

31E99906 Microeconomics policy

Lecture 6: Policies on Intellectual Property

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Plan for the lecture

This lecture is on **technologies and innovations**, with the following

Objectives

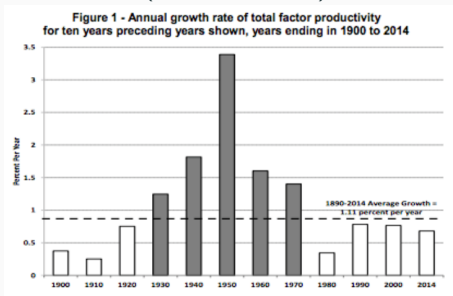
- **Market failures** in innovation activity → **policies**
- **IPR regimes** for innovators → **incentives to innovate**
- **Patents** as special IPRs → **market mechanisms**

Introduction

Innovations fundamental for long-run growth

New technologies based on the silicon chip have revolutionized the labor market as well as our society. This process is ongoing with robots and AI (Acemoglu, 2019)

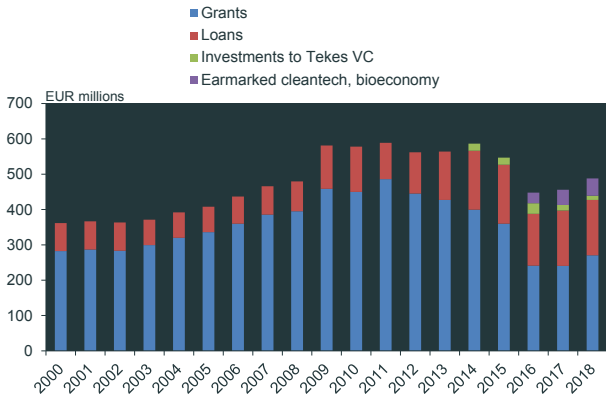
- But: "You can see the computer age everywhere but in the productivity statistics." (Robert Solow)



- Is the digital economy going to open up an new era of growth?
The answer depends in part on the **innovation system**.

One way to encourage innovations: public subsidies

TEKES funding. Source: Economic Policy Council, 2017



Another way to encourage innovations: Google Lunar X Prize

The competition offers a total of US\$30 million in prizes for landing a private spacecraft on the surface of the moon and sending “mooncasts” back to Earth.



Another innovation procurement: Netflix Prize

\$1 million prize to induce a 10 percent improvement in the accuracy of its movie recommendation algorithm.



Government uses prizes as well



Philips' EnduraLED may not look exactly like a 60-watt incandescent bulb, but it passes the test for parity in light output, quality, color and intensity, said judges of the \$10 million L Prize.

PHOTOGRAPH COURTESY PHILIPS LIGHTING NORTH AMERICA

Philips Wins L Prize, but the Race Is Still on for a Better Bulb

Philips captures the U.S. government's \$10 million L Prize for its LED replacement for the 60-watt bulb, but efficient lighting must still win consumers' hearts.

Intellectual Property Regimes

Intellectual Property (IP): A policy correcting the market failure

- Patents
- other IP regimes, different from patents:
 - Trade secrets/Trade marks: to protect industrial property; inventions, processes, machines, brand names, industrial designs etc.
 - Copyrights: to protect literary, musical, dramatic, artistic works; novels, poems, films, etc.
- It has been recently argued that governments can use prizes instead of traditional IP regimes
 - Bernie Sanders proposed two bills that together would create innovation prize funds of 0.57 percent of US GDP
 - We come back to how this approach works after studying the traditional IP regimes

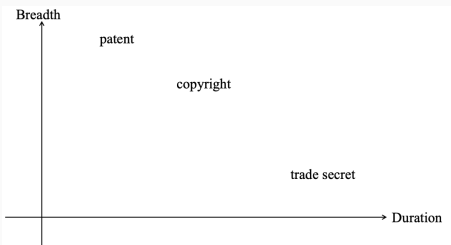
Intellectual Property: Classification

IP Duration

- patents: 20 years from application
- copyright: often author's life plus 70 years. Applies to the expression of works; gives the author an exclusive right over reproduction, performance, adaptation, translation.
- trade secrets: for life (the recipe for Coke)

IP Breadth

- measures the degree of patent protection: how difficult is it to introduce a non-infringing product either in product or technology space.
- elusive concept but needed in practice (note that copyright is by definition narrow).



Patents

Intellectual Property: Patents

ex ante, before the innovation:

- patents as IPRs (Intellectual Property Right) provide incentives to innovate
- incentives depend on the patent duration and breadth – important policy choices
- incentives can depend on the market structure: if the innovation substitutes or complements earlier innovations

ex post, after the innovation:

- patents restrict the use of the innovation: from non-excludable to excludable good in the patent duration period

Market structure and the incentives to innovate

What market structure gives the best incentives to innovate, competition or monopoly? Consider first only the gains (excluding R&D costs) from a potential innovation, assuming the innovator has full patent protection (infinite duration). See next page Figure.

- Innovation lowers the marginal cost, from C_0 to C_1
- Innovation is limited such that $C_0 - C_1 < A - H$
- The innovator holds the full property right to the lower-cost technology. What royalty rate would maximize the total royalty from the innovation? Alternatively, we can think that innovator monopolizes the industry
- The total gain from the innovation is larger if the market is initially competitive. This can be seen from the Figure – can you see how?

