General aspects of technological approach

Innovation and Trade

Shumpeter: the entrepreneur-innovator has a key role in the introduction of new goods and technology in the economy

Two types of innovation

a) product innovation: it implies "absolute adavantages"

b) process innovation: it implies "comparative advantages"

Waves of "**distructive creation**"
cause economic development

Innovation "shifts" production functions:
it creates temporary "monopolies" (patents ecc.)

a) analysis focuses on ABSOLUTE ADVANTAGES

b) Production functions are "unstable" and technology cannot be easily transfered:

- Factors endowment continuosly changes because of:

1. human capital growth
2. learning curves
3. production and import of machinery (capital goods)

c) Technological progress is a dynamic phenomenon and is closely linked to "imitation and structural break" processes

d) Technological progress is not compatible with perfect competition

e) Market demand interacts with market supply:

- When income increases, market dimension widens and growing opportunities for introducing new products and technologies arise (Linder)

f) Factors mobility (transfer of technology) becomes very important

g) Market competition depends not only on production costs but also on **quality and product differentiation**

h) Politics may affect the technology gap

Determinants of innovation
Three competing approaches

a. Demand pull

b. Technology push

c. Scarcity of factors of production

Demand pull

- Technological progress depends on society's needs represented by consumers' demand

  - technological trajectories depends on demand (e.g. government and military expenditure)

  - expected profits determine, among new avalaible technologies, the one that is actually applied to production

  - if domestic demand for a good is low, then that industry will show a low degree of innovation propensity

Critiques to the "Demand Pull" approach

- Consumers demand is not always well defined and identified

    → there may confusion between tra "demand" and "needs"

- Technical progress is ruled by an internal "logic" rather then by "external" elements

Technology Push

- Technological progress is **exogenous** with respect to market demand and is

    a) not continuos

    b) cumulative

    c) cyclical

    d) inter-related

Technology Push

- In history we observe several economic and technological "pursuits and overtakings"

- imitator may have advantages over innovator since they may learn from innovator's mistakes

- early innovators may be constraint by an "obsolete" capital stock (e.g England)

Factor scarcity

- Factor scarcity may induce innovation in order to overcome it

   →   if labour is "expensive" (scarce) firms may introduce "labour saving" innovation in production

- CRITIQUE: very often it is abundance of resources, rather than their scarcity, that fosters innovation

A synthesis

- introduction of new products or productive processes requires **complementary innovations**

- There is a variable lag (1 - 78 years) between a scientific innovation and its commercial exploitation

- market demand helps selecting among research projects

A synthesis

- Innovations **appear in cluster**, following long and variable cycles (long waves)

- Kondratieff's cycles:

  1. 1790 - 1825 STEAM

  2. 1825 - 1875 RAILROADS

  3. 1895 - 1915 CARS AND ELECTRICITY
  4. 1945 - ... ELECTRONICS, AIRPLANE AND SPACE INDUSTRIES

A synthesis

- Product and process innovations are generally inter-winded

- Main features of innovation processes:

  1. They are selective and follow specific paradigms and trajectories

  2. They are **cumulative** (dynamic economy of scale - learning by doing)

  3. Different industries offer different technological opportunities

  4. Retention of benefits from technological innovation differs among sectors ("monopolistic rents")

A synthesis

- Market (supplier) concentration depends on

  1. past accumulation of technological opportunities

  2. the degree in which monopolistic rents may be exploited

- the role of social and political strains and the law and normative environment in which firms live