A Changing Environment:

Are firms shifting attention to regulation of nanotechnology?

Jennifer Hill Geertsma
Department of Sociology
University of Massachusetts Amherst

IGERT Seminar Series
10/1/2009
Nanotechnology & Society

- Why is this area of study important?
- What do we hope to learn from this type of research?
  - How external environments shape nanotech firms’ activities
  - Why firms are responding to the environment in the ways observed
  - How the regulatory environment is being shaped by firms’ responses
Organizational Theory

- Organizations
  - Boundaries
  - Environment
  - Buffering

- Social, cultural, regulatory and political environments
Organizational Environment

- Development has far outpaced risk assessment and materials characterization
  - Over 1,000 consumer products incorporating nanotechnology
  - Environmental and health risk assessment
Organizational Environment

- Public response to nano
  - Public surveys of nano knowledge
  - NanoTex
  - Magic Nano
Organizational Environment

- Local government regulations
- Federal and state regulations
Research Questions

- How is this external environment shaping firm activity both inside and outside the firm?
- Why are firms responding to the environment in the ways observed?
- How is the regulatory environment being shaped by firms’ responses?
Research Methods

- Survey instrument
- Population
- Data collection
Survey Instrument

Four main sections, 40 questions total

- Screening questions (UML 2006)
- Acquiring patented technology (AAAS 2007)
- Environmental Health & Safety
Population

Massachusetts-based firms engaged in research, manufacture or use of nanoscale materials or processes

Listed in Nanobank with article author, patent assignee, and grantee organization identified as a “firm”

AND

Listed in Dun & Bradstreet Million Dollar Database (U.S. businesses with $5 million+ sales or 65+ total employees, plus branches with 500+ employees this site)
Population

- $N = 224$

- Biggest worry was non-response
  - UML (2006) response rate = 33%
  - NCMS (2006) 10%
  - AAAS (2007) 27%
  - NOS (2002) 62.4%
  - ICON (2006) 33%
Data Collection

- Pre-survey letter
- Multi-method (web and telephone survey)
- Extensive email and telephone follow up
- Incentive
- Final response rate – 72.32% (85 firms)
Data Collection

- Survey data is linked to secondary data
  - Nanobank (formation of collaborations and impact on organization structure)
  - D&B (relationship between firm demographics and response to organizational environment)
<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Sales</td>
<td>44</td>
<td>$794M</td>
<td>$3,110M</td>
<td>$1.78M</td>
<td>$20.3B</td>
</tr>
<tr>
<td>Employment</td>
<td>44</td>
<td>495</td>
<td>1,203</td>
<td>10</td>
<td>7,000</td>
</tr>
<tr>
<td>3yr Employment Change</td>
<td>42</td>
<td>22</td>
<td>130</td>
<td>-60</td>
<td>823</td>
</tr>
<tr>
<td>Plant Facility Size (sq ft)</td>
<td>42</td>
<td>136,645</td>
<td>233,860</td>
<td>5,000</td>
<td>1,200,000</td>
</tr>
<tr>
<td>Year Established</td>
<td>44</td>
<td>1971</td>
<td>34.9</td>
<td>1811</td>
<td>2003</td>
</tr>
<tr>
<td>Location Type—Headquarters</td>
<td>44</td>
<td>70.45%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Market</td>
<td>85</td>
<td>82.35%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign Competition</td>
<td>85</td>
<td>88.24%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boston Metro Area</td>
<td>44</td>
<td>72.73%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main R&amp;D Source</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Internal R&amp;D</em></td>
<td>48</td>
<td>55.47%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Industry Suppliers</em></td>
<td>17</td>
<td>20.00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Academic</em></td>
<td>6</td>
<td>7.06%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Government</em></td>
<td>4</td>
<td>4.71%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Independent Contractor</em></td>
<td>3</td>
<td>3.53%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results

How is the external environment shaping firm activity?

- No external influence on nanotech activity
- Influence from suppliers and consumers
- Influence from regulatory agencies
- Influence from the public
Results

How is the external environment shaping firm activity?

- No external influence on nanotech activity
- Influence from suppliers and consumers
- Influence from regulatory agencies
- Influence from the public
Results

How is the external environment shaping firm activity?

- No external influence on nanotech activity
- Influence from suppliers and consumers
- Influence from regulatory agencies
- Influence from the public
Results

How is the external environment shaping firm activity?

- No external influence on nanotech activity
- Influence from suppliers and consumers
- Influence from regulatory agencies
- Influence from the public
Discussion

- The survey data is rich in information on how firms are responding to nano-

Discussion

- Why are firms responding to the environment in the ways observed?
- Training and education
  - Pre-emptive involvement in creation of regulations
Discussion

How is the regulatory environment being shaped by firms’ responses?
Questions?

For more information about this research…

Jen Geertsma
hill@soc.umass.edu