Patents and Technology Markets: How is the market operating, and can it be improved?

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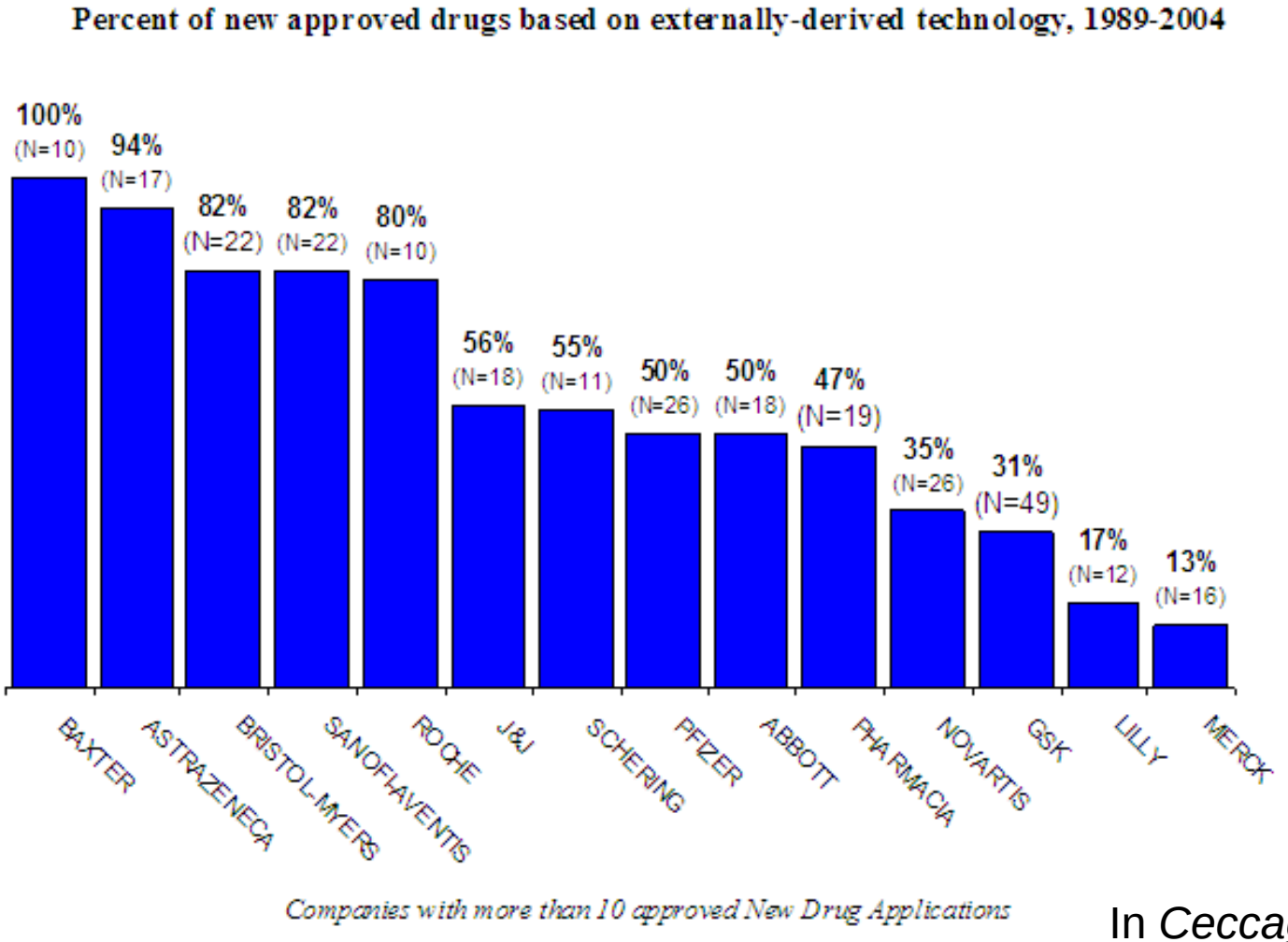
Research highlighted in this presentation

