The Litigation of Financial Innovations

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This project

- Seeks to understand consequences of patenting of business methods.
- Focuses on litigation of finance patents.
- Key findings:
  - Extraordinary high litigation rates.
  - Especially of patents to individuals, private firms.
  - Driven by third parties.
  - Larger firms are targeted.

What is patentable?

- Criteria under U.S. patent law:
  - Novelty.
  - Utility.
  - Non-obviousness.
  - “Any new and useful process, machine, manufacture, or composition of matter.”
    - Interpretation has varied over time!

Treatment of business methods

- Ambiguity in common law countries:
  - Apparently allowed in *Darcy v. Allin* (U.K. 1602).
  - Excluded in subsequent decisions:
    - *Hotel Security Checking v. Lorraine Co.* (1908) established "business method exception" to patentability in U.S.
  - Contrast with civil law countries.

Treatment of business methods (2)

- While USPTO began issuing awards in 1970s, questions about validity:
  - Only two filed cases prior to 1996 settled before trial.
  - Many financial institutions, service providers relied on trade secrecy.

The *State Street* case

- Signature Financial obtained patent on “hub and spoke” system of mutual fund management in 1993.
- Approached mutual fund custodians to license, with some success.
- Licensing talks with State Street Bank & Trust proved unsuccessful.

The *State Street* case (2)

- State Street sued in 1996 to have patent declared invalid.
- Federal District of Massachusetts made summary judgment in favor of State Street:
  - "Jurisprudential quagmire."
- Signature appealed to CAFC.

The *State Street* case (3)

- CAFC reversed decision in July 1998:

  > The [district] court relied on the judicially-created, so-called "business method" exception to statutory subject matter. We take this opportunity to lay this ill-conceived exception to rest.

- Supreme Court refused to hear appeal in January 1999.
- Decisions much discussed in trade press.

US007426488B1

(12) **United States Patent**
Gompers et al.

(10) **Patent No.: US 7,426,488 B1**
(45) **Date of Patent: Sep. 16, 2008**

(54) **PRIVATE EQUITY INVESTMENTS**

(76) Inventors: **Paul A. Gompers**, 156 Mason Ter., Brookline, MA (US) 02446; **Joshua Lerner**, 108 Moulton St., South Hamilton, MA (US) 01982; **Andrew Metrick**, 604 Schiller Ave., Merion Station, PA (US) 19066; **Leslie Ann Jeng**, 32 River St., Cambridge, MA (US) 02139

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1333 days.

(21) Appl. No.: **09/990,893**

(22) Filed: **Nov. 14, 2001**

Related U.S. Application Data

(60) Provisional application No. 60/248,272, filed on Nov. 14, 2000.

(51) **Int. Cl.**
G06Q 40/00 (2006.01)

(52) **U.S. Cl.** ..... **705/36 R**; 705/35

(58) **Field of Classification Search** ..... 705/36 R, 705/35, 45, 30, 33; 707/202, 1, 10
See application file for complete search history.

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(Continued)

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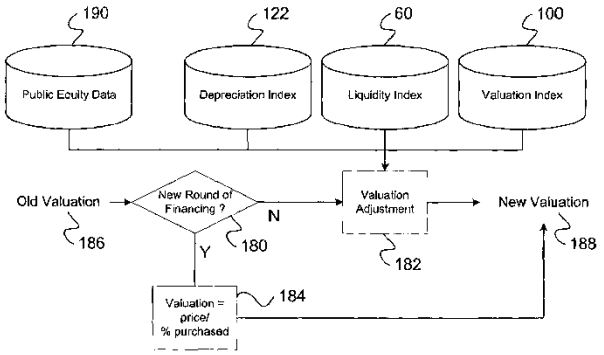
(57) **ABSTRACT**

In general, in one aspect, the disclosure describes a computer program for analyzing private equity investments. The program includes instructions that access public equity data identifying performance of a set of more than one public equities. The instructions also access private equity data identifying one or more characteristics of different private equity investments. The program analyzes a private equity investment based, at least in part, on the public equity data and the private equity data of other private equity investments.

