

Lecture 2

Patents

- A patent is a set of exclusive rights granted by a sovereign state to an inventor or assignee for a limited period of time in exchange for detailed public disclosure of an invention.
- It is usually for 20 years.
 - Some exceptions

Patent

- Gives the inventor the right to litigate anybody that makes, uses, sells, imports in the protected country

Example:

- I have a patent only in Greece for a tomato seed
- Someone in France makes the seed and sells in France → I cannot sue
 - If export to Greece, I can

Patents

- Two justifications for granting monopoly rights via patents.

- 1) Incentives for R&D

- Risky, time and money

- 2) Full disclosure of invention

- (sequential innovation)

There is also a third that has been overlooked:

- 3) Market for ideas. Clearer rights → market efficiency

Patent Length

- The government can provide incentives for R&D by providing more years of patent protection.
- Overall, patents are protected for 20 years from application date.
- However, for some patents patent protection can be extended
 - Drug Price Competition and Patent Term Restoration Act
- Also, applicants pay maintenance fees and the government can set the fees.

Patent Breadth and Scope

Patent breadth defines the technological territory claimed and protected by the patent - the area in the technological space within which competitors cannot offer rival innovations without infringing the patent - and is explicitly chosen by the innovator.

- Yiannaka, A., & Fulton, M. E. (2002). *Patent Breadth as an Entry Deterrent: The Case of Vertically Differentiated Product Innovations* (No. 375-2016-20041).

The scope of the claims of a patent determines the ability of competitors to produce substitutes without fear of infringement suits, and hence the real 'monopoly power' of the patent holder

- Merges, R. P., & Nelson, R. R. (1994). *On limiting or encouraging rivalry in technical progress: The effect of patent scope decisions. Journal of Economic Behavior & Organization, 25(1), 1-24.*

The four criteria for patentability

- 1) **Patentable subject matter**.-Can everything be patented? No
- 2) **Utility** An invention must offer some positive benefit to society
- 3) **Novelty** An invention must not have been previously used or described in a single publication
- 4) **Non-obviousness** An invention must differ from the "prior art" in ways that would not have been obvious to somebody who had ordinary skill in the technology. This criterion is one that the Patent Office spends the most time to either approve or disprove at an invention

Applicant vs. Inventor

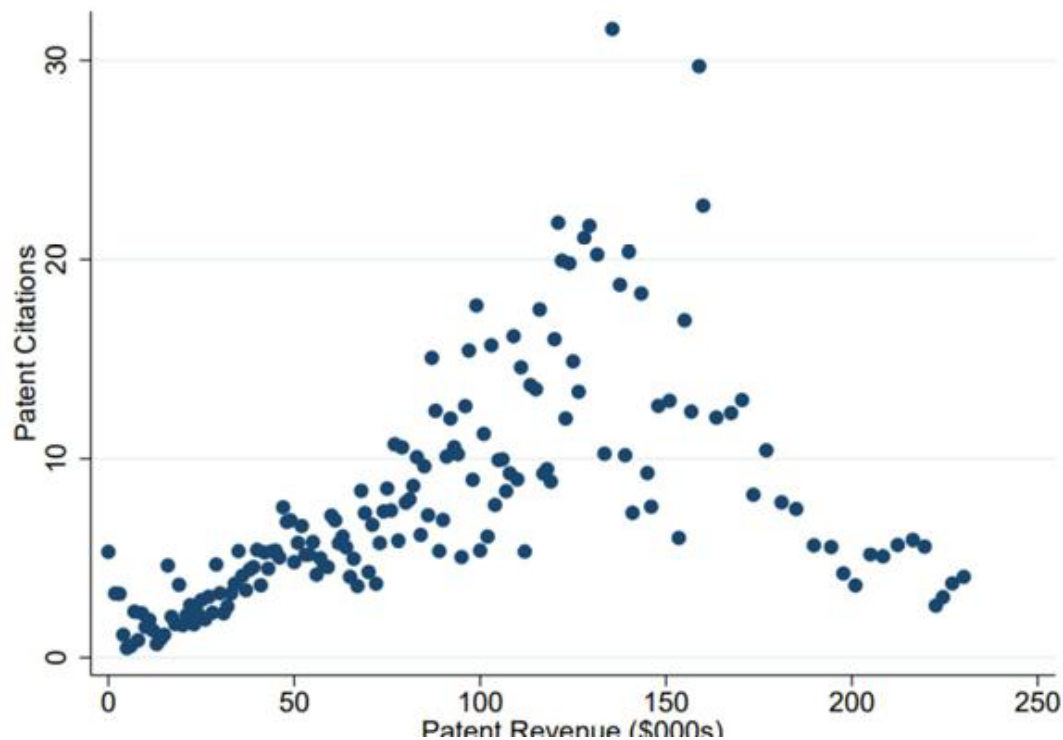
- In certain offices (e.g. USPTO) only a person can file for a patent.
- After a few days (or on the same day) the inventor transfers right to the owner (applicant).

