



E DEPARTMENT
OF ECONOMICS
AND MANAGEMENT



**Università
degli Studi
di Ferrara**

The economics of patents

Ugo Rizzo

What is a market failure?

- Situations in which the market alone does not reach Pareto Efficiency
- The 'market alone' produce an outcome where an individual may be made better-off without making someone else worse-off
- In these cases, is a public intervention justified?
 - Which type of intervention? Depending on the situation and its characteristics various types of action are possible

Various categories of mkt failure

- Due to:
 - Asymmetries of information
 - Lack of competition
 - Externalities
 - Public good
 - ...

What is a public good?

- Two characteristics identify the public good:
 - Non excludability: once produced it is not possible (or not convenient) to impede the fruition of the good
 - Such as in presence of free-riding
 - Non rivalry: a good cannot be consumed at the same time by two individuals
- In economics terms: the marginal cost of one additional individual consuming the good is zero (or very close to zero)
- The market does not create appropriate incentives to produce these goods

Pure public good

- A pure public good is both non-excludable and non-rival
 - Can you think of an example of pure public good?
- Can you think of a good which is excludable and non-rival?
- And a good that is rival but non-excludable?

Private & public good

	Excludable	Non-excludable
Rivalrous	<u>Private goods</u>	<u>Common goods</u>
	food, clothing, cars, parking spaces	fish stocks, timber, coal
Non-rivalrous	<u>Club goods</u>	<u>Public goods</u>
	cinemas, private parks, satellite television	free-to-air television, air, national defense

Data, Information, Knowledge

- Data: basic elements of information
- Information: sets of data
- Knowledge: comprehension of information and their applicability
- Economic theory did not distinguish information from knowledge for quite a long time
 - We consider information to be the same as knowledge

Why research is not a private good?

- Let's think about the output of a research
 - What is the output of the research that made Google to come into life? Or Facebook?
- Have you seen “The Social Network” movie?
 - <https://www.youtube.com/watch?v=BzZRR4KV59I>
 - <https://www.youtube.com/watch?v=xdiFzcpmmJc>

Research as a public good

- The contributions of Arrow (1962) and Nelson (1959) highlight:
- Knowledge, given its characteristics of public good, once created, generate benefits also to those that did not contributed to produce it (it's a sort of spillover, knowledge spillover)
- The private marginal benefit of who made the investment to produce the new knowledge is inferior to the social benefit
- Romer (1989) in the theory of "Endogenous technological change" starts from this premise: "Once the costs of creating a new set of instructions has been incurred, the instructions can be used over and over again at no additional cost. Developing new and better instructions is equivalent to incurring a fixed cost. This property is taken to be the defining characteristics of technology."

As a consequence a trade-off emerges

- On the one hand the higher is the amount of knowledge in the economic system, the higher will be the benefit for the entire system
- On the other hand the private sector will invest in the production of knowledge only if they can return of the investment made to produce such knowledge
 - Conflict interest between social and individual interest
 - Why?
 - Which is the social interest?
 - Which is the individual (firm) interest?

Which available solutions?

- Two possible solutions:
 - Public funding to the creation of knowledge
 - Incentives for privates to invest in new knowledge production
 - Patent system

Public finance of research

- In ancient times scientists were supported by riches and kings
- Today they are publicly supported by the State
- The greater the amount of knowledge in the society, the larger the welfare of the society
 - Think about Education, Health, and so on (examples of public good market failure in which the State support the expenditures)

What is a patent

- It is a right on a 'public' good
- Temporary monopoly on the property of a piece of information/knowledge or set of information/knowledge
- It provides the incentives to invest in the creation of research: motivate (in part) R&D expenditure

The first patent (Granstrand, 2005)

- When and where was promulgated the first formal patent code? Make your bets
 - 1474
 - Venice
- The 1474 patent code constituted a policy for Venice to attract engineers from the outside and stimulate orderly technical progress. These laws signified the emergence of a new era, as patent-like privileges spread within Europe

The economics of patents

- The patent system has two main functions:
 1. Incentivise private sector investment in research (or in production of new knowledge): private incentive
 1. Facilitate the diffusion of innovation: social benefit
 - Inventions that would be kept secret without patents are more likely to be revealed when under patent protection, making them freely available after the patent expires

According to David (2003)

