Determinants of Environmental Innovation in US Manufacturing Industries

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Process of Technological Change

- Invention
- Commercialization
- Diffusion
Environmental Innovation

- Acid rain prevention
- Air pollution prevention
- Water pollution prevention
- Solid waste disposal
- Hazardous or toxic waste destruction or containment
- Recycling or reusing waste
- Alternative energy sources
Pollution Abatement Expenditure and Innovation

Expenditure

Patents
Model

Environmental R&D

Abatement Costs

Time effects

Propensity to patent

Monitoring

Market Structure

Capital Intensity

Industry Size

International Pressure
# Estimation Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Linear, Fixed Effects</th>
<th>Poisson, Population Averaged</th>
<th>Negative Binomial, Fixed Effects</th>
<th>Negative Binomial, Random Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abatement Costs</td>
<td>0.0125 (0.000)***</td>
<td>0.0005 (0.004)***</td>
<td>0.0005 (0.044)**</td>
<td>0.0004 (0.045)**</td>
</tr>
<tr>
<td>Monitoring</td>
<td>-0.0025 (0.109)</td>
<td>-0.0002 (0.760)</td>
<td>0.0004 (0.388)</td>
<td>0.00009 (0.822)</td>
</tr>
<tr>
<td>Industry Size</td>
<td>0.00005 (0.002)***</td>
<td>0.00000007 (0.000)***</td>
<td>0.00000005 (0.012)**</td>
<td>0.00000005 (0.004)***</td>
</tr>
<tr>
<td>Market Power</td>
<td>-0.6395 (0.477)</td>
<td>-0.8963 (0.027)**</td>
<td>0.1067 (0.779)</td>
<td>-1.086 (0.004)***</td>
</tr>
<tr>
<td>Capital Intensity</td>
<td>4.6501 (0.270)</td>
<td>1.4138 (0.016)**</td>
<td>1.581 (0.065)*</td>
<td>1.1211 (0.199)</td>
</tr>
<tr>
<td>International Pressure</td>
<td>0.0307 (0.414)</td>
<td>0.0180 (0.214)</td>
<td>0.0598 (0.000)***</td>
<td>0.0237 (0.086)*</td>
</tr>
</tbody>
</table>
Conclusions and Future Research

- Innovation responds to incentives, including regulatory and market pressures.
- Type of environmental policy.
- Level versus quality of innovation.
- Invention $\rightarrow$ commercialization $\rightarrow$ diffusion.
- Effect on industry profitability.