

Technology and economic models

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- 1) Technology in neoclassical framework:
endogenizing technical change
- 2) Appropriability
- 3) Uncertainty
- 4) Cumulateness

Technology in neoclassical framework

$$Q = AK^\alpha L^{1-\alpha}$$

A = shift factor of production function, i.e. technological change

A is determined by factors that are outside the economy, i.e. exogenous....

... but, firms deliberately devote resources to the development of new technologies

Appropriability

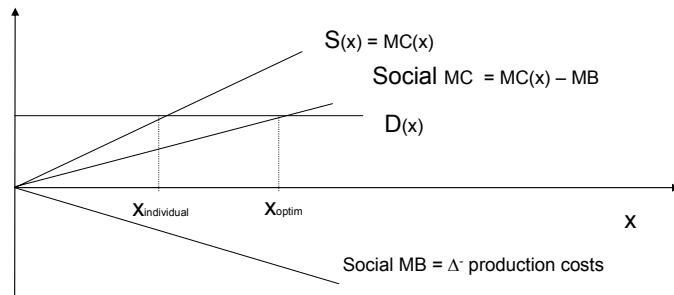
Is technological knowledge a public good?

-Non rivalry

-Non excludability

Technological knowledge has certain features of public goods: research activities carried out by firms produce benefits for other firms → **positive externalities**

→ Market failure: sub-optimal investments in R&D



The production of a public good generates a “positive externality”: good/service whose use/consumption increases profits/utility of others.

The producer of the good/service is not paid for the additional value created → APPROPRIABILITY

Knowledge spillovers

- Imitation by competitors
- Pervasiveness of applications
- Mechanisms of imitation:
 - Reverse engineering
 - Mobility of skilled workers
 - Oral/written transmission of ideas/information

Remedies to market failures due to knowledge spillovers....

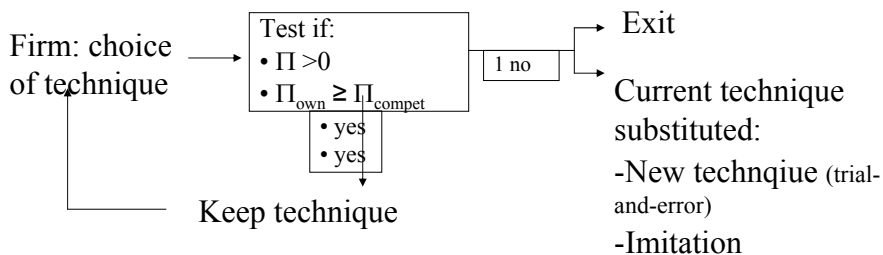
- Vertical integration:
 - Limitation: high number of future possible applications
- Allocation of intellectual property rights: **PATENTS**
 - Structure of patent system (duration, breadth..)
 - Effectiveness of patents
- Use of other strategies
 - Secrecy
 - Lead time
 - Learning curve

... knowledge is not a “pure” public good

- **Tacit** elements of knowledge (non replicability)
 - Individuals: skills (know how)
 - Firms: routines (organisational procedures)
- **Absorptive capability**: using others’ knowledge is expensive
 - Reverse engineering
 - Purchase of new machinery
 - Investments in absorptive R&D

Uncertainty

- Technological (and market) uncertainty: firms do not know in advance what is possible from a technical point of view, how consumers will respond to the introduction of new products, etc.
- How to cope with uncertainty in economic models?
 - Neoclassical models → maximizing agents + stochastic outcomes
 - Evolutionary models → boundedly rational agents



- Real world too complex and uncertain for firms to be *fully* rational agents
- Firms (and individuals) do not 'maximise' → adopt simple rules of behaviour (**routines**) that guide strategic decisions

• Methodological problem: abandoning hp. that firms are maximising agents implies that we are unable to predict their behaviour?

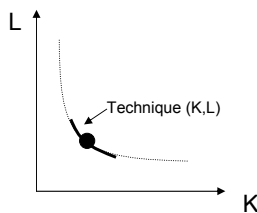
→ NO: also “random” choices are selected by the environment

→ sub-optimal choices tend to disappear, when they lead to negative outcomes (firms exit from the market)

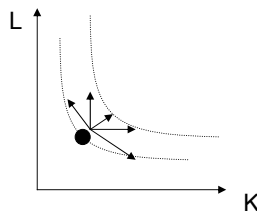
→ observing the number and types of firms operating in a market allow to formulate predictions on what behaviours/firms are most likely to be selected

→ what is a “optimal” behaviour depends on the environment, on the behaviour of other agents: ‘local’ optima

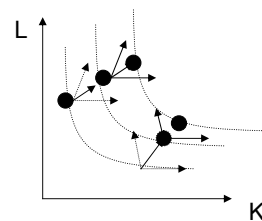
Firm only know a portion of the isoquant



When relative prices of factors change, movements along and movement of the isoquant indistinguishable



Firms may follow different technological trajectories



Cumulativeness: new knowledge builds upon previous knowledge

→ heterogeneity of firms