- By increasing the expected private returns from innovation, it acts as an incentive mechanism to private investment in knowledge production.
- Patents facilitate the market test of new invention because they allow disclosure of the related information while (in principle) protecting against imitation
- Patents create transferable rights (by granting a license, the owner of the knowledge allows it to be exploited by other agents).
- Patents are a means to signal and evaluate the future value of the technological effort of the companies that own them (which is particularly useful in the cases of new or young companies for which other classes of “intangibles” cannot be used for proper evaluation).
- This way of providing market incentives for certain kinds of creative effort leaves the evaluation of the intellectual production to be determined *ex post*, by the willingness of users to pay; it thereby avoids having society try to place a value on the creative work *ex ante* – *as would* be required under alternative incentive schemes, such as offering prospective authors and inventors prizes, or awarding individual procurement contracts for specified works

According to Hall & Harnoff (2012)

The Patent System Tradeoffs

Effects on:	Benefit	Cost
Innovation	creates an incentive for R&D; promotes the diffusion of ideas	impedes the combination of new ideas & inventions; raises transaction costs
Competition	facilitates entry of new small firms with limited assets; allows trading of inventive knowledge, markets for technology	creates short-term monopolies, which may become long-term in network industries

Summing up, patents are useful for:

- Create the incentives for firms to invest in R&D (providing an economic return from the investment)
 - Know-how generated via R&D is very costly to produce and relatively cheap to reproduce
- In some sectors is the only way to advance research in the private sector:
 - Pharmaceutical and Biotech
 - Impede rapid imitation from competitors (and impede free riding)
 - Function also as signalling for start-up to raise venture capitalists (VC) funds
- Allow an efficient market for knowledge and facilitate technology transfer

Conversely the drawbacks are

- Given the indivisibility of knowledge:
 - Knowledge is cumulative (dispersion and fragmentation across agents)
 - Obstacle for new innovation based on knowledge owned by others
- Hostile behaviours: ‘patents war’
 - <https://www.wired.com/2012/03/opinion-baio-yahoo-patent-lie/>
 - <https://www.wired.com/2012/05/rockstar/>
 - <https://www.wired.com/2014/12/apple-microsoft-alliance-disarms-patent-warheads/>
- Patent troll
 - <https://formiche.net/2013/08/patent-trolling-pratica-brevetti-fa-male-a-innovazione/>
- Knowledge exchange and diffusion limited

Licenses

- Two main types of licenses:
 - Exclusive: patent licensing to only one buyer
 - Problems of diffusion and fragmentation of knowledge and inventions
 - Non exclusive: patent licensing to more operators at a lower price compared to exclusive license
 - Usually adopted when the invention is of lower value

Patents differ across sectors

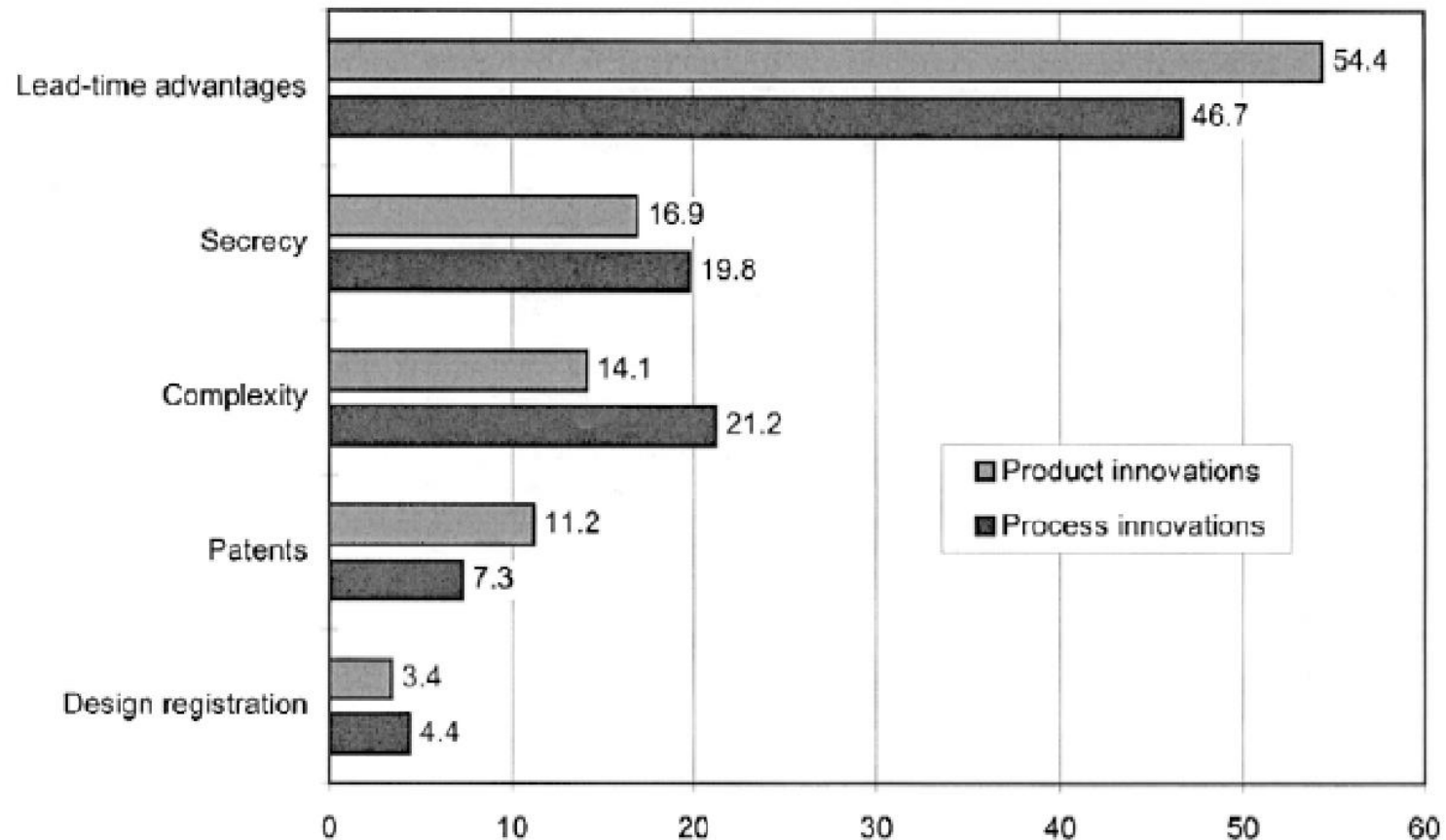
- Most studies of the role of IPRs, especially patents, reveal strikingly large differences across industries or sectors and countries or regions.

