

Innovation, patent strategy and patent reform

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Overview

- ▶ Patents and innovation- brief tour of economic research
- ▶ Strategic use of patents
 - Focus on information & communication technology sector
- ▶ Recent patent reform efforts in the U.S.

When do patents encourage innovation?

▶ Theory

- When one product = one or a few patents
- When one product = many patents - uncertain
- When one invention builds on another - uncertain

▶ Empirical evidence on incentive effects

- Historical investigations of changes in patent systems
- Firm surveys
- Recent research on software/business method patents in the US

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Historical evidence

▶ 19th century (variation across Europe/US)

- Moser (2005) - little effect on overall innovation, but change in focus
- Lerner (2001) - increase in patenting by foreigners but no increase by firms within country or in Britain (that is, no increase in innovation)

▶ 20th century

- Park and Ginarte – 60 countries, 1960-90. Strength of IPR (including coverage of pharmaceuticals) positive for R&D in developed countries
- Kanwar & Evenson (2003) – 31 countries, 1981-1990. Strength of IPR positive for R&D
- Branstetter & Sakakibara – increasing patent scope in Japan (1988) did not increase R&D

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Survey evidence

- ▶ Industrial R&D managers in the US
 - Yale survey (Levin, Klevorick, Nelson, and Winter 1983)
 - Carnegie-Mellon survey (Cohen, Nelson, and Walsh 1994)
 - ▶ EU innovation surveys
 - 1993 CIS for Norway, Germany, Luxembourg, the Netherlands, Belgium, Denmark, and Ireland – 2,849 R&D-performing firms (reported in Arundel 2001)
- patents *not* the most important means of securing returns to innovation
- Only ~10% of respondents rate them first or second
 - **Exceptions:** pharmaceuticals, specialty chemicals, medical instruments, auto parts

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What happens when patentability is extended to a new technology?

- ▶ 1994/1995 court decisions led to new USPTO guidelines on software patentability in May 1995
 - Market value of software firms (esp. applications software) initially falls
 - However, software patents are more valuable than other patents to the firms that own them post-1995
 - In general, firms are less likely to enter product classes in which there are more software patents
 - However, firms that hold software patents are more likely to enter these markets and less likely to exit

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A useful taxonomy

- ▶ “discrete” product industries
 - food, textiles, chemicals including oil and plastics, pharmaceuticals, metals, and metal products
 - patents used to exclude, and sometimes for licensing; also to prevent litigation
- ▶ “complex” product technologies
 - machinery, computers, software, electrical equipment, electronic components, instruments, and transportation equipment
 - patents used in negotiations (cross licensing and other), and to prevent litigation
- ▶ In general, patents more important for appropriating returns to innovation in discrete product industries
- ▶ Strategic uses (cross licensing, negotiations) greater in “complex” product industries

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Summary

- ▶ The role of patents in encouraging innovation is ambiguous
 - Positive on balance in discrete product industries
 - Neutral or negative in complex product industries
 - BUT considerable heterogeneity within industry
- ▶ Patents may actually help competition if they facilitate entry or leapfrogging

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Strategic Use of Patents

- ▶ Narrow definition – intended to identify anti-competitive uses of the patent system:

Strategic use of the patent system arises whenever firms leverage complementarities between patents to attain a strategic advantage over technological rivals. This is anticompetitive if the main aim and effect of strategic use of the patent system is to decrease the efficiency of rival firms' production.

- ▶ From the study by Dietmar Harhoff, Bronwyn H. Hall, Georg von Graevenitz, Karin Hoisl, and Stefan Wagner for the European Commission. (July 2007 for ENTR/05/82)

Ingredients

- i) patents filed in a technology are *complements*;
- ii) firms are building up *portfolios* of complementary patents;
- iii) patent portfolios are employed to raise rival firms' costs of production.
(by means other than changing their R&D incentives)

Further definitions

- ▶ **Portfolio** – a set of patents owned by a single firm. Recall that innovations are often protected by several patents
- ▶ **Complements** – value in a portfolio exceeds the sum of the values when held by individual firms (and not cross-licensed)

