A Spatial Competition Model of Knowledge Spillover Entrepreneurship

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Outline

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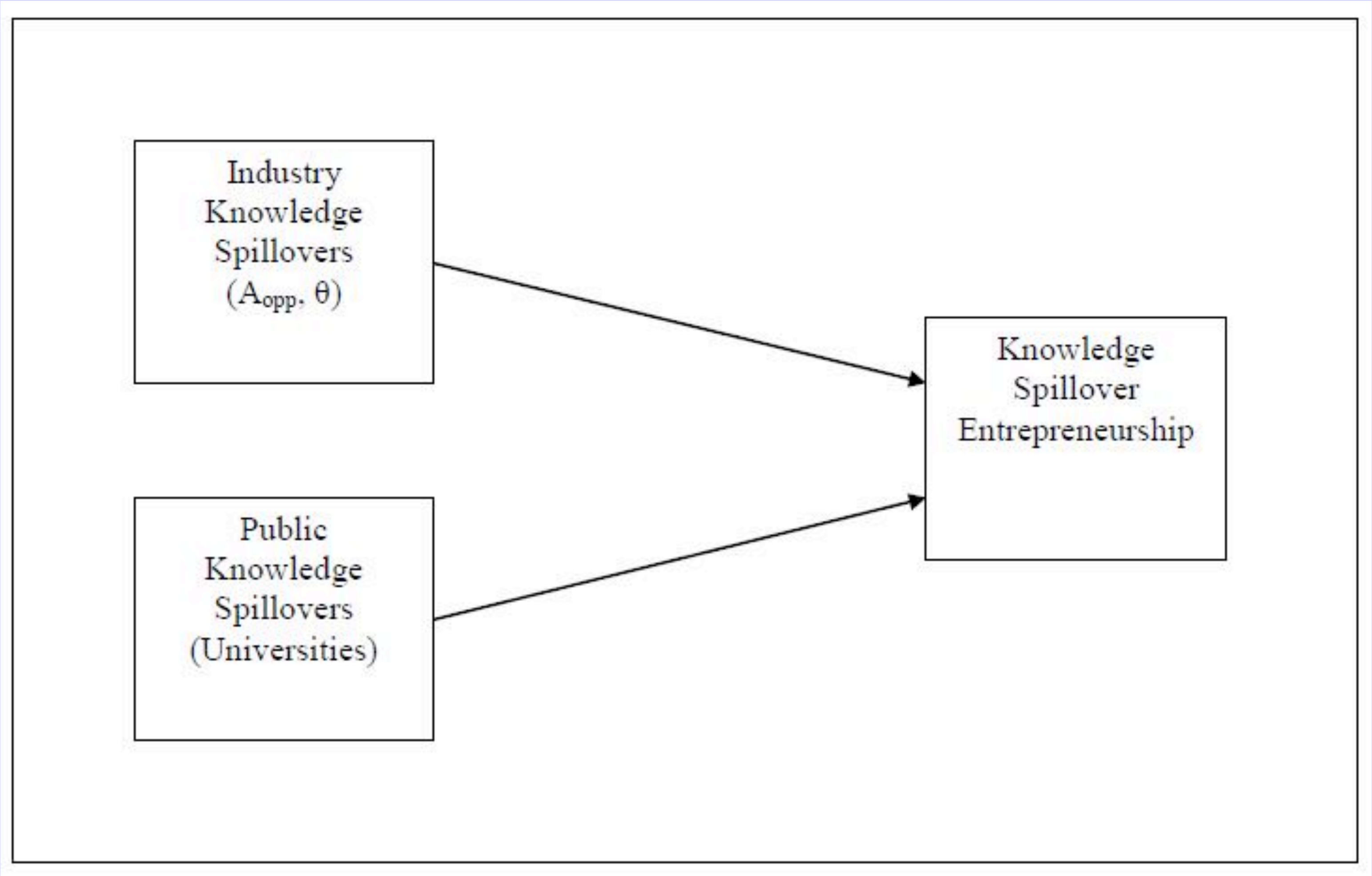
Introduction