37 Claims, 6 Drawing Sheets



The *Bilski* case

- Patent application for method of hedging commodities trading:
  - Rejected by Board of Patent Appeals and Inferences.
  - Appealed to CAFC:
    - Rejection upheld in October 2008 in 9-3 decision.
      - "Of course, a claimed process wherein all of the process steps may be performed entirely in the human mind is obviously not tied to any machine and does not transform any article into a different state or thing. As a result, it would not be patent-eligible."

The *Bilski* case (2)

- Decision appealed to U.S. Supreme Court:
  - Ruling expected imminently.
  - Considerable skepticism about business method patents in oral arguments.
    - Their suggestions:
      - How to choose a jury (Justice Ginsberg), teaching antitrust law without putting students to sleep (Justice Breyer), speed-dating (Justice Sotomayor), horse-whispering (Justice Scalia).

Critique of business method awards

- "Although patents in other areas of technology have brought forth complaints from various quarters, the magnitude of adverse commentary and reportage on business method patents was unprecedented."
  - Allison and Hunter (2005).
    - "The increased volume of patent applications stemming from this newly patentable subject matter has pushed the patent system into crisis."
      - Merges (2000).
    - "A new monster called forth from an old statute."
      - Lessig (2000).

Response

- In 2000, USPTO introduced “Second Pair of Eyes Review.”
  - All patents in class 705 get second review.
- Consequences:
  - Slow-down in awards.
  - Substitution into other classes.
    - Allison and Hunter (2005).

More generally

- Enormous economics literature on design of intellectual property rights:
  - E.g., Scotchmer (2004).
- Substantial works on patents as indicators:
  - Griliches (1990); Jaffe and Trajtenberg (2002).
- But little attention to understanding quality of issued awards:
  - Exceptions include work on oppositions [Hall, et al. (2005)], examiners [Cockburn, Kortum, and Stern (2003)], and patent trends [Kortum and Lerner (1997)].

Second motivation: Financial innovation's importance

- Claims in Miller (1986), Merton (1992).
- Evidence from Tufano (1989):
  - Substantial turnover of securities issued.
- Potential implications for other firms:
  - Easing capital constraints?
  - Reducing cost of capital?
    - But also skeptics.

"I can't sleep. I just got this incredible craving for capital."

Yet little study

- Frame and White (2005) identify 39 empirical studies of financial innovation:
  - Contrast to 1000s on manufacturing innovation.
  - Most focused on “back end”:
    - Diffusion and consequences.
  - Only two papers on origins of innovation.