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Range of patent strategies

Portfolio maximization	Portfolio optimization	Protection of specific IP
Firms try to increase the size of their patent portfolio by filing large numbers of patent apps. Share of marginal pats high and opp/litigation relatively low.	Firms build patent portfolios with constant filing from a single priority; frequent opposition against competitors.	Patenting of specific R&D output with less emphasis on strategic mgmt of the portfolio; share of marginal pats low

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Strategy	Portfolio maximization	Portfolio optimization	Specific IP protection
Prevalent in	Complex tech: Telecomms, IT, electrical	Discrete tech: Chemistry, pharma, food	Most remaining technology areas
Examples of firms	Infineon, Qualcomm, NTT Docomo, Intel, IBM	L'Oreal, Beiersdorf, Schering, Henkel	n.a.
Volume of apps.	very high	high	average
Use of opp.	below average	above average	average
Use for blocking <i>only</i>	infrequent	frequent	average
Share of critical refs per claim	average	high	average
Use of continue/divisionals	frequent	frequent	infrequent
Apps with shared priorities	average	above average	average

Anticompetitive strategies

► Portfolio maximization

- More likely in complex technology sectors, where a single product relies on many patents, often held by different firms => complements.

► Weak patents - strategy facilitated by uncertainty and low quality patents

- **Farrell and Shapiro (2007)** show that in the presence of downstream competition, incentives to challenge patents are sub-optimal if patents are probabilistic.
- Problem is worse in the case of many complements (profit at issue is much larger than the contribution of the patented technology).

Farrell and Shapiro (2007)

- ▶ Weak (low probability of validity) patents licensed to **non-rival** downstream firms command low royalties
 - Usual reason - because they are low value
- ▶ Weak patents licensed to **rival** downstream firms command large running royalties
 - Sometimes with negative fixed fees
 - Free-riding means litigation for invalidity too low
 - Royalty structure allows collusion to maintain monopoly price

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Summary

Strong patents (certain validity) are better than weak patents, but.....

- ▶ Even weak patents can be used anti-competitively
- ▶ Even weak patents can be powerful given the threat of injunction
 - Under reasonably royalty damages, pay now or pay later with probability $p < 1$
 - Under injunctive threat, loss later may be much greater, even though $p < 1$, especially in complex technology industries

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Semiconductors

- ▶ **Hall and Ziedonis (2001)** showed that patent portfolio racing in semiconductors began in 1984/1985 in response to changes in enforceability of US patents.
- ▶ **Ziedonis (2004)** showed that building up large portfolios was associated with fear of hold-up due to fragmented rights holders in the technologies used by the firm.

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Hall and Ziedonis (*RJE* 2001)

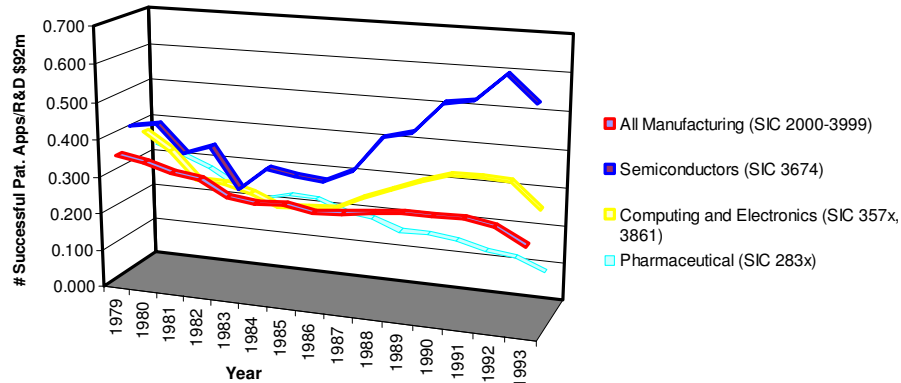
- ▶ Increase in US patenting since early 1980s (now paralleled by increases at JPO and EPO)
- ▶ Survey evidence - patents ineffectual for firms in most industries
 - Yale Survey 1982
 - Carnegie Mellon Survey (CMS) 1994
 - Firms did not increase their reliance on patents for appropriating returns to R&D between these two surveys.
- ▶ Why did patenting increase in these industries?