- 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



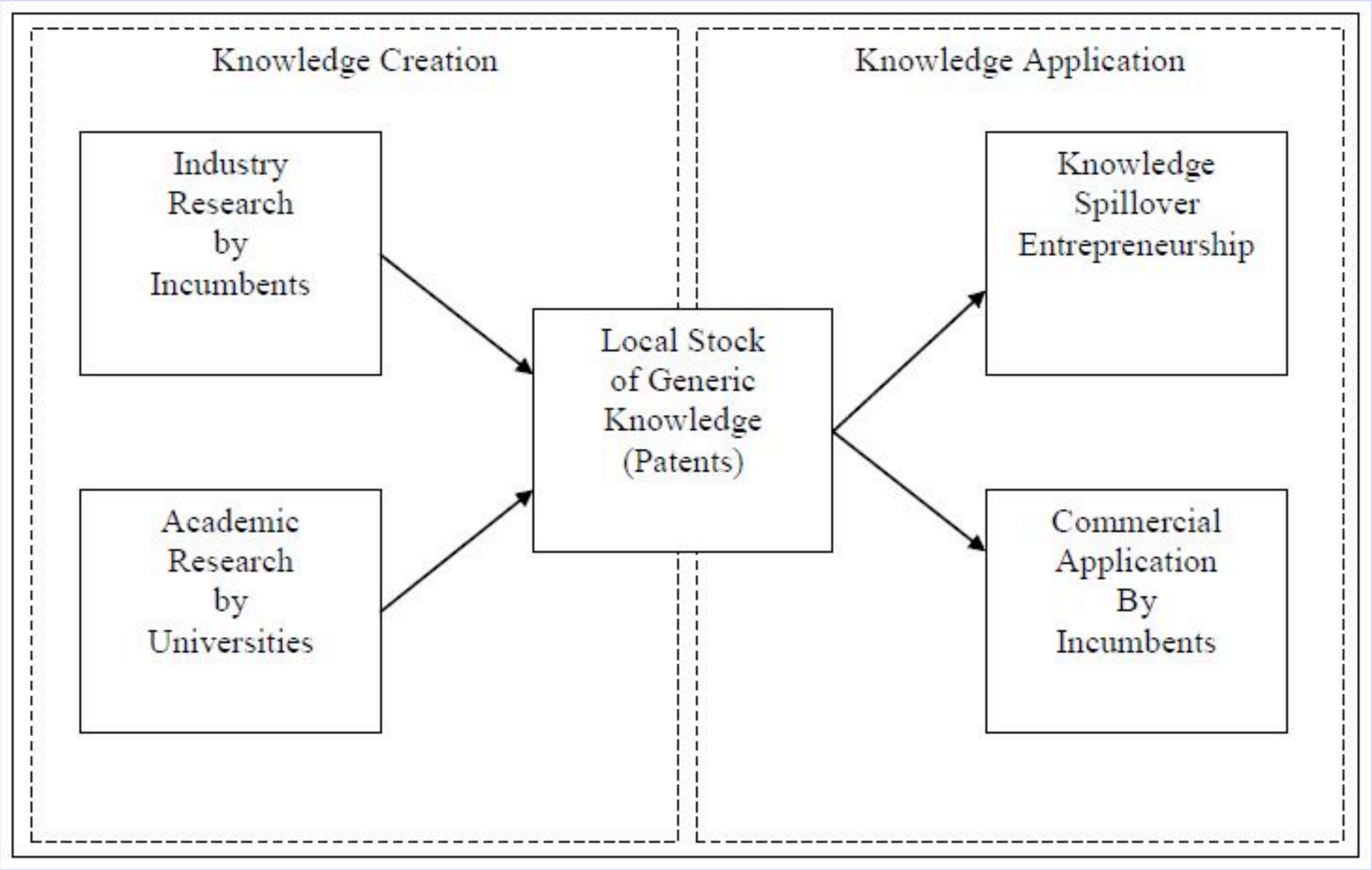
$$E^* = (1/\beta) f(\pi^*[A_{opp}, \theta] - w)$$

where E^*	=	level of knowledge spillover entrepreneurship
β	=	institutional constraints
π^*	=	profit
A_{opp}	=	knowledge "available" from incumbents
θ	=	efficiency

$$\begin{aligned} A_{\mathrm{opp}} &= (A - A_c) \\ \theta &= A_c/A \end{aligned}$$

where A	=	new knowledge
A_c	=	knowledge not commercialized or appropriated by the incumbent firm