- "*Why do Start-ups Patent?*" S. Graham, T. Sichelman (2008). Berkeley Technology Law Journal, 23(3), pp. 1063-1097.
- "*Would the U.S. Benefit from Patent Post-grant Reviews? Evidence from a Twinning' Study,"* S. Graham, D. Harhoff (2008). *Working paper.*
- "*Entrepreneurship, Intellectual Property and Platform Technologies*," T. Simcoe, S. Graham and M. Feldman (2009). Journal of Economics and Managerial Strategy. *Conditional acceptance.*
- *"Firm Reliance on External Knowledge in the Pharmaceutical Industry,"* M. Ceccagnoli, S. Graham, M. Higgins, and J. Lee (2009). *Working paper.*
- *"High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey,"* S. Graham, R. Barr, R. Merges, P. Samuelson, and T. Sichelman (2009). *Working paper*.

Markets For Technology (M4T): Not just in IT

Figure 1. Widespread use of technology markets in the pharmaceutical industry



In *Ceccagnoli, et al* (2009)

Technology Entrepreneurship and M4T

The 2008 Berkeley Patent Survey (BPS)

- *Berkeley Center for Law and Technology* led effort
- Survey of U.S. “entrepreneurial companies” on innovation and patenting
  - Surveyed top managers in firms founded after 1997
  - Sample included over 15,000 companies, in biotech, medical devices, and software / internet sectors
    - Drawn from Dun & Bradstreet, Thomson data
- Dual-mode survey: Mail & web, summer-fall, 2008.
  - Non-respondent bias testing: Telephone, fall 2008.
- <u>Responses: 1,332 unique respondent firms</u>

In Graham, et al (2009)