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Patent propensity: semiconductors vs. all US manufacturing, 1979-93



Summary of interview results

- ▶ **Capital-intensive manufacturers**
 - Strong demonstration effect of TI and Kodak-Polaroid cases
 - ▶ "Ramping up"; "harvesting latent inventions"
 - ▶ "If in doubt, patent"
 - Safeguard assets; avoid halt in production
 - ▶ "Exclude before you're excluded"
 - Improve bargaining position with other patent owners
 - ▶ Gain access to external technology on more favorable terms
 - ▶ Secure royalty income
 - Changes (except at TI) in management of patent process
 - ▶ "Patent advocacy committees"; increased bonuses; targets
- ▶ **Design firms**
 - Secure rights in niche product markets
 - Critical role of patents in attracting venture capital

Summary of econometric results

- ▶ Patent production function
 - Patenting proportional to size of firm
 - Until 1984: patents also depend on R&D intensity
 - After 1984: patents depend on capital intensity and not on R&D intensity
 - This pattern also true of computing, electronics, and instruments more broadly (Hall 2003)
- ▶ Growth accounting of the US patent surge shows that it is entirely due to increases in patenting by US corporations in this sector (until the mid-1990s, at least).

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Trend exacerbated

- ▶ Patent portfolio race in semiconductors spreads to integrated ICT firms like IBM, Hitachi, etc.
- ▶ Internet – pressure grows on USPTO for software patents and then business method patents, resulting in two CAFC decisions favoring subject matter expansion
- ▶ Lack of prior art databases and trained examiners causes a number of doubtful patents to issue

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Updated trends 1981-2002

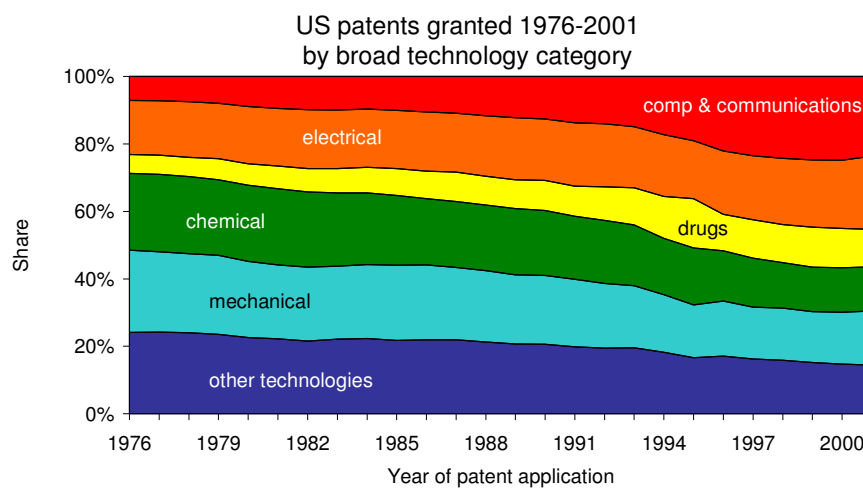
- ▶ Technology trends at USPTO
 - ICT/electrical has risen from 22% to 40%
- ▶ Sectoral trends for US firms
 - Patents per R&D for ICT firms more than doubled
 - Patents per R&D for chemical/drug firms fell slowly

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The shift towards ICT



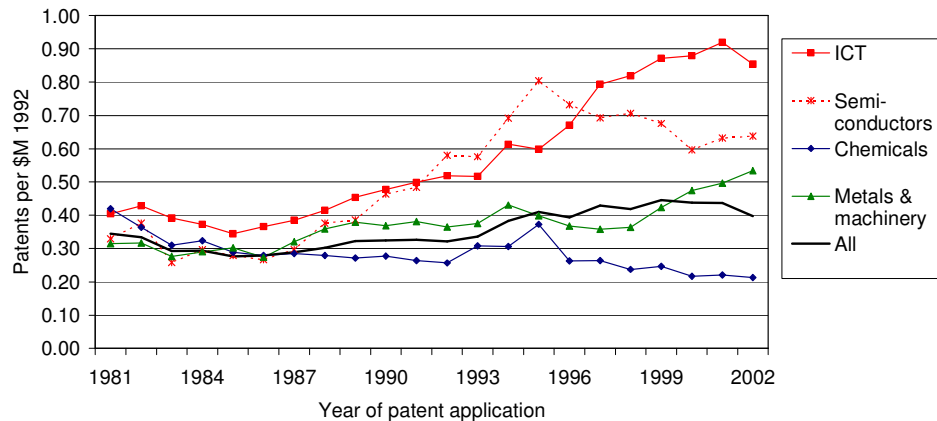
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Sectoral trends to 2002