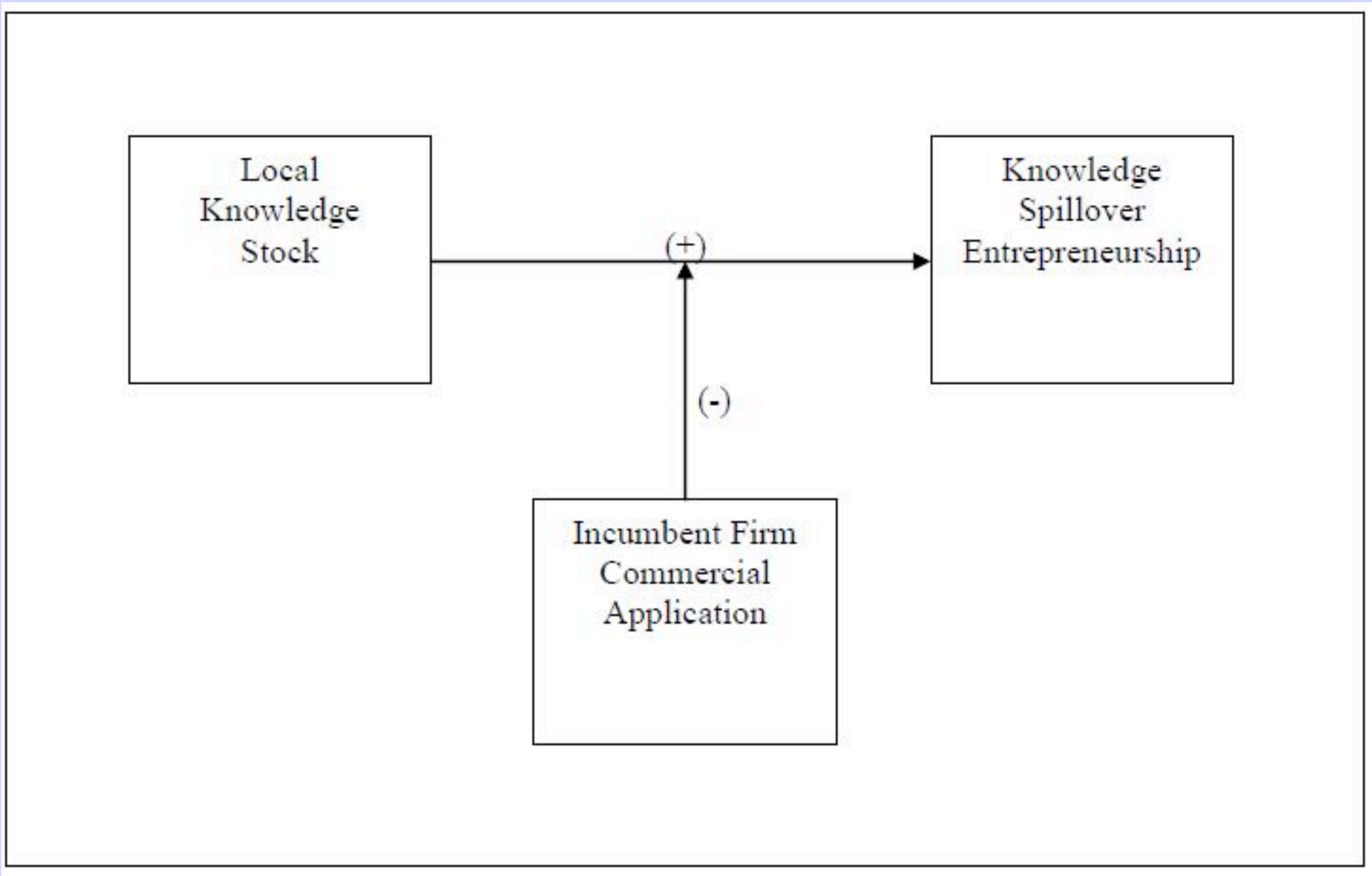
Competition for knowledge



- Spatial competition model
  - Distinction between knowledge creation and knowledge application, and R&D
  - Disagreements between the agents over new idea and approach

- Knowledge created → Local stock of generic knowledge
- Spatial proximity → Knowledge available to all
- Would-be entrepreneurs → 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 (+)

$$
\begin{aligned}
Y_{it} &= \alpha + \beta_1 P_{it-1} + \beta_2 I_{it-1} + \beta_3 (P \times I)_{it-1} + \beta_4 Z + \mu_i + \epsilon_{it} \\
Y_{it} &= \gamma Y_{it-1} + \rho W Y_{jt} + X_{it-1}\beta + \mu_i + \epsilon_{it} \text{ where } i \neq j \\
\Delta Y_{it} &= \gamma \Delta Y_{it-1} + \rho \Delta W Y_{jt} + \Delta X_{it-1}\beta + \epsilon_{it}
\end{aligned}
$$

where Y_{it}	=	the rate of firm births in county i in year t
P	=	patents
I	=	incumbents
Z	=	control variables
α	=	intercept
μ_i and ϵ_{it}	=	error terms
W	=	blocked diagonal matrix associated with spatial weight matrix
γ	=	temporal autocorrelation coefficient for the rate of firm births
ρ	=	spatial autocorrelation coefficient for the rate of firm births

Driscoll-Kraay fixed effects estimates

Variables	Complete Model		Denver Removed		Outliers Removed		Outliers Dummied	
Establishment Size	-0.013	*	-0.012	*	-0.013	*	-0.013	
	[-2.16]		[-2.05]		[-2.16]		[-2.17]	
Per Capita Income Growth	0.108		0.125		0.108		0.107	
	[0.71]		[0.81]		[0.70]		[0.70]	
Density	0.000	**	0.003	**	0.001	**	0.000	
	[3.74]		[4.09]		[3.68]		[4.44]	
Unemployment Rate	-0.024	**	-0.023	**	-0.023	**	-0.023	
	[-2.42]		[-2.42]		[-2.42]		[-2.42]	
R&D Universities	0.028	**	0.029	*	0.022		0.031	
	[2.50]		[1.96]		[1.63]		[3.03]	
Patents	1.860	**	1.275	*	2.445	**	1.950	
	[2.77]		[2.07]		[2.67]		[3.23]	
Incumbents	1.509	**	-0.034		1.691	**	1.509	
	[4.25]		[-0.17]		[3.86]		[4.55]	
Patents x Incumbents	-5.978	**	-3.757	*	-8.251	**	-6.239	
	[-2.64]		[-1.91]		[-2.51]		[-3.08]	
Constant	0.425	**	0.359	*	0.413	**	0.420	
	[2.54]		[2.00]		[2.45]		[2.59]	
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**.