Likely different dynamics

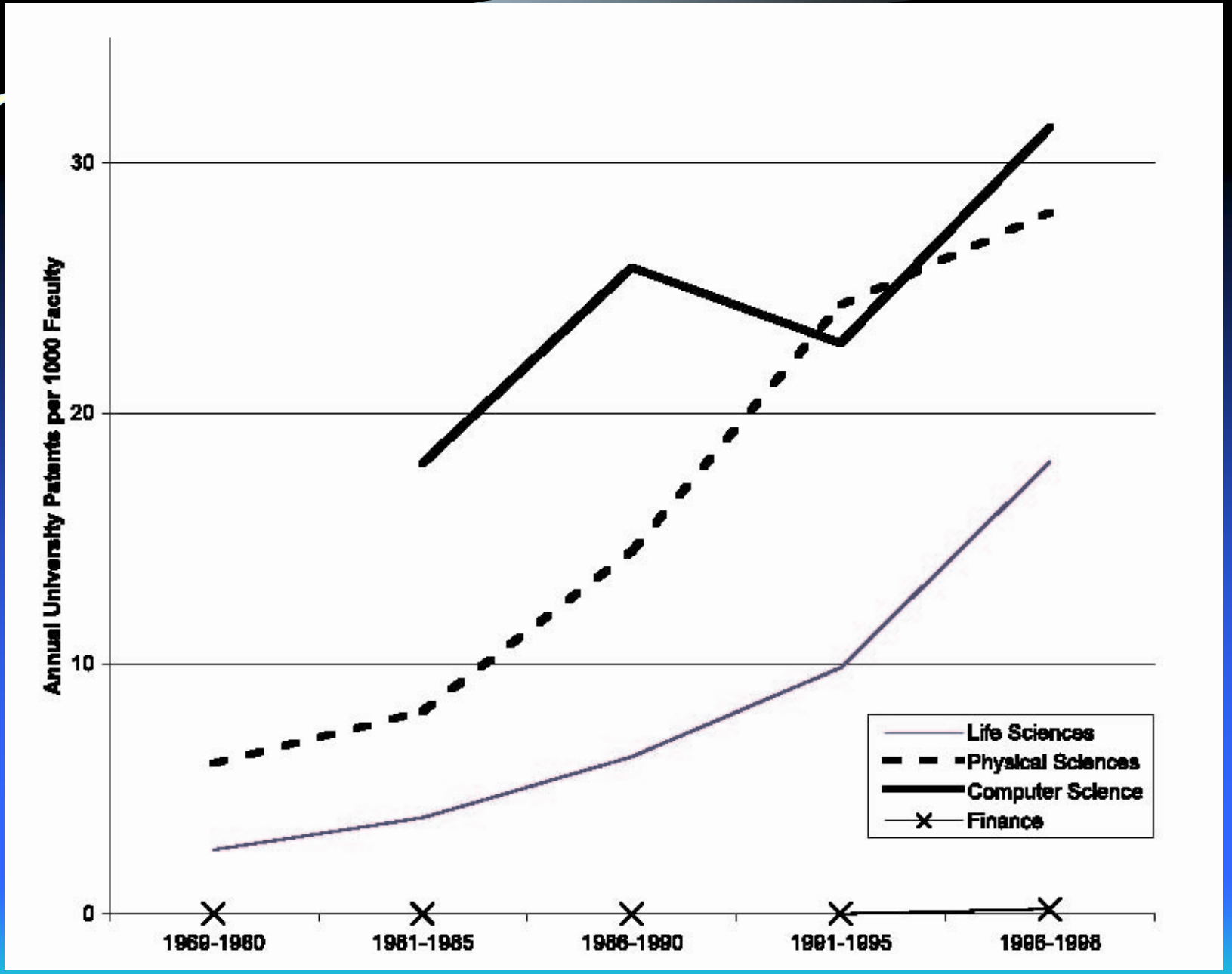
- Little patent protection until recently.
- Great deal of disclosure due to regulatory, marketing considerations.
- Importance of collaborations.

  $\Rightarrow$Imply that important to examine as a distinct phenomenon.

Part of series

- Lerner (2002):
  - Lots of awards and more coming!
  - Minimal academic role in patenting:
    - Largely due to lack of interest or understanding, rather than subject matter.
  - Little reference to academic research:
    - Apparently due to background of examiners.

Journal and Author	Survey Responses		
	Expert A	Expert B	Expert C
Journal of Finance			
Barberis (2000)	+	++	++
Pástor (2000)	++	++	++
Rajan, Servaes, and Zingales (2000)	−−	−−	0
Wilner (2000)	−−	−	0
Journal of Financial Economics			
Bakshi and Madan (2000)	+	+	++
Bertsimas, Kogan, and Lo (2000)	+	−	++
Gupta and Subrahmanyam (2000)	−−	0	++


Annual University Patents per 1000 Faculty
30
20
10
0
1976-1980
1981-1985
1986-1990
1991-1995
1996-1998
Life Sciences
Physical Sciences
Computer Science
Finance

Part of series (2)

- Lerner (2006):
  - Small firms play as important—even disproportionate—role in financial innovation.
  - Less profitable firms with stronger academic ties innovate more:
    - Consistent with (some) theoretical suggestions.
    - Increase in profitability after innovation.
  - After *State Street*, large firms increasingly dominate innovations:
    - Fundamental change?

The sample: Identifying finance patents

- Patents are sorted into >100,000 subclasses.
- Relevant subclasses:
  - 705/4.
  - 705/35 through 705/45.
  - 902/1 through 902/41.

