Lecture # 10 – Patent Policy Reform

I. You Can Patent That?

- Today's class was a discussion of various issues pertaining to patent policy reform. Thanks to Jason and Nick for leading a very interesting and informative discussion. My lecture notes for this class will focus on organizing the material in the reading, as well as adding some supplemental material. I'll try to follow the spirit of today's discussion, but the organization will not be the same.
- One of the key issues concerns treatment of new subject matter. Below are some of the key points from the reading on software and business method patents.
- Key questions:
    - Are these inventions non-obvious?
    - Are these patents needed to stimulate invention?
    - Are the social costs too high?
        - That is, do they block too many areas of potential innovation?
- The software patent explosion
    - Prior to 1992: fewer than 100 Internet-related patents
    - 1992-1996: 750 Internet-related patents
    - 1999: nearly 4000 Internet-related patents
- Legal background
    - Recall that inventions must be novel, non-obvious, and useful to be patented.
    - The non-obvious requirement asks the following question: Would the invention have been obvious, at the time it was made, to a person with ordinary skill in the field and with knowledge of the relevant prior art.
        - One criticism of the USPTO is that examiners do not have appropriate knowledge of the prior art in software.
    - Courts have identified some things to be unpatentable, such as:
        - Laws of nature
        - Physical phenomena
        - Abstract ideas
    - Prior to 1980, the common view was that computer software and business methods fell under this list.
    - Key legal decisions:
        - 1972 US Supreme Court (*Gottschalk v. Benson*) concluded the computer program applying for patent protection was a mathematical algorithm that, like laws of nature or abstract ideas, does not fall under the category of patentable material.
            - At the time, most programs were custom written. Thus, they didn't work on other machines.
                - More code was written by the computer company, so trade secrets could be used for protection.
            - The move towards mass-produced PCs in the 80s => standardization => "off the shelf" software.

- 1980: Congress modified the Copyright Act to explicitly extend copyright protection to computer programs.
    - However, this turned out to be relatively narrow protection. Recall that copyright standards are not as high. Thus, competitors could offer very similar products without infringing.
- 1981: US Supreme Court (*Diamond v. Diehr*) raised the possibility that computer programs could be patented.
    - They ruled that an invention using temperature sensors and a computer program to calculate the correct curing time for a traditional process of molding rubber goods could be patented.
    - The USPTO had rejected the patent, arguing that the only new part of the invention was the computer program, which repeatedly solved a well-known chemical equation using data from the sensors.
    - The Court said that the invention was an improved production process that happened to use a computer program.
        - The Court appeared to be distinguishing between mathematical algorithms *per se* and the application of an algorithm to accomplish something useful.
        - Patent attorneys learned to write claims that captured the usefulness of software.
- 1994: US Supreme Court upheld patentability of a computer program that smoothes digital data before displaying it as a waveform on a computer monitor.
    - USPTO had rejected because there was no physical transformation of matter.
    - Court argued that the invention, a computer programmed in a certain way, was a machine, and thus patentable.
    - This ruling extended the notion of usefulness as the key criterion.
    - Number of computer patent applications jumped after 1994.
- A recent Supreme Court ruling, Bilski v. Kappos (2010) overturned a lower court ruling that patents needed to involve a machine and/or a transformation of an article
    - Background
        - Plaintiffs tried to patent a system used to hedge seasonal risks of buying energy
        - USPTO denied patent. Plaintiffs sued
        - Key question: should a patent be granted on an invention not meeting the “machine-or-transformation” test
    - 5-4 ruling

