A Spatial Competition Model of Knowledge Spillover Entrepreneurship

Zoltan J. Acs
School of Public Policy
George Mason University

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Outline

• Introduction
• Knowledge Spillover Entrepreneurship
• Competition for knowledge
• Hypothesis
• Results
• Conclusion
Introduction

• Role of entrepreneurial process and knowledge spillover in the economic growth and prosperity

• Explores the paradox of incumbent firms as both a cause and constraint of knowledge spillover entrepreneurship
Knowledge spillover entrepreneurship

- Industry Knowledge Spillovers ($A_{opp, \theta}$)
- Public Knowledge Spillovers (Universities)

→ Knowledge Spillover Entrepreneurship
$$E^* = \frac{1}{\beta} f(\pi^*[A_{opp}, \theta] - w)$$

where $E^*$ = level of knowledge spillover entrepreneurship

$\beta$ = institutional constraints

$\pi^*$ = profit

$A_{opp}$ = knowledge “available” from incumbents

$\theta$ = efficiency

$$A_{opp} = (A - A_c)$$

$$\theta = \frac{A_c}{A}$$

where $A$ = new knowledge

$A_c$ = knowledge not commercialized or appropriated by the incumbent firm
Competition for knowledge

Knowledge Creation
- Industry Research by Incumbents
- Academic Research by Universities

Local Stock of Generic Knowledge (Patents)

Knowledge Application
- Knowledge Spillover Entrepreneurship
- Commercial Application By Incumbents
• Spatial competition model
  – Distinction between knowledge creation and knowledge application, and R&D
  – Disagreements between the agents over new idea and approach

• Knowledge created \( \rightarrow \) Local stock of generic knowledge
• Spatial proximity \( \rightarrow \) Knowledge available to all
• Would-be entrepreneurs \( \rightarrow \) Exploit new knowledge
Hypotheses

Local Knowledge Stock

(+)

Knowledge Spillover Entrepreneurship

(-)

Incumbent Firm Commercial Application
• **Hypothesis 1**: Ceteris paribus, the rate of KSE in a region *increases* with expansions of the local stock of knowledge.

• **Hypothesis 2**: Ceteris paribus, because industry and university research contribute to the pool of would-be entrepreneurs as well as the stock of new knowledge, the rate of KSE *increases* with the number of incumbents and the number of universities conducting research in the region.

• **Hypothesis 3**: Ceteris paribus, because employment is a necessary pre-condition for individuals to become would-be entrepreneurs, the rate of knowledge spillover entrepreneurship *decreases* with higher rates of unemployment in the region.

• **Hypothesis 4**: Ceteris paribus, the increase in KSE following the expansion of the local stock of generic knowledge is *negatively* moderated by an increase in the number of incumbent organizations.
Research Design: Colorado

- HT new firm Birth Rate (per 1000 workers) 0.16
- Establishment size # workers/ # establishments (-)
- Per Capita Income Growth annual change (+)
- Density, population per sq. miles (+)
- Unemployment Rate in local area (-)
- R&D Universities, annual research funding (+)
- Utility Patents (NSF) (+)
- Incumbents, # business with +100 employees (+)
\[ Y_{it} = \alpha + \beta_1 P_{it-1} + \beta_2 I_{it-1} + \beta_3 (P \times I)_{it-1} + \beta_4 Z + \mu_i + \epsilon_{it} \]

\[ Y_{it} = \gamma Y_{it-1} + \rho W Y_{jt} + X_{it-1} \beta + \mu_i + \epsilon_{it} \text{ where } i \neq j \]

\[ \Delta Y_{it} = \gamma \Delta Y_{it-1} + \rho \Delta W Y_{jt} + \Delta X_{it-1} \beta + \epsilon_{it} \]

where \( Y_{it} \) = the rate of firm births in county \( i \) in year \( t \)

\( P \) = patents

\( I \) = incumbents

\( Z \) = control variables

\( \alpha \) = intercept

\( \mu_i \) and \( \epsilon_{it} \) = error terms

\( W \) = blocked diagonal matrix associated with spatial weight matrix

\( \gamma \) = temporal autocorrelation coefficient for the rate of firm births

\( \rho \) = spatial autocorrelation coefficient for the rate of firm births
Driscoll-Kraay fixed effects estimates

<table>
<thead>
<tr>
<th>Variables</th>
<th>Complete Model</th>
<th>Denver Removed</th>
<th>Outliers Removed</th>
<th>Outliers Dummied</th>
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<td>Per Capita Income Growth</td>
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<td>Unemployment Rate</td>
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<td>-0.023 **</td>
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<td>Patents</td>
<td>1.860 **</td>
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<td>Incumbents</td>
<td>1.509 **</td>
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<td>1.691 **</td>
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<td>Patents x Incumbents</td>
<td>-5.978 **</td>
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<td>Constant</td>
<td>0.425 **</td>
<td>0.359</td>
<td>0.413 **</td>
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| No. of Observations  | 630            | 620            | 626              | 630              |
| Number of Panels (Counties) | 63            | 62             | 63               | 63               |
| F-Statistic          | 274.2 **       | 1147 **        | 139.7 **         | 186 **           |
| R-Squared            | 0.13           | 0.09           | 0.13             | 0.13             |
| Within R-squared     | 0.07           | 0.07           | 0.07             | 0.07             |

Robust t-statistics in brackets from standard errors corrected for temporal and spatial dependence and heteroskedasticity. One-tailed tests: * p<0.05, ** p<0.01
Conclusion

• The increase in the rate NFF is highest when increase patents and incumbents is high.
• The second highest rate of NFF when high increase in patents and low incumbents.
• The third highest rate of NFF when low increase in patents and high incumbents.
• Knowledge is more important than incumbents which is what we expect from KSE.