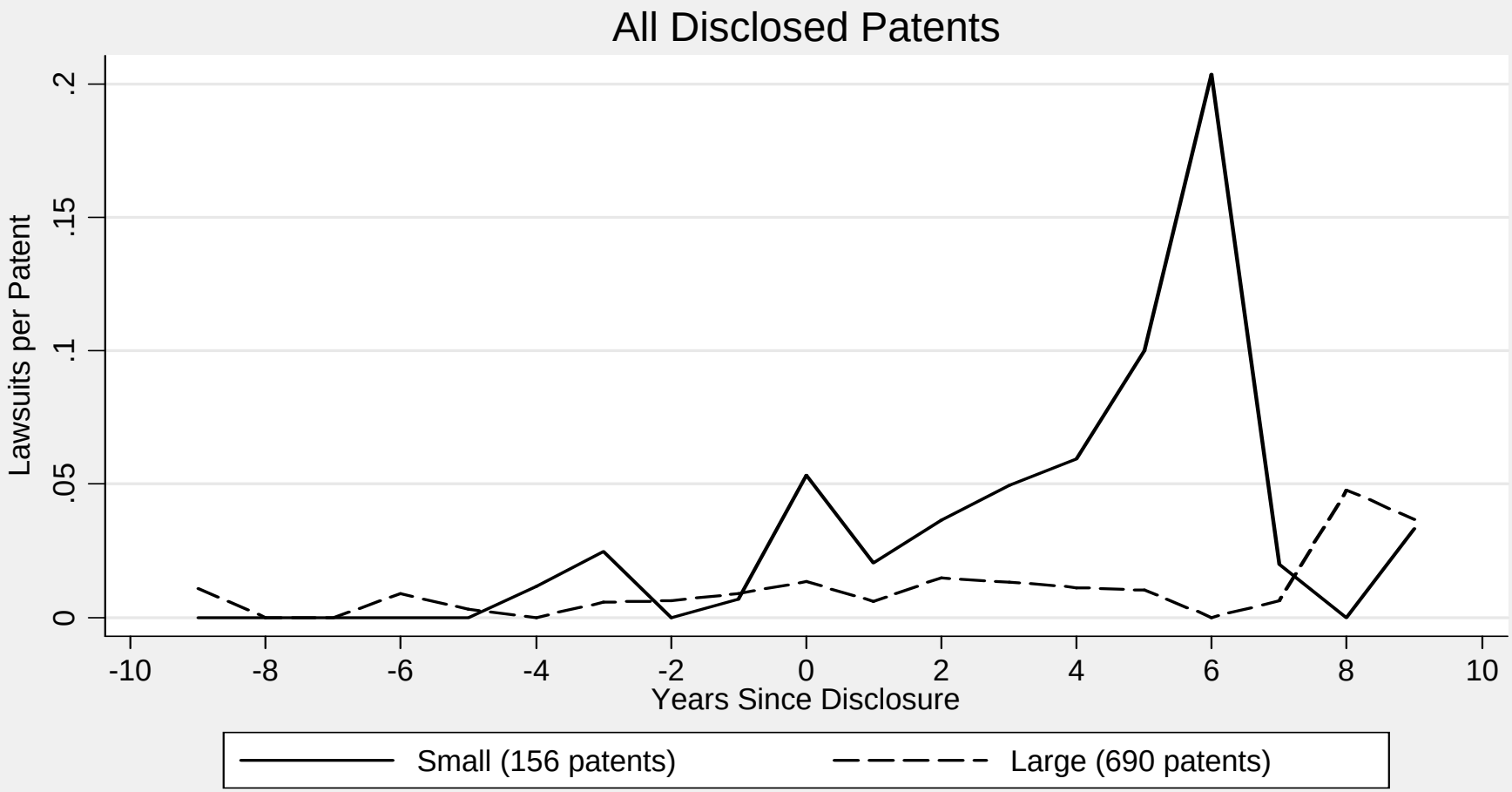
Some 2008 BPS Findings

- Young firms report less than 5% of revenues (mean) derive from licensing out their technologies.
  - But there are sector differences, with biotechnology firms more likely, and medical device firms less likely.
- Patents are significantly more important (for sustaining competitive advantage) to young firms as they generate more of their revenues from technology licensing.
- Generally, young firms rate patenting for “obtaining licensing revenues” as relatively unimportant compared to other reasons such as “preventing copying” or “enhancing company’s reputation”
  - But here too sectors matter, with biotechnology rating it more important compared to other sectors (but not within)
  - And, as firms rate “licensing” as more important, they are also more likely to rate patents as a more important means of capturing competitive advantage from technology

In Graham, et al (2009)

Patents and M4T in the Standards Context: Enforcement

Pre/post-disclosure litigation rates by firm size



In Simcoe, et al (2009)

Patents, Litigation, and Standards

- Our research shows that
  - patents disclosed to standard-setting organizations (SSOs) are much more likely to be litigated
  - among smaller firms, the patent's disclosure to the SSO appears to be a triggering event for litigation
  - there is no divergence in the "quality" of the patents post disclosure for large and small companies
    - This result points toward a change in firm strategy, and not increased infringement
- In sum
  - Small firms involved in the SSO process appear to be using their disclosed patents differently
    - Is this evidence of "troll-like" behavior? Not necessarily
    - We interpret it more as evidence of vertical specialization
      - Small firms compete on upstream technology, while larger firms compete on downstream implementation (product markets)

In Simcoe, et al (2009)

Improving the transactional environment

- Welfare gains from the patent system
  - Costs: monopoly (deadweight) loss
  - Benefits: Incentives to invent, develop, commercialize, & transact, *plus* knowledge spillovers from disclosure
- Forces eroding welfare gains
  - Low “Quality”
    - Lacking requisite novelty, non-obviousness, utility
  - Uncertainty
    - Over final *boundaries* of the disclosure
    - Over the *validity* of the property right
      - Under- or misdirected investments
      - Confers market power to trivial innovations
      - Creates an environment inviting to costly litigation
      - Adds transaction costs to commercialization, technology transfer (licensing), developing markets for IP

