

# Economics of innovation

Exam with solutions

Prof. V. Chiariello

University "Parthenope" of Naples

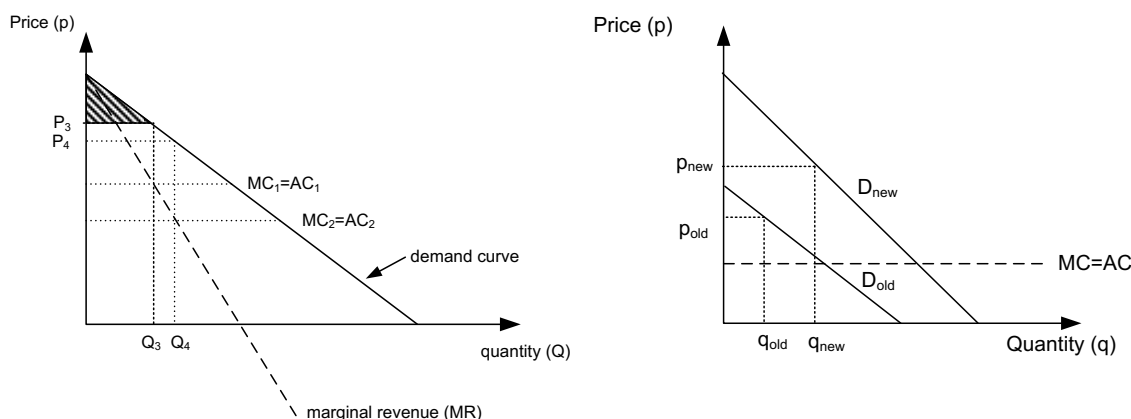
Name \_\_\_\_\_ Surname \_\_\_\_\_ Matr \_\_\_\_\_

1) Define a process innovation and a product innovation, explain what happens when they occur and comment with graphs. (10 points)

*Product and Process innovation are two different types of innovation.*

*Product innovation, can be defined as the introduction by a firm of a new product in the market or a significantly change in existing products. Process innovation consists of a change in the way of doing or manufacturing product or services. The two innovation could be not independent because a process innovation can lead also to a product innovation, but not necessarily. We have different types of process and product innovation and more innovation we introduce in our company more valuable or successful it would be.*

*The microeconomics effects of innovation are different on the basis of the market structure in which they are introduced , it could be a monopoly or a perfect competitive market. In general we can say that usually inventors or firms protect their innovation with the introduction of IPRs.*



*In the graphs is shown the effects of process innovation and of product innovation. In the first case, we are in a monopoly situation because there is the presence of a patent. We understand that we are in a monopoly situation because  $P_3$  is greater than  $MC$  and so the consumer surplus is not maximized. The process innovation lead to a decrease of  $MC$  to  $MC_2$  and we have a shift of prize from  $P_3$  to  $P_4$ . With this change also the consumer surplus will become greater.*

*In the second graph we have the case of the introduction of a new product in the market, for sure the most obvious consequence is the new demand curve . In this case we can say that consumers are willing to pay also a higher price in exchange of a more valuable product, for more quality. And also the quantity demanded is higher because more people want that new product. With this new demand curve also the consumer surplus increase.*

2) Explain why technologies exhibit an s-curve in their performance improvement over their life-times. Why the s-curve model suggests that technological change is cyclical? Draw a graph and describe it. (5 points)

*Technologies exhibit an s-curve in their performance improvement over their life-times. Performance improvement in the early stages of a technology is slow because the fundamentals of the technology are poorly understood. Great effort may be spent exploring different paths of improvement or different drivers of the technology's improvement. Furthermore, until the technology has established*