The sample: Identifying patent litigation

- Employ Derwent on-line database.
- Based on reports to USPTO by courts.
- Incomplete due to:
  - Non-reporting to USPTO.
  - Lawsuits not yet filed.
- Supplement missing data

The sample: Patentee characteristics

- Sort into awards to public and private firms, individuals, and others.
- Obtain financial, employment data from:
  - Compustat.
  - WorldScope.
  - Nation and industry directories.
    - Less data (if any) for private firms.

The sample: Patent characteristics

- Download from HBS patent database web site:
  - Applicant and assignee name.
  - Application and award dates.
  - Patent classification.
  - Prior art cited and subsequent citations (through July 2006).

Table 1, Panel A

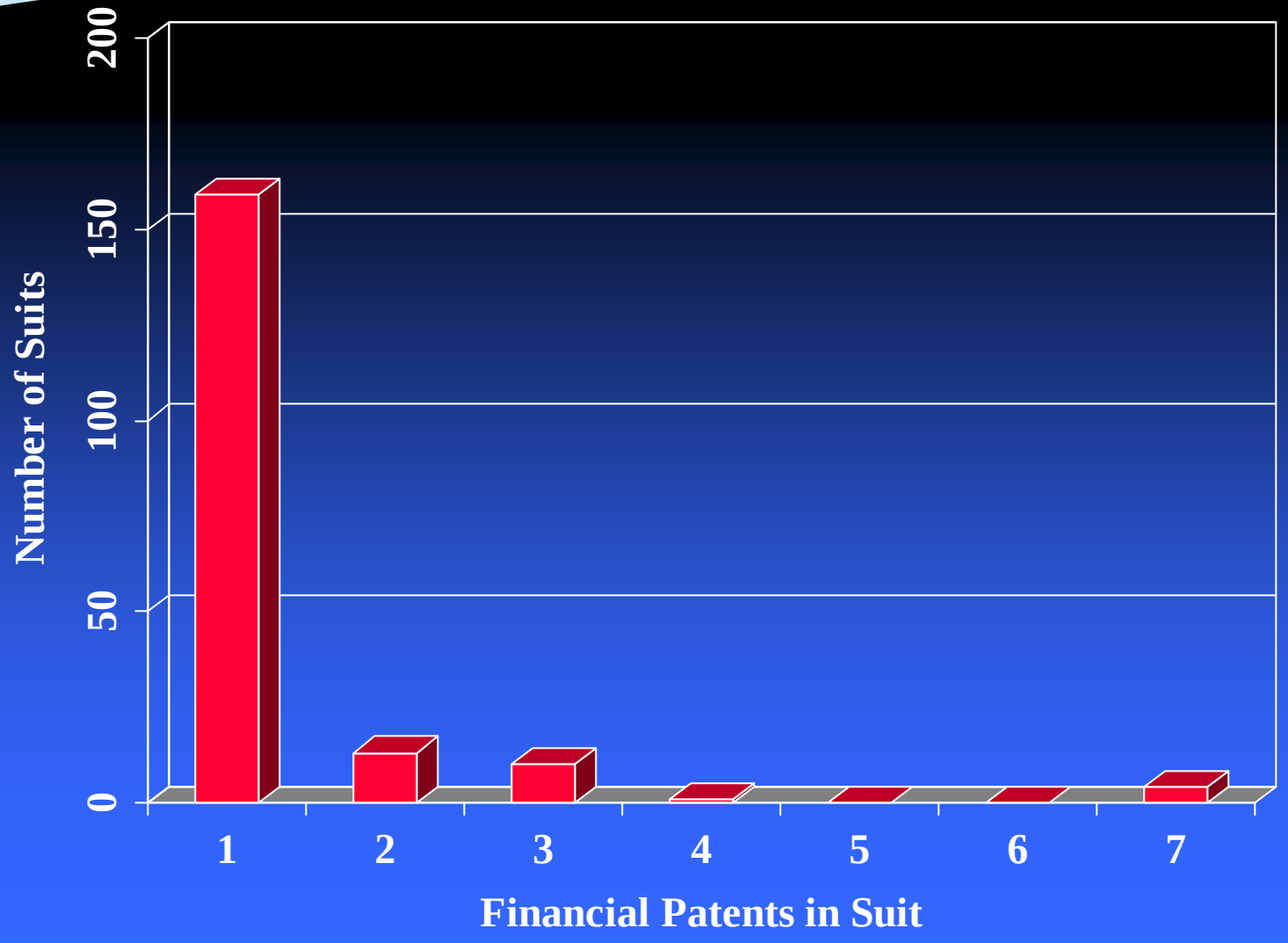
Panel A: Patent Awards	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Award year	1994.7	7.3	1976	2003
Application year	1992.1	7.1	1969	2002
Claims made	20.9	20.9	1	375
Citations made	13.3	17.6	0	243
Citations made per claim	1.2	3.1	0	121.5
Citations received through July 2006	24.0	33.2	0	407
Citations received through July 2006 per claim	2.3	6.0	0	129
Self-citations made	0.6	2.1	0	60
Self-citations received through July 2006	0.4	1.0	0	15
Generality	0.44	0.25	0.07	1
Originality	0.53	0.27	0.06	1
Sales of assignee in award year (billions of 2003$s)	24.9	37.8	0	467
Employment of assignee in award year (000s)	86.0	113.3	0.005	891
Assignee is a U.S.-based individual	16.0%			
Assignee is a non-U.S.-based individual	2.3%			
Assignee is a U.S.-based public corporation	32.5%			
Assignee is a non-U.S.-based public corporation	16.2%			
Assignee is a U.S.-based private firm	24.9%			
Assignee is a non-U.S.-based private firm	7.7%			
Nationality of assignee (if non-U.S.):				
Japanese	57.6%			
British	8.5%			
French	6.5%			
German	6.3%			
Lawsuits involving patent through end of 2005	0.08	0.59	0	15