Table 10.4 Sensitivity of the R&D investments of large Japanese corporations to length of term (1992)

What would the effect be on your company's total R&D budget (as a rough percentage), if the maximum length of patent protection was:	Chemical (n=9)	Electrical (n=10)	Mechanical (n=5)	Total (n=24)
(a) Increased by 3 years	+8.5	+2.8	+0.3	+4.8
(b) Decreased to 10 years	-21.2	-3.7	-0.3	-10.7
(c) Decreased to 0 years (i.e. patent protection ceases)	-59.2	-40.0	-5.5	-38.2

Source: Granstrand (1999).

How do firms protect their innovations?





If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it.

— *Fritz Machlup* —

AZ QUOTES

Why do researchers quite like patents?

- Because they are a very nice source of information
 - IPC: international patent classes
 - Technological variety, technological distant, patterns of specialisation, ...
 - Citations
 - Backward and forward: flows of knowledge, geography of knowledge, networks, ...
- Very much used to study innovation
 - Sometimes caution is needed in drawing implications

Esternalità

- Si ha un'esternalità ogni volta che un individuo o un'impresa compie un'azione che abbia effetti su un altro individuo o impresa, senza che quest'ultimo paghi o riceva una compensazione per tali effetti
- Possono essere positive o negative
 - Esempi: apicoltore produce un effetto impollinazione nel frutteto del vicino e istruzione da un lato vs inquinamento e rumore dall'altro

Esternalità, tipologie

- Le esternalità si dividono anche in esternalità nella produzione e esternalità nel consumo
 - Produzione positive: apicoltore, innovazione
 - Produzione negative: inquinamento
 - Consumo positive: istruzione
 - Consumo negative: consumo di alcol
- Solitamente non danno luogo a scambi sul mercato e quindi non hanno un prezzo
- Portano ad una situazione di conflitto tra ottimo individuale e ottimo sociale

Soluzioni ai fallimenti del mercato

- Regolamentazione: vincoli sulle quantità: l'Autorità può imporre la produzione di quantità definite di esternalità
 - Tali quantità saranno presumibilmente quelle che conducono ad una situazione di massimizzazione del benessere sociale
 - Nella definizione di tale livello si generano conflitti sulle utilità delle parti
- Tasse o sussidi: tasse rivolte ai produttori di esternalità negative e sussidi ai produttori di esternalità positive
 - Imposta pigouviana (da Pigou 1877-1959): tassa ogni quantità di prodotto così da ridurre la percezione di ottimismo dell'individuo produttore dell'esternalità negativa
- Identificazione di standard (ad esempio di qualità)

Esempi generali fallimenti del mercato

- Politica agricola comune (PAC)
- Acqua da irrigazione
- Energia