            - Lower court was wrong that the "machine-or-transformation" test is the only relevant test
                - However, the law "does not suggest broad patentability" of such inventions
            - The specific invention in question was nonetheless ruled not patentable
            - The minority suggested business methods should not be patentable
        - Courts have generally held that there must be some purpose to the software beyond the algorithm itself (see examples, Graham and Vishnubhakat, p. 74)
- Business method patents
    - Business methods have existed throughout history.
        - Example: In 1982, Merrill Lynch's obtained a patent for the computer system used to implement their cash management accounts. Paine Webber sued to invalidate, saying it was unpatentable. A federal court sided with Merrill Lynch.
        - Increased Internet use and increased patenting of software in the 1990s led to an increase in patents for doing computer-related business.
    - 1998: State Street v. Signature Financial Group validated business method patents.
- Smart Phones and Software Patents
    - What is a software patent
        - Software patents are general purpose technologies
            - They are used in many fields
        - Difficult to identify, because often combine software and non-software components
        - 133 patents initially involved in lawsuits
        - As of November 2012, 73 controversial patents remained
            - Most included at least one software claim
            - However, 8 did not (e.g. display technology, microprocessor instead of software)
        - Of the 65 software patents, 21 have received preliminary decisions
            - 80% of those likely valid
            - Inconsistent with the claim that low quality patents are the problem
                - Is this necessarily true? Might the patents meet legal standards, but still be problematic?
- How do software patents compare to other patents?
    - Rejection rates for both software and non-software patents have increased since 2005
    - Software patents 1.4% more likely to receive first rejection, and 2.4% more likely to have a final rejection
        - Note that a first decision may not be final, as the applicant can amend the application and seek continued examination

    - Internal USPTO audit reviewed 29,000 random patents to see if correctly awarded. No differences between software and non-software patents
        - Note, however, that this depends on the patent office defining what is "correct"
    - Denials of software patents upheld when appealed 8.2% more often than non-software patents
    - Graham and Vishnubhakat argue the evidence does not support the claim that the USPTO approves weak software patents
        - But could it be the idea of patenting these technologies itself that is the problem?
- Are these patents good or bad?
    - Arguments in favor of these patents
        - Patents are designed to stimulate research. From 1995-98, R&D by computer firms grew 67%.
            - Response: sales grew 65%, so R&D growth just a sign of industry growth.
            - R&D/sales ratio rose from 5% in early 1980s to 7.5% in recent years.
                - Most of the increase occurred during the 1990s.
        - The poorest quality patents are simply a learning phenomenon. They will not hold up in court.
        - Licensing provides an opportunity for small firms.
    - Arguments against these patents
        - Many of the patents have been poor.
            - The USPTO has missed examples of prior art.
            - Even if these patents are not enforced, they lead to costly litigation.
        - Lots of patents with weak standards increase the risk that a new invention will infringe on an existing one.
        - In addition, competition among patents may make them less valuable.
            - In high tech, innovation is fast, so last effect dominates the previous.
        - Cumulative nature of high-tech leads to "patents arm races" in which companies need to cross-license technologies from rivals.
            - This can delay introduction of new products, which is particularly harmful in a fast-paced industry.
        - Innovations in this field were occurring long before software and business methods were patentable.
        - The high costs of licensing provide a barrier to entry for small firms.
    - These ideas raise a discussion question: is software protection good or bad for the industry (as opposed to society as a whole)?
        - Do firms patent because they want the benefits, or because they need to, since everyone else is doing it?
- Boldrin & Levine use examples of the problems with smartphones
    - Microsoft imposing licensing fee on Android phones

- Charging the fee for a feature for scheduling meetings that is rarely used
  - Example of the patent pool problem. This is one of 1000s of patents in a smartphone operating system
  - Each one can lead to licensing fees and hold up innovation
- Google purchasing Motorola was defensive – access to patents – not to increase innovation
- Patent pools create barriers to entry

II. Patent Policy Reform: What are the Issues?

- Concerns raised about the U.S. patent system
  1. Problems with new subject matter
     - Prior art is poorly defined
       - The goal is to protect new ideas without encroaching on ideas in the public domain.
     - Even if poor patents are eventually found invalid, after the fact litigation is costly
     - The examination process
       - Patents are assigned to a technology class and examiner group
       - Examiners have specialized training in a given technology
       - While a patent may be in the queue for multiple years, an examiner likely only looks at it for a couple of days
       - Congress states that a person is "entitled to a patent unless" the examiner finds reasons to deny the application
         - Basis for rejection depends on a search of the prior art
     - However, note that the USPTO has changed some practices in response to concerns:
       - Double review for business methods patents
       - Mandatory search of non-patent literature for computer and software patents
     - Proposals to address include:
       - Independent inventor defense (as with copyrights)
       - Allowing limited reverse engineering for software to ensure compatibility
       - Allowing exemptions against infringement for using research tools for experimental purposes, even if it leads to new commercial products (the “even if” is currently not allowed)
  2. Questions of quality pertain to a reduction in the standard for non-obviousness
     - Relates to concern over patent “height:” how novel is the new invention?
       - Jaffe/Lerner cite examples such as patents for crustless peanut butter sandwiches and using a laser pointer to amuse a cat.
     - *Apple v. Samsung*