Summary statistics

- Back-end loaded sample.
- Heavily cited (4x general level).
- Under-representation of foreign firms (one-half level).
- Little government or university patenting.

Table 1, Panel B

Panel B: Lawsuits	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Number of financial patents in suit	1.32	1	1	7
Patents awarded to plaintiff?	5.90%			
Patents assigned to plaintiff?	32.60%			
Patents awarded to defendant?	1.10%			
Patents assigned to defendant?	6.40%			


Number of Suits
200
150
100
50
0
1
2
3
4
5
6
7
Financial Patents in Suit

Lawsuit features

- Most cases around only one patent.
- Only 46% of cases involve inventor or assignee as plaintiff or defendant:
  - Hints at importance of individual inventors here.

Most frequently represented firms

Innovators	***Patentees***	***Litigators***	***Defendants***
Merrill Lynch	Hitachi	Panip, LLC	American Express
Citigroup	IBM	Divine, Inc.	Citigroup
American Express	NCR	Source, Inc.	Chicago Board of Trade
Citicorp	Citigroup	Meridian Enterprises	New York Mercantile Exchange
McGraw-Hill	Fujitsu	Travelers Express Co.	JP Morgan Chase
Charles Schwab	AT&T	Allcare Health Management	

Most frequent parties

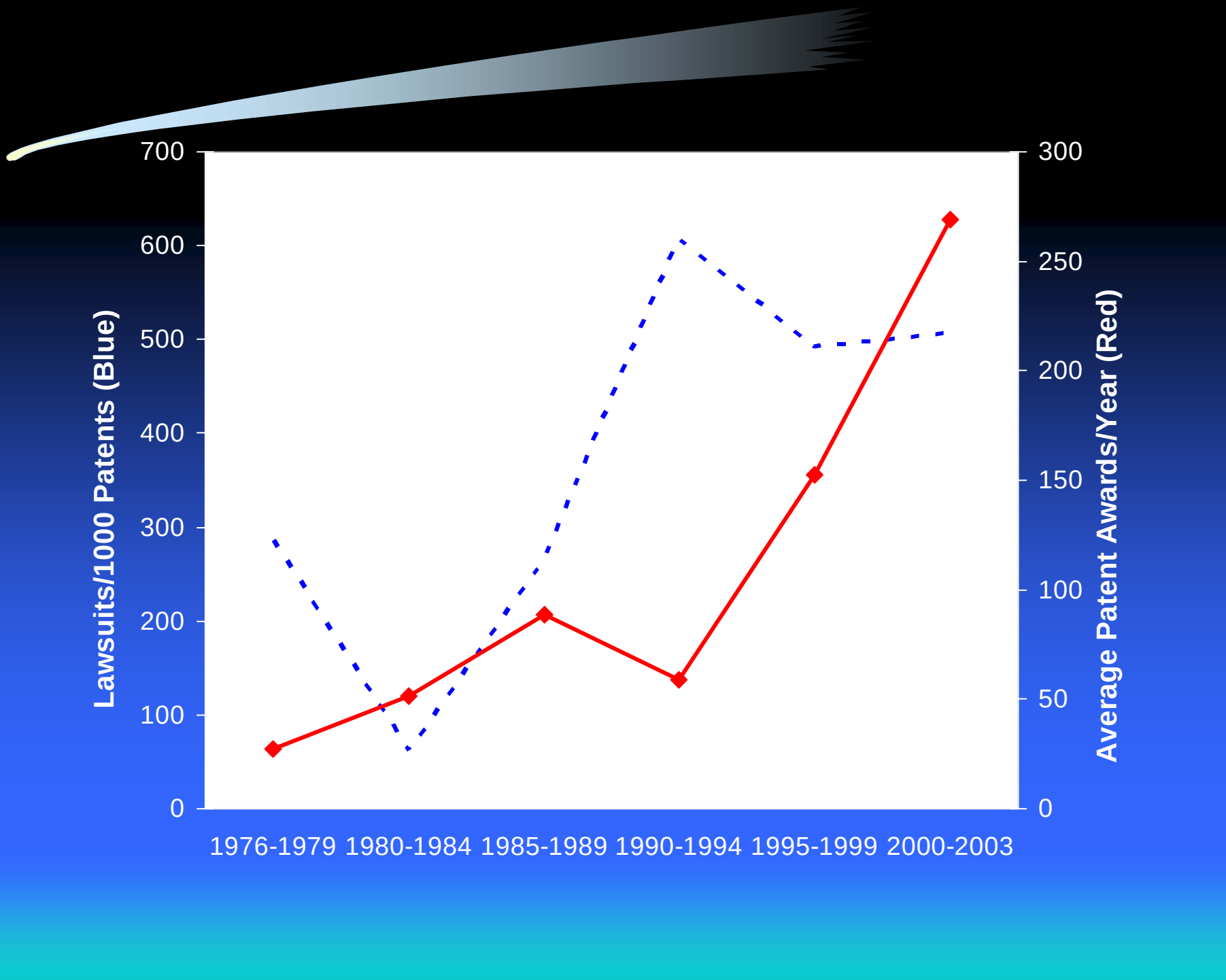
- Innovators, defendants dominated by major financial institutions.
- IT consultants play a much more important role in financial patenting.