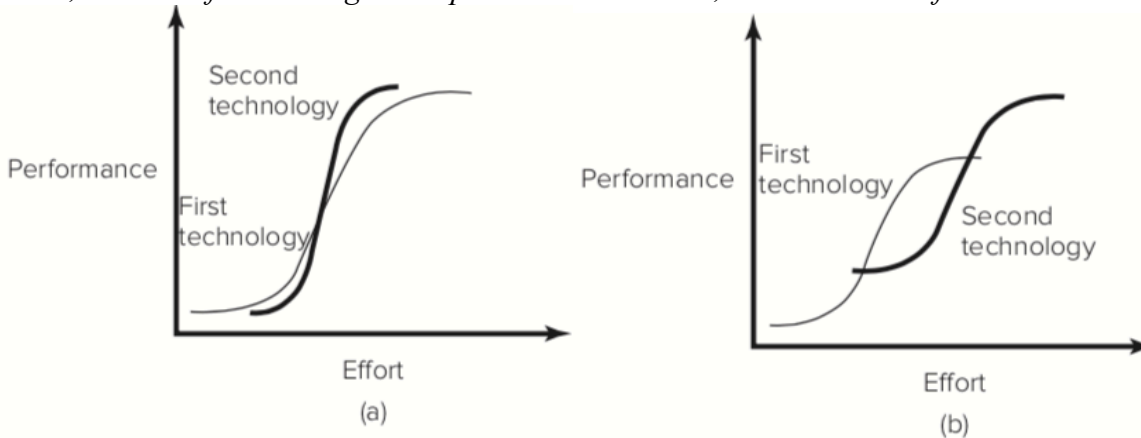
## Economics of innovation

Exam with solutions

Prof. V. Chiariello

University "Parthenope" of Naples

a degree of legitimacy, it may be difficult to attract other researchers to participate in its development. However, as scientists or firms gain a deeper understanding of the technology, improvement begins to accelerate. The technology begins to gain legitimacy as a worthwhile endeavor, attracting other developers. Furthermore, measures for assessing the technology are developed, permitting researchers to target their attention toward those activities that reap the greatest improvement per unit of effort, enabling performance to increase rapidly. However, at some point, diminishing returns to effort begin to set in. As the technology begins to reach its inherent limits, the cost of each marginal improvement increases, and the s-curve flattens.



Technologies do not always get the opportunity to reach their limits; they may be rendered obsolete by new, discontinuous technologies. A new innovation is discontinuous when it fulfills a similar market need, but does so by building on an entirely new knowledge base. Initially, the technological discontinuity may have lower performance than the incumbent technology. In early stages, effort invested in a new technology may reap lower returns than effort invested in the current technology, and firms are often reluctant to switch. However, if the disruptive technology has a steeper s-curve or an s-curve that increases to a higher performance limit, there may come a time when the returns to effort invested in the new technology are much higher than effort invested in the incumbent technology. New firms entering the industry are likely to choose the disruptive technology, and incumbent firms face the difficult choice of trying to extend the life of their current technology or investing in switching to the new technology. If the disruptive technology has much greater performance potential for a given amount of effort, in the long run it is likely to displace the incumbent technology, but the rate at which it does so can vary significantly.

3) Describe the main forms of intellectual property right (IPR) that you know. Why IPR are so important to the innovations? (6 points)

3) We have different forms of intellectual property rights. They are used as a solution to competitive market and in a macroeconomic perspective they increase growth processes. The IPRs are patents, trademark, copyright and then we have also trade secrets. They are used to protect the inventor of a particular product or service, and in particular in fields where knowledge are public good, so non-rival and non-excludible. They allow them to acquire the returns of their investment in R&D and preventing that others firms copy their invention.

- Patents are used to protect inventions, trademark symbols or design allowing the consumers to distinguish the producer of a particular product or service; copyright to protect works of authorship. The best-known appropriability mechanism is the patent. To qualify for a patent, an invention must be useful, novel, and non-obvious, and must cover an invention within the bounds of patentable subjects such as new products or new processes. A patent grants a legal monopoly

# Economics of innovation

Exam with solutions

Prof. V. Chiariello

University "Parthenope" of Naples

*on use of an invention for a limited period of time (currently 20 years from the time of patent application).*

- *Trademark is a word, phrase, symbol, design, or other indicator that is used to distinguish the source of goods from one party from the goods of others.*
- *Copyright is a form of protection granted to works of authorship.*
- *Trade secrets are intellectual property (IP) rights on confidential information which may be sold or licensed.*

*These IPRs are important because they give an exclusive right to the inventor and prevent from copying. In this way a firm can acquire returns related to their innovation. They are used also to create incentive to innovate as because to innovate firms have to deal with huge research and development expenses and so they need incentives.*

## 4) What is a learning effect? (3 points)

*4) The more a technology is used, the more it is developed and the more effective and efficient it becomes. As a technology is adopted, it generates sales revenues that can be reinvested in further developing and refining the technology. As firms accumulate experience with the technology, they find ways to use the technology more productively, including developing an organizational context that improves the implementation of the technology. So the more a technology is adopted, the better it should become.*

## 5) What is the National Innovation System? (3 points)

*5) The national innovation system essentially consists of three sectors: industry, universities, and the government, with each sector interacting with the others, while at the same time playing its own role." It is also called Triple Helix model.*

## 6) What are the patent races? Describe their policy implications. (3 points)

*6) A patent race is a competition between two or more inventors (usually firms) to discover an invention first in order to obtain patent protection for the invention and exclude competitors. In a typical patent race, each inventor or company makes an irrecoverable bid – notably, inventors make substantial research and development (R&D) investments - for the prize of obtaining the patent. The patent system is designed to encourage innovation. Where this is the case, governments can promote research alliances in order to avoid over-investment and duplication of research efforts.*