        - In August 2012, a US jury found Samsung guilty of infringing 6 Apple patents
            - Ordered to pay over $1 billion in damages
        - Dispute was over the look and feel of phones
            - Ability to zoom
            - Rubber band effect when scroll to bottom of a page
            - Rounded corners on icons
- Possible causes:
    - The role of the US Federal Circuit Court of Appeals
        - There was concern in the US that invalidated patents put the US at a competitive disadvantage.
        - This led to the Court of Appeals.
        - The Court of Appeals is "more willing to rely on secondary factors, such as evidence of commercial success, to indicate that an invention was nonobvious."
            - Other decisions made it easier to get a temporary injunction against potentially infringing activity.
    - Changing pressure on examiners
        - The USPTO gets its revenue from applicants, and now views patent holders as its constituency.
        - As such, there is more pressure to issue patents.
            - One examiner says "When I first started here, I was told, 'When in doubt, reject' and to try to reject. Now I am told, 'When in doubt, allow' and try to find a reason to allow."
    - Compared to others with similar training (lawyers, engineers), examiners are underpaid. This makes hiring qualified people with the necessary technical and legal skills difficult.
- Note that a recent Supreme Court decision addresses nonobviousness as interpreted by the US Federal Circuit Court of Appeals
    - In *KSR International v. Teleflex* (4/30/2007), the Supreme Court unanimously overturned a patent granted to Teleflex
    - The patent was for an adjustable gas pedal.
        - It combined two known elements: the pedal and an electronic sensor.
    - KSR challenged, saying the combination was not a new invention.
        - A lower court agreed, but the Circuit Court of Appeals overturned the lower court and upheld the patent.
        - Circuit Court of Appeals said an invention was not obvious by looking at whether some "teaching, suggestion, or motivation" had anticipated it.

        - Supreme Court said this test was too rigidly applied.
        - Makes many patents vulnerable to challenge.
3. Length of examination time
    - Part of the problem with pendency times comes from staffing issues, particularly in new fields such as biotech and software.
    - However, delays also result from intentional attempts to slow the process via continuations.
        - Firms use continuations to keep an application active even after the first patent has been granted.
            - This serves as a hedge against changes in the market .
        - Continuations also contribute to patent thickets.
4. The rise in litigation costs
    - Litigation increases uncertainty over the value of a patent:
        - Uncertainty over the commercial significance of the invention
        - Will the invention have value?
        - Uncertainty about the validity and scope of the patent.
        - This pertains to enforcement and litigation.
        - They note that 46% of patents are held invalid.
    - Litigation can cost from $1 million to several million
        - Lerner (1995) estimates the costs of patent litigation started in 1991 at $1 billion, which is 27% of basic R&D expenditures that year
    - Length of litigation is increasing
    - Litigation begins in federal courts with a jury trial.
        - Appeals go to the Federal Circuit Court of Appeals.
        - Defendants typically claim:
            - That the patent claim is invalid, and
            - that they weren't infringing anyway.
        - The remedy for infringement includes injunctions, recovery of lost profits, and triple damages if there is "willful infringement."
    - Only 1.5% of all patents litigated (and only 0.1% go to trial).
        - Higher in some industries: 2% for drugs and health, 6% for biotech.