- Plaintiffs dominated by holding firms.
- Defendants appear to have deep pockets.

Adjustments

- Use Lanjouw-Schankerman [2001, 2003] factors to adjust for:
  - Non-reporting to USPTO.
  - Truncation due to litigation over patent life.
- No adjustment for understating due to reporting delays.

Additional adjustments

- Patent count:
  - L&S employed only one patent per suit.
  - In actuality, approximately 1.3 per suit.
    - Researched pre-1990 cases.
- Suit consolidation:
  - Derwent frequently has multiple entries for lawsuits, sometimes with slightly different docket numbers.
  - Consolidation of these cases.
  - Impact hard to measure exactly, but likely to be 10%-20% reduction.
    - No adjustment for evident reporting delay.


700
600
500
400
300
200
100
0
Lawsuits/1000 Patents (Blue)
300
250
200
150
100
50
0
Average Patent Awards/Year (Red)
1976-1979
1980-1984
1985-1989
1990-1994
1995-1999
2000-2003

Comparing to L&S

- Dramatically higher rates of litigation:
  - 10.7 cases per 1000 in overall data.
    - 293.5-429.3 per thousand here.
    - 27-39 times greater rate here!
  - Highest category, drugs, is 20.1.
- Far more litigation by third parties:
  - 56% in sample not litigated by awardee or assignee.
  - In L&S, only 31%.
- Like them, no clear time trend.