Incentives to innovate in monopoly and competition

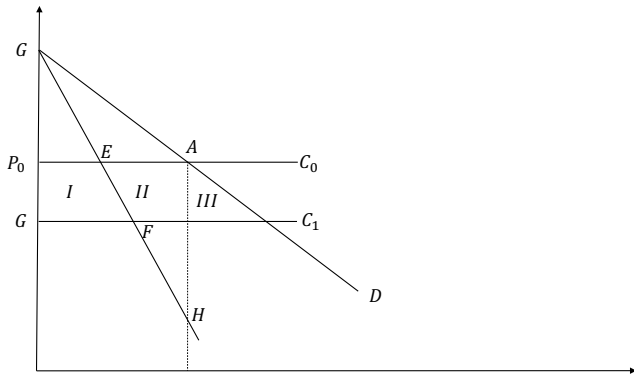
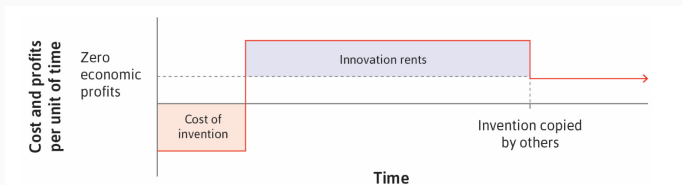


Figure 1: GD is the demand, and GH gives the marginal revenue for a monopoly

How should we define patent duration?



As above, assume savings $C_0 - C_1$ from the innovation, and that the market is initially competitive. For how long should we grant the monopoly right to the innovator?

- Flow of gains to the innovator from protection is $(C_0 - C_1)Q_0 = B$
- Total discounted gains over time is

$$\int_0^T B \exp(-rt) dt$$

where T is the patent duration and t denotes time

- Assume that the $R\&D$ cost is $K(B) = \alpha B^2/2$

Patent duration, continued

The innovator chooses effort to

$$\begin{aligned} \max_B \int_0^T B \exp(-rt) dt - K(B) \\ \Rightarrow \\ B^* = \frac{1 - \exp(-rT)}{\alpha r} \end{aligned}$$

- higher T , higher savings in costs B
- but there is also a cost, DWL (denoted by III in the Fig above)
- the balance:
 - one can imagine an inverse U-shaped relationship between the strength of protection and social gains
 - the right to exclude should be temporary

Should Prizes replace IPR

Prizes do not have the deadweight loss from monopoly power. But how should such prize contests be organized?

- Winner takes it all: prize is awarded to the first agent who obtains a success
- Equal sharing: prize is shared among all successes by a given deadline
- Hidden winner takes it all: no information given during the race if there has been a winner

See Halac et al, JPE 2017

Patents are importantly shaping the innovation activities in firms, as illustrated by personal communication (Jan 2019) with Robin Stitzing, former head of economic research at Nokia Technologies:

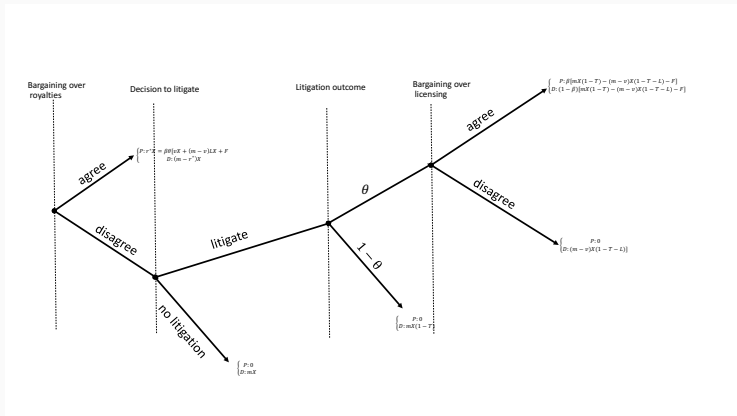
- *Our current expected annual recurring licensing revenue is around 1.4bn euros. We are expecting this to grow 10% CAGR between 2017 and 2020*
- *We have over 100 royalty bearing licensees, mainly for wireless SEPs.*
- *We filed patent applications on over 1,300 new inventions in 2017.*
- *2017 annual R&D spend was 5bn euros. Over the last 20 years (patent term) we have spend in total 123bn euros on R&D, including former Nokia-Siemens Networks and Alcatel-Lucent*
- *Our current patent portfolio size is around 20,000 patent families, with around 1700 SEP families. We do not specifically disclose patent portfolio maintenance cost but as part of the Alcatel-Lucent merger we reduced our portfolio from 30,000 to 20,000 patent families and disclosed that this would save around 30mio euros annually.*

How good is the protection in practise?

The reading for the lecture allows us to think through the process that defines the patent value in practice – this prepares us for the guest speaker. The patent is a probabilistic property right, with strength and value determined by the courts' interpretation of the Patent law, the parties' bargaining skills and options, and the nature of the product itself. The game tree next page provides one interpretation (from the reading)

- What is hold-up in this context?
- Where hold-up shows up in the game tree attached?
- What happens in the final licensing stage of the game tree – why is there licensing and not royalties as in the first bargaining stage?
- The redesign lag has an impact on royalties – how?
- The role of litigation costs.

How good is the protection in practise?



References



Suzanne Scotchmer: Innovation and Incentives MIT Press, 2004



Paul Bellefamme, and Martin Peitz: Industrial Organization: Markets and Strategies, second edition, Cambridge University, 2015.