    Ways to avoid litigation:
        - Don't do research in areas where firms have a competitive advantage in litigation
        - Defensive patenting: amass patent portfolios
            - The probability of a patent being involved in a litigation suit falls when the patent holder has a larger portfolio
            - Exception: not true for pharmaceuticals

        - In 2013, the Supreme Court heard a case about whether victors in patent cases can sue to have opponents pay legal fees
            - Currently, losers forced to pay if the case is deemed "exceptional"
                - Lower court ruled that a party sued for violating a patent must show that the charges were objectively baseless and that there is evidence of bad faith by the plaintiff
                - In contrast, it is easier for a patent holder to recover costs if winning a case
            - Octane Fitness, who defended an infringement suit, wants the standard lowered to say should recover if there was an "objectively low likelihood" of winning the case
            - Could prevent abuse (e.g. patent trolls), but also makes it more difficult for smaller firms to challenge large firms
    5. Other areas of concern: raised by the STEP report
        - Access to patents for research
            - Universities typically assumed they would not be sued for infringement during non-commercial research.
            - A 2002 ruling of the US Court of Appeals for the Federal Circuit changed that.
            - However, in 1999, the Supreme Court struck down a law stopping states from claiming immunity from infringement.
                - Does this mean private universities can be sued, but public ones cannot?
        - Differences across nations add to the cost of patenting
            - Different search requirements, disclosure, etc.
        - Does willful infringement discourage dissemination?
            - An infringer can be required to pay triple damages if it can be shown that the infringer was aware of the patent.
            - This might deter firms from learning about other patents, to avoid this possibility.
                - But one of the goals of the patent system is dissemination!

III. Are Patents Necessary?

- Patent puzzle: despite increase in number of patents and strength of patent protection, US economy has not seen increases in productivity or R&D.
    - General equilibrium effect of patents on R&D can be negative
        - Reduces ability of other firms to compete
        - Potentially increases wasteful lobbying ("rent seeking")
    - Historical evidence suggests patent protection most important for mature industries
    - Argue that competition and first-mover advantage are main drivers of innovation

- How do patents hurt innovation?
  - Patents don't just affect current researchers, but also "follow on" researchers.
  - Stronger patents mean future researchers are more likely to infringe.
  - Boldrin & Levine use examples of the problems with smartphones
    - Microsoft imposing licensing fee on Android phones
      - Charging the fee for a feature for scheduling meetings that is rarely used
        - Example of the patent pool problem. This is one of 1000s of patents in a smartphone operating system
        - Each one can lead to licensing fees and hold up innovation
      - Google purchasing Motorola was defensive – access to patents – not to increase innovation
      - Patent pools create barriers to entry
  - Do patents encourage information disclosure
    - Argue if secret can be kept longer than the value of patent protection, innovation will keep the idea secret
      - Seems more likely for process than for products
    - Engineers often told to avoid studying patents when developing new products, so as to avoid infringement
      - Cohen *et al*. survey says patents are not a valuable source of info
      - In fast moving technologies, patent information is outdated when granted
    - Publishing applications may help
      - Note that surveys find patents more useful for information in Japan.
    - Patent portfolios and the tragedy of the commons lead to more disclosure, even if not more innovations.
      - Note that stronger patents encourage patenting, and thus encourage defensive patenting.
- Evidence: Do patents encourage productivity growth?
  - Patents increasing, but R&D and productivity not increasing
    - I would note that the increase is due mostly to new sectors patenting. Shouldn't expect increases elsewhere
  - Boldrin and Levine argue that biotechnology and software were thriving without patents
  - Studying is difficult, as harmonized patent laws leave little variation to examine
    - Evidence supporting links between patents and growth
      - Gould and Gruben (1996): use cross country data to show patents => economic growth
      - Branstetter and Saggi (2011) find increased in developing countries => more inward FDI, greater local production, and higher wages for labor