Cross-sectional differences

- Also look across population of business method patents:
  - Whose awards are being litigated?
  - What seem to be key drivers of litigation?
  - What can we infer from these patterns?

Adjusted lawsuits by firm type

Firm type in award year	***Adjusted lawsuits/ 1000 patents***
Publicly Traded	114.5
Privately Held	396.6
Individual	591.7

Adjusted lawsuits by firm location

Assignee nation in award year	*Adjusted lawsuits/ 1000 patents*
United States	382.8
Japan	29.9
Other	61.0

Adjusted lawsuits by employees

Employees in award year	*Adjusted lawsuits/ 1000 patents*	*Employees in award year*	*Adjusted lawsuits/ 1000 patents*
0-200	1153.0	50,001-200,000	47.1
201-1000	313.1	>200,000	0.0
1001-50,000	80.3		

Adjusted lawsuits by sales ($M)

Revenues in award year	*Adjusted lawsuits/ 1000 patents*	*Revenues in award year*	*Adjusted lawsuits/ 1000 patents*
0-10	790.9	1000.1-10,000	84.5
10.1-100	681.5	10,000.1-50,000	45.1
100.1-1000	74.7	>50,000	0.0

Litigation patterns

- Unlike overall, corporate financial patents less likely to be litigated.
- U.S. patents 9x more likely to be litigated.
- Dramatic fall-off in litigation with firm size (overall, no patterns).

Table 5

	Domestic		Foreign	
	Litigated	*Not Litigated*	*Litigated*	*Not Litigated*
Claims	31.00	22.73 ***	24.83	14.40 *
Forward citations/year	4.04	2.40 ***	4.07	1.40 ***
Backward citations	19.39	14.78 **	9.83	8.24
Forward cites/year/claim	0.28	0.20 *	0.21	0.16
Backward cites/claim	1.77	1.18 *	0.61	0.96

Comparing patents

- Litigated patents:
  - Have more claims.
  - Are more cited.
    - But, unlike overall, magnitude of differences much small when examine cites per claim.
  - Have more backward cites:
    - Opposite to overall pattern.

Regression analyses

- Unit of analysis is each patent in sample.
- Dependent variables:
  - Was patent litigated?
  - What was the litigation count?
- Independent variables follow specification in Lanjouw-Schankerman [2001]:
  - Award year fixed effects.
- Also examine predicted effects.

Table 6

	Dependent variable: Was patent litigated?	*Dependent variable: Number of lawsuits involving patent*				
	Probit	Poisson	Negative Binomial			
	(1)	(2)	(3)	(4)	(5)	(6)
Logarithm of number of claims in patent	0.55	1.06	1.13	0.98	0.81	0.85
	[0.07]***	[0.10]***	[0.18]***	[0.18]***	[0.18]***	[0.18]***
Log of forward citations per claim	0.35	0.67	0.96	0.84	0.7	0.78
	[0.08]***	[0.12]***	[0.25]***	[0.24]***	[0.24]***	[0.24]***
Log of backward citations per claim	0.55	0.89	1.05	0.92	0.7	0.71
	[0.11]***	[0.15]***	[0.30]***	[0.29]***	[0.28]**	[0.29]**
Was assignee a public corporation?				-1.09	-0.02	0.09
				[0.27]***	[0.36]	[0.44]
Was assignee an individual?				0.43	0.34	0.28
				[0.28]	[0.28]	[0.28]
Was assignee based in the United States?				1.31	1.39	1.25
				[0.39]***	[0.40]***	[0.39]***
Log of employment in year of issue (000s)					-0.57	
					[0.12]***	
Log of sales in year of issue (millions of 2003 $s)						-0.25
						[0.07]***
Year of issue dummy variables	Y	Y	Y	Y	Y	Y
Zero or missing data dummy variables	Y	Y	Y	Y	Y	Y
Controls for self-citation rate	Y	Y	Y	Y	Y	Y
p-Value, $\chi 2$-test	0.00	0.00	0.00	0.00	0.00	0.00
Pseudo R2	0.10	0.13	0.07	0.11	0.12	0.13
Observations	2757	2941	2941	2941	2941	2941

