Patents and the Financing of New Innovative Firms

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Patent system as viewed by a "two-handed" economist

Effects on	Positive	Negative
Innovation	creates an incentive for R&D and innovation investments	impedes the combination of new ideas & inventions; raises transaction costs; inhibits cumulative invention
Competition	facilitates entry of new or small firms with limited assets; enables vertical disintegration	creates short-term "monopolies", which may become long-term in network industries

This paper

- Focus on the lower left hand corner – patents as an aid to obtaining finance, promoting competition from new entrants
- Theory supplies two reasons this might be true:
  - Salvage value (patents as assets)
  - Signaling

Patents as assets

- Startup firms in technology areas usually have relatively few tangible assets
- Primary assets are their ideas
- Property rights on those ideas should help secure financing
  - In principle, patent rights increase the salvage value of a firm that fails

Signaling

- Spence (1973) for employees, in this context:
  - VC cannot see project quality
  - High quality types signal quality with patents
  - Effective because easier/cheaper to get if high quality
- Conti et al (2013) refinement:
  - Cost of patenting inversely related to project quality
  - Patents also increase returns (appropriability)
  - Unique signaling equilibrium where entrepreneur files for more patents than in symmetric info case
  - Assortative matching between VCs and entrepreneurs

Empirical evidence

- Three questions:
  1. Patenting ⇨ VC funding
  2. VC funding ➡ patenting
  3. Patenting and startup performance
- Simultaneity between the first two, making causality difficult to identify.

Preliminary observation

- With the exception of two samples of Israeli startups (mostly VC-backed), fewer than half of the firms in the various samples studied have applied for patents.
- Applying for patents somewhat more likely in biotech and life sciences.
- That is, many firms do without, or do not even apply until much later in their growth (after successful VC-financing and often unobserved by the research papers I survey).
- Why not? Graham et al. (2009):
  - Software –cost, including enforcement, trade secret use
  - Biotech –cost, fear of too much disclosure

US evidence (1)

- Hsu and Ziedonis (2008) - 370 VC-backed semiconductor firms
  - Doubling in patent application stock associated with a 28 percent boost in funding-round valuations.
  - Greater in earlier financing rounds and when funds are not secured from prominent investors.
  - Larger patent stocks increase likelihood of sourcing initial capital from prominent VCs; liquidity through an IPO.
- Mann and Sager (2007) –VC backed software firms
  - 25% acquire a patent
  - Firms that do get a patent experience better performance in terms of financing, survival, and exit status.

US evidence (2)

- Sichelman and Graham (2010) - large survey of startup and early-stage companies conducted in 2008
  - Biotech, medical instrument, software, internet, computer hardware
  - Response rate about 10 per cent, yielding 1000 companies
  - Rated financing and improving exit valuation as moderately to very important motives for obtaining patents.
  - Both cos & expert investors - patents more important for biotech and medical device firms than software and internet firms.
  - Nevertheless, about half of the experts found patents relevant for software and internet.
- Cockburn and MacGarvie (2009) – patenting in narrow software categories
  - Thicker markets – lack of patents delays VC funding and IPOs, more after patentability changes in 1995 and 1998

Non-US evidence

- Haeussler et al. (2009) – German and British biotechs
  - European patent applications an important signal to VC investors
- Helmers and Rogers (2011) - all high and medium tech startups in the UK in 2000
  - Positive impact of UKIPO or EPO patent application in 2000/2001 on asset growth 2001-2005.
  - Uses a sample selection model to control for exit
- Munari and Toschi (2015) – VC-financed nanotechnology firms
- Greenberg (2013), Conti et al. (2013) – VC-backed Israeli firms

Conclusion

- Patents help startups raise funds
  - Importance varies by sector
- Patents associated with better performance (growth, survival) by these firms

BUT

- What is the source of increased funding and better performance?
  - The patent right – the asset?
  - Or the associated invention(s) for which the patent is a signal?

Causal evidence

- Farre-Mensa, Hegde, and Ljungqvist (JF 2019) – first time US patenters, for-profit firms
  - Instrument patent application first action success by examiner leniency (past grant probability)
  - If (instrumented) first action decision positive, then
    - 50-80% higher growth five years later
    - More follow-on patenting
    - Greater access to VC-funding
  - Implies patent right itself is valuable

Salvage value

- Theory
  - Patented invention has potential value, even if firm that made it failed.
  - Potentially useful to another firm, possibly in conjunction with their own inventions
- Practice
  - Purchase by other established firms for defensive purposes
  - Purchase by a mass patent aggregator, used in litigation
  - Feldman (2014) – 65% of VCs do not consider salvage value when funding firms (18% do, remainder neutral)

Market for "ideas"

- Gans & Stern (2010) – Roth (2007) on preconditions for successful market, in the case of ideas:
  - Market not thick, due to need for complementary assets, possibly held by other firms
  - Ideas nonrival in use, but rival in value (congestion)
  - Given copying and reverse engineering, market is not safe
- Agrawal et al. (2015) – survey of potential licensors; confirming the above - deals fail because
  - Finding a partner difficult due to thin market, agreement on IP scope
  - Bargaining frictions
  - Lack of market safety due to inability to fully protect IP

Evidence on salvage value

- Most is for all firms, does not focus on startups
- Sampling frames not well-defined
- Love et al (2017): >100 sales offers of patent lots 2012-2016.
  - Sellers 2/3 operating cos,
  - Buyers operating cos and PAEs/defensive aggegators (who are the vast majority of asserters)
- Oliver et al (2016) – similar data
  - 70-80% when company is underperforming the NASDAQ 100
- Serrano & Ziedonis (2018) 285 failed VC-backed startups
  - 68% of patents sold within 5 years, mostly to oper. cos.

