new kinds of work