Obtaining a Patent is a Marathon, not a sprint...

- To obtain a patent from filing date to grant date can take years.
- During these years, you need to interact with the patent office (usually via a patent attorney).

How can we perceive #4digit IPCs?

- The more technological fields a patent is relevant to, the more likely it will “harm” other patents’ interests.
- ipcs -> predefined common codes of technological fields-> higher changes of litigation
- Citations -> show knowledge flows
- Claims: description unique (most important part)



Who adds the citations?

- In the US, the “duty of candor” rule requires all applicants to disclose all prior art of which they are aware. Therefore, many citations at the USPTO come directly from inventors, applicants, and attorneys and are subsequently filtered by patent examiners.
- The “duty of candor” rule does not exist at the EPO, and patent citations are added by the patent examiners when they draft their search report.

Patent Claims

- Always look for that.
- The Description of the invention is the subject matter.
- However, what do you claim the patent for?
- There is a lot of back and forth between examiner and applicant about the patent claims.

More claims lead to bigger application length

- The language is technical (drafted by lawyers)
- However, perhaps the most important dimension of the patent.
- Claims are related to patent value

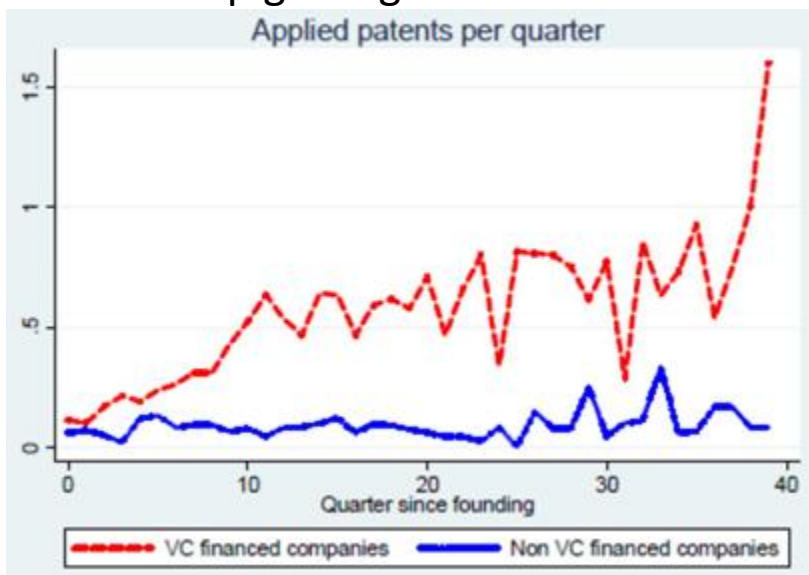
Net Present Value (NPV)

- The invention will provide benefits in the many years to come.
- We need to evaluate this stream of monetary flows in today's terms.
- So, we need to discount future flows.
- In doing so, we will also subtract any present or future costs.
- Hence, we do not estimate the Present Value but the Net Present Value.

Venture Capital

- The perception is that VC funds the early stages of R&D in a startup.
*1 £K £ → 10%
10 £K £*
- In reality only 6% of VC goes to startups.
- VC plays an important role in infrastructure and developing the firm.
- The VCs are not in it for the long-term. They want to provide support until a company is sold or goes for an IPO.
- The idea is that VCs invest in good ideas and people. In reality VCs invest in high-growth industries (right when they grow)
- Ideally VCs fund x million for y% of the company's equity. Then they say if the company fails, the VC has first right in any of the company's assets.
- They require favorable terms because the probability of failure is very high.
- There can be multiple VC rounds

Patents help getting financed



Trademarks also...

- Show that the number and breadth of trademark applications have inverted U-shaped relationships with VCs' financial valuations of start-ups.
- In later funding rounds, the positive effect of new trademark applications decreases when the start-up progresses into a more advanced development stage.