Table 7

	At means	+1 Standard Deviation in *Log Claims*	+2 Standard Deviations in *Log Claims*	+1 Standard Deviation in *Log Forward Citations per Claim*	+2 Standard Deviations in *Log Forward Citations per Claim*	+1 Standard Deviation in *Log Backward Citations per Claim*	+2 Standard Deviations in *Log Backward Citations per Claim*
Probability of Litigation (regression #1 in Table 6)	3.22%	8.45%	18.37%	5.57%	9.08%	5.71%	9.49%
Count of Lawsuits (#3)	0.024	0.064	0.170	0.049	0.099	0.040	0.067
Count of Lawsuits (#4)	0.014	0.033	0.076	0.026	0.048	0.022	0.035
Count of Lawsuits (#5)	0.005	0.010	0.021	0.009	0.014	0.007	0.010

	At means	*Patent Holder is a Public Corporation*	*Patent Holder is an Individual*	*Patent Holder is from the United States*	+1 Standard Deviation in *Log Employment*	+2 Standard Deviations in *Log Employment*
Probability of Litigation (regression #1 in Table 6)	3.22%	-	-	-	-	-
Count of Lawsuits (#3)	0.024	-	-	-	-	-
Count of Lawsuits (#4)	0.014	0.005	0.021	0.052	-	-
Count of Lawsuits (#5)	0.005	0.005	0.007	0.020	0.002	0.000

Key findings

- More litigation is associated with:
  - More claims.
  - More forward citations.
  - More backward citations:
  - Public corporations.
  - U.S.-based firms:
    - Effect driven by individuals and private concerns.

Table 9

	Dependent variable: Number of lawsuits involving firm		
	Negative Binomial		
	Entire Sample	U.S.-Based Firms Only	1999 and After Observations Only
	(1)	(2)	(3)
Log years firm has been publicly traded	0.18	0.43	0.30
	[0.25]	[0.28]	[0.26]
Log of firm's assets	0.46	0.36	0.44
	[0.14]***	[0.13]***	[0.14]***
Profit margin	-0.13	0.04	-0.07
	[0.39]	[0.55]	[0.41]
Leverage	-1.62	-1.67	-2.04
	[1.14]	[1.35]	[1.09]*
Innovations by firm	0.52	0.38	0.20
	[0.40]	[0.34]	[0.27]
Academic connectedness	-0.76	-1.39	-0.61
	[1.02]	[2.80]	[0.46]
Other innovations in ZIP code	-0.27	-0.17	0.01
	[0.24]	[0.23]	[0.21]
Industry controls	Y	Y	Y
Nationality of patentee dummy variables	Y	N	Y
p-Value, χ2-test	0.000	0.000	0.000
Observations	15937	15034	5472

Who gets sued?

- Scale: Bigger is more likely to be sued:
  - If litigation more costly to them than other (reputational or collateral damage), more likely to be targeted.
    - Theory of sham litigation.
- Many other things don't matter:
  - Innovation doesn't matter.
  - Location doesn't matter.

Robustness checks

- Two-stage regression to control for zero observations.
- Using total litigation filings, adjusted lawsuit count as dependent variable.
- Controlling for application year as well.
- Controlling for patent originality and generality:
  - Measures had no power.
- Additional financial data.
- Firm fixed effects.

Interpreting the results

- Key findings:
  - Much more frequent litigation of financial patents.
  - Typically those awarded to individuals and smaller, private entities.
  - Patents with mote claims and citations more frequently litigated.
  - Large firms disproportionately targeted.

Interpreting the results (2)

- Consistent with theoretical models of suit and settlement:
  - High-stake disputes should lead to more litigation.
  - If accept claim that larger firms have more costs of litigation:
    - Patterns of lawsuit initiation and targets are consistent.
  - Consistent with models of strategic exploitation of weak patents:
    - Farrell and Shapiro [2008]; Henkel and Reitzig [2007].
    - Suggests broader social costs.

Open questions

- How does litigation impact innovation in financial services?
  - What kind of distortions do weak patents introduce really?
  - How has changing intellectual property environment matter?

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