Evidence on salvage value

- Growing importance of auctions like Ocean Tomo?
  - Studies of 2006-2008 auctions find about half sold in lots, at $50,000-150,000 per patent
  - OTPAT - Ocean Tomo patent value index in 2006, used as basis for some ETFs
  - Mauck & Pruitt (2016) – positive excess returns vis-à-vis CRSP value-weighted and benchmark portfolios 2008-2013.
  - Nevertheless, appears not to have attracted investor interest – all are defunct today (some patent applications, many abandoned, some used as security)
  - 2009/2010 attract little interest, business sold to ICAP, however both seem to be in the auction business now.

Interim conclusion

- Market for patented technologies does exist but….
  - Not fully developed
  - Evidence very incomplete, due to lack of transparency in some parts
  - Specifics on firms and prices sometimes hard to come by
  - Differences between
    - Sales by firm exiting a line of business which may still be viable
    - Sales by failed startup, whose technology may not be that valuable
  - We have more evidence on the former than on the latter
- Do these markets allocate patented technology to its most productive use?

The dark side?

- Patents acquired for range of reasons, most of which do not involve actually using the protected technology
- Burstein (2015) – problems with these markets:
  1. Presence of some low quality patents (Bessen & Meurer 2009 on fuzzy boundaries; free-riding problems)
  2. Frequency of parallel invention (Cotropia & Lemley 2009 on very little alleged copying in suits)
  3. Bargaining threat points that allow extraction of more value than the invention (Lemley & Shapiro in several papers)
  4. Actual returns to inventors are low (so incentive effects are weak) – Bessen et al (2011), Chien (2014),
     - Haber & Werfel (2016) find inventors prefer certain returns or contingent fee arrangement to monetize their patents

Market for enforcement rather than technology?

- 63% of Ocean Tomo lots sold 2006-2008 purchased by non-practicing entities (NPEs)
- Love et al (2017) – most enforcement litigation comes from patent assertion entities (PAEs) purchasing for that purpose
- Cotropia et al (2014) – half of patent cases filed in 2012 from NPEs, in ICT 70%
- Hall & Ziedonis 2008 on litigation in semiconductors
  - Large R&D-doing firms more likely to be a target of patent lawsuits
  - Surge in lawsuits filed by "non-rivals", "ex-rivals" such as Wang, Univac, etc.
- High profile patent portfolio acquisitions mostly involve ICT, especially mobile telephony, for defensive purposes

VC startup view

- Feldman (2014) – survey of VCs and portfolio cos
  - One-third of startups have received patent demands, more in ICT
  - 2/3 report all or almost all from PAEs
  - 58% report significant impact
  - 100% of VCs will not invest in company with existing patent demand
  - Generally negative view of the rise of PAEs

An unanswered question

- Do the benefits of patents for entry and the creation of salvage value outweigh the transactions costs associated with the assertion of patents by exiting firms and by patent aggregators?
- Cautionary quote from Haber and Werfel (2016):

  "Some studies claim that PAEs extract rents via nuisance lawsuits, thereby placing a direct tax on innovation. An alternative hypothesis is that PAEs are financial intermediaries that facilitate innovation. These hypotheses are not mutually exclusive." (from their conclusion)

BACKUP SLIDES

Defensive purchase

- May 2011 – Google purchases Modu (failed maker of tiny phones) patents for $4.7M
- June 2011 – Nortel's 6000 patent portfolio purchased for $4.5B by a consortium (Apple, EMC, Ericsson, Microsoft, RIM, Sony) – 750K/pat
- Aug 2011 - Google purchases Motorola Mobility for $12.5B, primarily for 17.5K-25K patents (500K/pat)
- Aug 2011 – Kodak puts 1100 patents up for sale – est $2B (1.8M/pat), puchased Dec 2012 by Gogle/Facebook/Apple/samsung consortium for $525M
- Sep 2011 – Google purchases 1023 patents from IBM
- March 2012 – Facebook purchases 750 patents from IBM for "hundreds of millions" (~200K-500K per patent)
- ……and other such transactions

Mass patent aggregators

- Ewing & Feldman (2012) http://stlr.stanford.edu/pdf/feldman-giants-among-us.pdf
- Intellectual Ventures
  - Founded in 2000; began massive accumulation of patents in 2004/2005
  - Raised $5B in capital commitments from
    - Large tech companies
    - World Bank/ Hewlett Foundation
    - Universities
  - Structured as venture/private equity fund (tax reasons)
  - Estimated worldwide patent holdings 30K-60K, placing it in the top 20 firms globally

Hidden threats?

- IV has 1000+ shell companies, mostly located in Nevada, Delaware at the same registration addresses
- 1000+ transactions acquiring patents
- Can be delays in registering patent reassignment when purchased, sometimes as long as 7 years
- Generally uses third parties to sue for infringement, began suing under its own name in Dec 2010
- So a potential licensor will not learn who to approach easily (*ex ante*)
- See Ewing & Feldman (2012) for details

Why is this successful?

- Most of the activity is in ICT, where
  - Independent invention common – for non-pharma, 4.5% of wilful infringement complaints allege copying (Cotropia & Lemley 2009)
  - Notice is weak, property rights vague (Bessen & Meurer 2010)
  - Discovery and search impossibly expensive due to lack of a way to organize ICT patents, esp. software (Mulligan & Lee 2012) – $O(n^2)$
- Net result – even if patent not an incentive for invention, it has the potential to earn rents from licensing or litigation settlement

Why invest in IV?

- For some, diversification of financial portfolio
  - World Bank, foundations
- For others, a litigation defense insurance
  - E.g., Verizon paid $350M for licenses and an equity stake
  - 2008 – TiVo sued Verizon for infringement
  - Verizon (one of the investors) purchased a patent from IV, counterclaimed against TiVo