- Do stronger patents stimulate more innovation?
  - Metastudy of 24 studies asking whether stronger IP => innovation
    - Claim to only find weak or no evidence
    - Strengthening IP increases flow of foreign investment in sectors using patents heavily
    - Note that these studies focus on strengthening patents, not the existence of them.
    - Patents more common in competitive industries. These industries are also more productive
      - Boldrin & Levine argue it is competition, not patents, that spur productivity.
    - Kortum & Lerner (1998) don't find support for friendly court hypothesis.
      - Patent applications hadn't increased from foreign nations.
    - Lerner (2001) finds an inverted-U relationship
      - Strengthening patents has a positive effect if protection is initially low, but a negative effect if protection is initially high.
    - Licensing requirements may lead to barriers to entry.
      - Hall/Zedonis (2001) find new semiconductor firms spend $100-$200 million in licensing fees for basic technologies.
      - Thus, they are a problem in complex industries.
  - Graham and Vishnubhakat argue that without convincing evidence, simply dismantling the patent system is too drastic a change
- What does encourage innovation?
  - First mover advantage
    - Apple earned substantial rents on iPhone before facing competition
      - Had exclusive market for 16 months
    - Surveys suggest lead time more important than patents
      - Exceptions: pharmaceuticals and medical instruments
    - Consider the life cycle of an industry
      - When new, many firms compete to enter the market, each with different products
      - Demand for the product grows and quality increases
        - Demand will be price elastic, because there is lots of competition
      - At this point, entering the market and reducing costs are the goals
    - As industry matures, demand stabilizes and becomes less price elastic
      - Market concentration increases as some firms leave the industry
      - Rent seeking becomes more important
      - Patents used to inhibit innovation and prevent entry

            - Patent litigation takes place when innovation is low
            - Costs of litigation are high
    - What about pharmaceuticals?
        - Most of the development costs are for clinical testing
        - By law, clinical tests are done privately
            - Should they be considered a public good?
                - Could be funded by NIH
        - Should drugs be allowed to enter the market before clinical testing is complete?
            - Boldrin & Levine argue that the prices should be regulated until clinical testing complete
                - Would allow sales at higher prices once proven effective
        - Would generics immediately if didn't have patents?
            - Now, they have 10 years to reverse engineer a drug while waiting for it to come off patent
            - Lanjouw (1998) finds it takes four years in India to bring a copycat drug to market
                - Suggests there is a first-mover advantage even in pharmaceuticals

IV. Patent Reform Proposals

- An important thing to remember is that patents have two purposes:
    1. Spur innovation
    2. Encourage disclosure
- What do Boldrin & Levine argue?
    - Few patents granted only for innovations with high fixed costs, low imitation costs, and inelastic demand
    - Note how this relates to the two concerns above
        - Patents most useful for spurring innovation when fixed costs are high and risk of imitation is great
    - However, they feel that politics makes reform impossible
        - Note that, over time, patents have become more restrictive
            - This is also consistent with theory saying appropriate patent protection varies as a country develops
        - Consumers do not play a prominent role
            - It is a technical subject
            - Few voters know much about patent policy
        - Leads to regulatory capture
            - Players are:
                - Inventors
                - Corporate lawyers
                - Patent trolls
                - Patent office
                - Courts

- Pressures of patent office
    - Applicants and lawyers want low standards so that patents are issued
    - Many judges for the US Court of Appeals for the Federal Circuit are former patent attorneys
- Patent infringement cases are a public good
    - If win, anyone can use the patent, not just the plaintiff

- How do Graham and Vishnubhakat feel about patent reform?
    - They argue that problems with the patent system have occurred throughout US history, and that the patent system can adjust
    - History of patent reforms
        - Until 1836, all patent applications were approved.
            - Courts needed to decide validity
        - Other reforms:
            - 1930: extend eligibility of plant patents
            - 1952: clarifying case law
            - 1970: extent eligibility of plant patents again
            - 1982: US Court of Appeals for the Federal Circuit
            - 1994: TRIPS: 20 year term from priority date
            - 1999: American Inventors Protection Act: publish applications
        - Historic examples of patents
            - Eli Whitney patented mechanical cotton gin in 1794.
                - However, local juries often did not support his patent in court
            - Elias Howe patented a sewing machine in 1846
                - Did not use the patent, however
                - Rivals were unable to invalidate patent in courts
                - 1856: one of the first patent pools established to cross-license relevant patents for sewing machines
            - Wright Brothers patented wing and steering design of their airplane in 1906
                - Infringement cases delayed development of airplanes until 1917, when Asst. Navy Secretary FDR pressured rivals to allow unrestricted production of planes for the war effort
            - 1957: patent for LASER by Gordon Gould
                - Some of his patents were submarine patents – no longer possible
            - Note that in each case, patent reforms were possible to adjust the system as needed
            - Graham and Vishnubhakat argue that moving quickly and adjusting is better than doing nothing

