

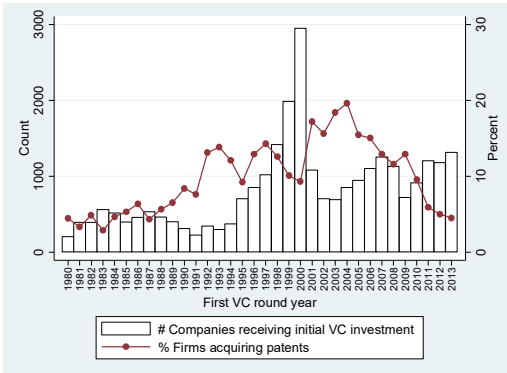


Inorganic Growth in Innovative Firms: Evidence from Patent Acquisitions

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Introduction

Startup firms are better suited to exploration than exploitation. Nonetheless, approximately 10% of VC-backed companies acquire external patents while still private.



This paper focuses on understanding what motivates these firms to buy external patents.

Hypotheses & Results

H1: Low productivity hypothesis: Patent acquisition is a response to weak internal innovation capabilities or low internal productivity.

- Firms buying patents are unlikely to be low-quality firms

	Firms buying patents prior to exit/censoring Obs. = 2,918	Firms not buying patents prior to exit/censoring Obs. = 24,952	Difference
VC characteristics			
VC firm age	14.42	12.85	1.566***
# Companies invested by VCs	26.48	24.47	2.004***
# IPO exits by VCs	3.70	2.95	0.752***
# M&A exits by VCs	5.50	4.42	1.080***
Financing characteristics			
# Rounds raised	4.69	3.19	1.503***
# VCs invested	4.85	3.31	1.542***
Capital raised (\$Mill)	46.62	20.84	25.782***
Capital raised at R1 (\$Mill)	5.78	4.29	1.485***
Patents			
I(At least 1 patent application)	0.68	0.25	0.430***
I(At least 1 patent acquisition)	1.00	-	-
# Patents applied	4.66	0.79	3.865***
# Patents acquired	5.26	-	-
# Citations	1.03	0.28	0.752***

- More productive firms, not less productive firms, tend to buy external patents

VARIABLES	(1) Patent acquisition = 1	(2) Patent acquisition = 1	(3) Patent acquisition = 1	(4) Patent acquisition = 1
ln(# Patents applied)	0.059*** (15.853)		0.030*** (8.165)	
ln(# Citations)		0.039*** (15.584)		0.019*** (6.749)
Observations	156,915	156,915	154,845	154,845
R-squared	0.024	0.019	0.236	0.236
Controls	Yes	Yes	Yes	Yes
Location FE	Yes	Yes	No	No
Stage FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Ind. x Year FE	No	No	Yes	Yes

H2: Litigation hypothesis: Patent acquisition represents a response to the threats stemming from firms' intellectual property (IP) environment.

- Firms sued for patent infringement are significantly more likely to buy patents

VARIABLES	(1) Patent acquisition = 1	(2) Patent acquisition = 1	(4) Patent acquisition = 1	(5) Patent acquisition = 1
I(Litigated)	0.043*** (5.471)	0.033*** (4.207)	0.017** (2.392)	0.015** (2.121)
ln(# Patents applied)		0.056*** (15.988)		0.030*** (9.020)
Observations	174,016	174,016	173,218	173,218
Sample ends in	2016	2016	2016	2016
R-squared	0.013	0.024	0.223	0.225
Controls	Yes	Yes	Yes	Yes
Location FE	Yes	Yes	No	No
Stage FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Ind. x Year FE	No	No	Yes	Yes

- Firms exposed to a high threat of litigation are significantly more likely to buy patents

VARIABLES	(1) Patent acquisition = 1	(2) Patent acquisition = 1	(3) Patent acquisition = 1	(4) Patent acquisition = 1
ln(Narrowness of public firm patent scope)	-0.033*** (-6.353)	-0.035*** (-6.529)	-0.029*** (-5.445)	-0.031*** (-5.597)
ln(# Public firm patents)		0.002*** (4.591)		0.002*** (4.347)
ln(# Patents applied)	0.055*** (9.669)	0.054*** (9.407)	0.060*** (9.552)	0.058*** (9.275)
Observations	40,392	40,392	36,599	36,599
Excludes biotech firms	No	No	Yes	Yes
R-squared	0.018	0.019	0.021	0.021
Controls	Yes	Yes	Yes	Yes
Location FE	Yes	Yes	Yes	Yes
Stage FE	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Ind. x Year FE	No	No	No	No

Identification

Alice Corp. vs. CLS Bank:

- Decided on 6/19/2014
- Raised the patent eligibility standards for business method patents → Led to a sudden reduction in the threat of litigation for firms whose technologies rely on business method patents

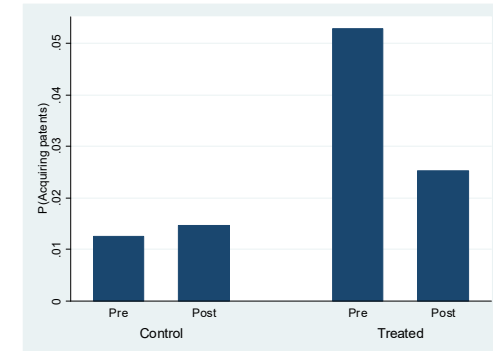
Difference-in-differences

- 16,035 firm-years between 2011-2017 (2,571 unique firms)
- Treated = 1 if a firm's products or technologies rely on business method patents
- Post = 1 if year ≥ 2014

Industry	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2018
Biotechnology	0	0	1	7	39	18	65	102
Communications and Media	0	4	10	46	199	353	457	210
Computer Hardware	2	8	38	32	100	190	515	388
Computer Software and Services	0	5	13	145	408	884	1,895	2,288
Consumer Related	0	1	1	0	3	7	31	18
Industrial/Energy	2	0	2	0	9	14	95	97
Internet Specific	0	0	1	20	244	390	1,153	1,417
Medical/Health	0	1	13	7	43	39	237	252
Semiconductors/Other Elect.	0	8	46	73	208	701	806	275
Other Products	0	2	1	2	12	21	104	30

Results:

- The probability of patent acquisition drops substantially for the treatment group



- Firms reduce patent acquisitions when patent litigation risk drops

VARIABLES	(1) I(Patent acquisition)	(2) I(Patent acquisition)	(3) I(Patent acquisition)	(4) I(Patent acquisition)
Treated x Post	-0.030*** (-2.985)	-0.031*** (-3.050)	-0.029*** (-2.834)	-0.031*** (-2.963)
Treated	0.036*** (3.648)	0.038*** (3.978)		
Post	-0.004 (-1.558)			
Observations	16,035	16,035	16,035	16,035
R-squared	0.008	0.013	0.210	0.214
Controls	Yes	Yes	Yes	Yes
Location FE	Yes	Yes	No	No
Stage FE	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	No
Year FE	No	Yes	Yes	No
Firm FE	No	No	Yes	Yes
Ind. x Year FE	No	No	No	Yes

Conclusion

Key findings

- A nontrivial fraction of young entrepreneurial firms buy external patents
- This behavior is closely related to the threat of litigation (rather than low internal productivity, product market competition, or VCs' liquidation pressure)

Contribution & Implications

- IP rights = important determinant of young firms' decisions to rely on inorganic growth

- IP rights can shape industry concentration by affecting entrepreneurial firms' exit channels
- Incumbent firms with market power have incentives to maintain their market power through patent rights
- The increasing industry concentration in recent years suggests that such opportunities are also increasing