Initial Public Offering

- A milestone for any company is the issuance of publicly traded stock.
- When a company wishes to make a public offering, its first step is to select an investment bank to advise it and to perform underwriting functions in connection with the issue.
- The most common type of underwriting arrangement involved with large issues is the “firm commitment” underwriting.
- In a firm commitment underwriting, the underwriter purchases the entire issue of securities from the issuer and then attempts to resell the securities to the public

Initial Public Offering

- After procedures, the SEC issues a prospectus.

<https://www.sec.gov/Archives/edgar/data/1326801/000119312512034517/d287954ds1.htm>

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- During the marketing phase by the underwriter, s/he receives indications of interest from investors.
- On the day prior to the effective date, after the market closes, the firm and the lead underwriter meet to discuss two final (and very important) details: the offer price and the exact number of shares to be sold.

Initial Public Offering

1,5 £ 1£ 50%,

- Underpricing:

$$(\text{Closing Price} - \text{Offer Price}) / \text{Offer Price}$$

- From the company's perspective, such underpricing "leaves money on the table" in the sense that the company is not getting the full value for its shares, but it may be preferable for the company if it guarantees that the issue succeeds.

Underpricing has become central in valuing a company.

- Test a model in which patents reduce information asymmetries in industries where the link between patents and inventive returns is transparent, thereby reducing underpricing.
- Conversely, patents reflect increased information asymmetries and underpricing in industries where the link is not transparent.

Capital Asset Pricing Model (CAPM)

- **Now that a firm is in the stock market we can more easily evaluate it.**

Let r_i be the stock's return

$$(price_{today} - price_{yesterday}) / price_{yesterday}$$

Let r_m be the market's return

Then:

$$r_i = \alpha + \beta r_m$$

↗ return of market

*↳ return
of firm i*

If we estimate this for many periods, we will realize that something is left unexplained:

$$AR_i = r_i - (\alpha + \beta r_m)$$

where AR: Abnormal Returns

Patents help Getting a License

Patents and Academic Technology Transfer

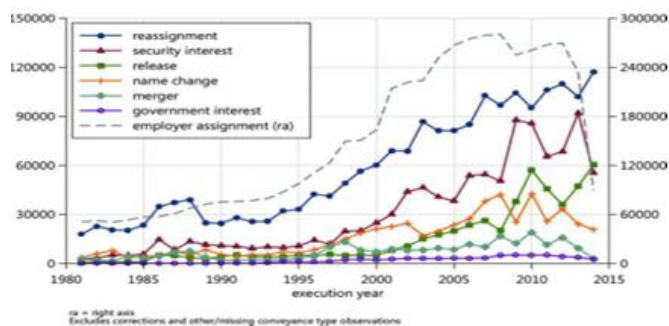
Inventors' prior academic output is positively correlated with the likelihood that their new technologies will be licensed.

Additionally, patent grants are associated with significant increases in the rate at which technologies are licensed and are most important for inexperienced inventors.

Patents and Exports

- Microdata of firm exports and international patent activity for Greek Exporters
- Exporters with patents have substantially higher export revenues
 - **Selling higher quantities rather than charging higher prices.**
- The innovative firm exports more compared with its non-innovative rivals in more distant markets

Patents and Financing



Patents pledged as collateral → raise significant debt financing.

Pledgeability of patents → financing of innovation.

Patenting companies raised more debt, and spent more on R&D.

Patents and Employee Benefits

- Identify patents that are ex ante valuable, [Kogan et al. (2017)] λ $10 \times \lambda$ $30 \times \lambda$
- Ex ante valuable patent \rightarrow substantial increases in firm productivity and worker compensation.
- Workers capture roughly 30 cents of every dollar of patent-induced surplus in higher earnings.
- Interpretation: these earnings reflect the capture of economic rents by senior workers, who are most costly for innovative firms to replace.

Patents and Inventor Mobility

- Examine the effect of patent protection on the mobility of early-career employee-inventors.
- One additional patent granted decreases the likelihood of changing employers, on average, by 23%.
- Findings consistent with the idea that patents turn innovation-related skills into patent-holder-specific human capital.

However, patents can also be harmful

Heller, M. A., & Eisenberg, R. S. (1998). Can patents deter innovation? The anticommons in biomedical research. *Science*, 280(5364), 698-701.

"An anticommons in biomedical research may be more likely to endure than in other areas of intellectual property because of the high transaction costs of bargaining, heterogeneous interests among owners, and cognitive biases of researchers."