- Challenges for software patents
    - Patents must balance the scope, so that the reward is commensurate with the scope of disclosure
        - For software, imprecise terminology makes this difficult
        - Describing functionality, rather than a specific product
    - Recent court cases have strengthened the requirements for such patents
    - Considering obviousness also important
        - *KSR v. Teleflex* (2007): Supreme Court rejected a narrow definition of obviousness
        - Along with the *2010 Bilski v. Kappos* case, these suggest laws on software patents still evolving
            - Note that the case did not clearly state where the boundaries are
- What are some proposed reforms? What problems do they address?
    - Hiring additional examiners
        - To reduce pendency time and allow examiners to spend more time on searches.
        - The USPTO now requires a second set of eyes for biotech and semiconductor patents.
        - USPTO has proposed increased fees, and additional fees for patents with 20+ claims, to help pay for this.
    - Use an opposition system
        - A third party can dispute a patent either just before or just after it is issued.
            - Used in Europe and, until recently, in Japan.
        - Provides better incentive to disclose prior art.
            - Don't want to be caught by outsiders
        - Should focus on most important patents
            - Firms would be reluctant to pay the legal costs for unimportant patents.
        - Problems:
            - Evidence may be biased
            - 3rd parties have excessive interest in blocking even good patents.
                - Does this give large firms an advantage?
            - Free-rider effect
                - Everyone in the industry benefits if a patent is overturned, so no one firm may be willing to bear the costs.
    - Three types of post-grant challenges allowed by 2011 American Invents Act
        - Post-grant review
        - Third party review
            - Allows anyone to submit evidence for examination
            - Ensures examiners have the most relevant information
                - May be particularly important in fast-moving areas

        - Reviews for “covered business methods” allowed
            - Allows a party sued for using a business method to challenge its validity
            - Business methods in software are eligible for review
        - All reviews done within one year, by a panel of administrative judges skilled in both the technology and in patent law
    - More information
        - Databases of non-patented prior art would help patent examiners deal with new technology areas.
        - The USPTO requires searching non-patent literature (NPL) for software.
    - Eliminate triple damages for willful infringement.
        - Removes subjective nature of litigation
    - Prior use defense could allow independent invention and help alleviate concerns over patenting things in the public domain.
        - Used for software as part of the American Inventors Protection Act.
        - Does this reduce incentive to disclose innovations?
    - Harmonize patent systems
        - First-to-file rules would simplify claims over priority.
            - Passed in America Invents Act of 2011.
    - Publish all applications after 18 months
        - Prevents surprises, and is necessary for opposition.
    - Levels of review
        - Jaffe/Lerner propose that trivial patents be dealt with at lower levels.
        - Petty patents are used in 60 countries.
        - Often not formally examined.
        - Involve smaller inventive steps, and offer shorter periods of protection.

- Changing litigation rules
  - Can no longer file one suit for infringement against many defendants
    - Must now file each individually
    - Has led to explosion of suits
  - In June 2013, President Obama ordered the USPTO to require companies to be more clear about what their patent covers and how it is being infringed
    - Goal is to reduce suits from non-practicing entities (e.g. patent trolls)
  - 2013 Supreme Court heard a case whether victors in patent cases can sue to have opponents pay legal fees
    - Currently, losers forced to pay if the case is deemed “exceptional”
      - Lower court ruled that a party sued for violating a patent must show that the charges were objectively baseless and that there is evidence of bad faith by the plaintiff
      - In contrast, it is easier for a patent holder to recover costs if winning a case
    - Octane Fitness, who defended an infringement suit, wants the standard lowered to say should recover if there was an “objectively low likelihood” of winning the case
    - Could prevent abuse (e.g. patent trolls), but also makes it more difficult for smaller firms to challenge large firms