Would the US benefit from adoption of Post-grant Review? Welfare Calculations

(1.1) *Saved litigation expenses*

$$W_1 = p_L \cdot P \cdot p_{O,L} \cdot (p_{R,L} + 0.5 p_{PR,L}) \cdot S_L$$

(1.2) *Removing excess market power*

$$W_2 = (1 - p_L) \cdot P \cdot p_{O,NL} \cdot (p_{R,NL} + 0.5 p_{PR,NL}) \cdot S_{NL}$$

(1.3) *Costs of post-grant review*

$$C = p_L \cdot P \cdot p_{O,L} \cdot (C_O + (p_{A,L} \cdot C_A)) + (1 - p_L) \cdot P \cdot p_{O,NL} \cdot (C_O + (p_{A,NL} \cdot C_A))$$

In Graham and Harhoff (2008)

Post-grant Review: Welfare Estimates

	Parameter	Scenarios									
		1	2	3	4	5	6	7	8	9	10
	Current System Parameters										
S_L	social cost of litigation	$4	$4	$4	$2	$4	$4	$2	$4	$4	$2
S_{NL}	social cost of non-litigated revocable patent	$4	$4	$2	$1	$4	$2	$1	$4	$2	$1
p_L	probability of litigation without post-grant system	0.032	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
	GH Estimates (Table 4, weighted averages)										
$p_{O,L}$	probability of opposition - litigated patents	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198
$p_{O,NL}$	Probability of opposition - non-litigated patents	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
$p_{R,L}$	probability of revocation - litigated patents	0.354	0.354	0.354	0.354	0.354	0.354	0.354	0.354	0.354	0.354
$p_{R,NL}$	probability of revocation - non-litigated patents	0.330	0.330	0.330	0.330	0.330	0.330	0.330	0.330	0.330	0.330
$p_{PR,L}$	probability of partial revocation - litigated patents	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
$p_{PR,NL}$	probability of partial revocation - non-litigated patents	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381
$p_{A,L}$	probability of appeal – litigated patents	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520
$p_{A,NL}$	probability of appeal – non-litigated patents	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325
	Opposition Cost Estimates										
C_O	cost of opposition	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.50	0.50	0.50
C_A	cost of appeal against opposition outcome	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.50	0.50	0.50
	Welfare and Total Cost Estimates										
W_1	welfare gain from avoided litigation	2,588	889	889	445	889	889	445	889	889	445
W_2	welfare gain from revocation of questionable patents without litigation	23,378	23,886	11,943	5,971	23,886	11,943	5,971	23,886	11,943	5,971
C_L	cost of opposition – litigated patents	193	66	66	66	132	132	132	331	331	331
C_{NL}	cost of opposition - non-litigated patents	1,488	1,520	1,520	1,520	3,040	3,040	3,040	7,600	7,600	7,600
W_{NET}	total net benefit	24,286	23,189	11,246	4,830	21,602	9,660	3,244	16,344	4,901	(1,515)
BC_{total}	overall benefit-cost ratio	15.5	15.6	8.1	4.0	7.8	4.0	2.0	3.1	1.6	0.8

Note: all cost and benefit figures in million US$.

In Graham and Harhoff (2008)

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In Graham and Harhoff (2008)

In Sum…

- Patents in the M4T are relevant beyond electronics
- There is still much to learn, particularly as regards the relationship among Patenting, the M4T, and technology entrepreneurship
- There are substantial inefficiencies in the transactional environment
  - Reducing uncertainty over the boundaries and validity of patents being transacted would tend to dampen some inefficiencies
  - Post-grant review as a means to increasing society's welfare looks promising *if* costs of the process remain relatively low