USPTO patents-R&D ratio for Compustat sectors



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Conclusion

- ▶ Substantial increase in patent applications during 1990s to mid-2000s (5% per year)
 - Primarily due to large firms in ICT portfolio-racing
 - Temporary cause of a decline in patent "quality"
 - Partly driven by subject matter expansion
 - Total pendency rose from 18 mos to 30 mos
- ▶ Now abating
 - Due to economic crisis?
 - Due to tightened standards at USPTO?

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U.S. patent reform

- ▶ On 3 March 2009, two patent reform bills introduced in the US Congress by the chairs of the Judiciary Committees in both houses:
 - Conyers (D-Mich.) introduced H.R. 1260 in the House
 - Leahy (D-Vt.) introduced S. 515 in the Senate
- ▶ How did we get here?

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Origins

The U.S. Federal Trade Commission and The National Academies (NAS) undertook independent, self-initiated studies of the patent system because of concerns about

- ▶ Disparity between USPTO workload and resources
- ▶ Apparent deterioration in patent quality
- ▶ Escalating litigation costs
- ▶ Lack of harmonization among major patent systems
- ▶ Perverse incentives to ignore patent literature
- ▶ Transparency still lacking

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Recommendations: Early Legislative Proposals

	NAS	FTC	HR 2795/109 th Congress
More financial, human resources for USPTO	X	X	appropriations
Institute robust post-grant challenge procedure	X	X	X
Tighten non-obviousness standard for patents	X	X	
Change or eliminate "willful infringement" claim	X	X	X
Change or eliminate "inequitable conduct" defense	X		X
Remove "best mode" requirement for patents	X		X
18-month publication of patent apps w/o exception	X	X	X
Priority on the basis of first-inventor-to-file	X		X
Lower hurdles to validity challenges		X	
Economic analysis for extensions to subj matter		X	

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Evolution

New Issues Emerged in the 109th and 110th Congresses:

- ▶ Injunctive relief automatic or dependent on circumstances
- ▶ Limit forum-shopping in patent suits
- ▶ Appeals of trial court claim construction decisions to the Federal Circuit Court of Appeals
- ▶ Expand USPTO rule-making authority to substantive patent law interpretation, application requirements, etc.
- ▶ Damages based on product's value or incremental contribution of the patented technology

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Most contentious issues reflect interests of two opposing corporate alliances...

Large software and electronics firms and financial institutions with huge patent portfolios used largely for defensive purposes and facing assertions/litigation by non-practicing entities

v.

Manufacturers, especially pharmaceutical and biotechnology firms, for which key patents are used offensively to exclude imitators.

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Recent court decisions

- ▶ Non-obviousness threshold raised (*KSR International Co. v. Teleflex, Inc.*)
 - ▶ Four-factor test for injunctions (*eBay, Inc. v. MercExchange LLC*)
 - ▶ Willfulness threshold raised (*In re Seagate*)
 - ▶ Basis for finding inequitable conduct tightened somewhat (*Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.*)
 - ▶ Software/business methods patentability seemingly narrowed (*In re Bilski*)
 - ▶ Appropriators suspended diversion of USPTO fees
- By the end of the 110th Congress the House had passed patent reform legislation but Senate action had stalled.

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Where we are now

S. 515 and H.R. 1260:

- ▶ First-inventor-to-file priority (conditional on grace period)
- ▶ Post-grant challenges/procedure
- ▶ Damages apportionment and standard for treble damages (willful infringement)
- ▶ Pre-grant third party submission of prior art
- ▶ Patent litigation venue criteria
- ▶ USPTO authority to raise or lower fees
- ▶ Federal Circuit jurisdiction over claim construction appeals

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Where we are now

Not considered in S. 515 and H.R. 1260:

- ▶ best mode requirement
- ▶ inequitable conduct defense
- ▶ universal publication of all applications

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Other changes?

- ▶ Increased renewal fees
- ▶ Independent invention defense



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