

3.3. Technology creation and diffusion

Schumpeterian Market Dynamics

Circular state 1

Circular state 2

New Combination → Swarming

Bound vision
Normal profit
Perfect competition
Marginal analysis

New vision

Band wagon

Supernormal profit → Investment boom

Quasi-rent

Dissipation of rent

Bound vision
Normal profit
Perfect competition
Marginal analysis

Imperfect competition, Non-marginal analysis

Why do firms and nations invest in innovation?

- First-mover advantages
 - (1) patent
 - (2) head start in investment
 - early learning and early reduction of costs → 'learning curve'
 - pre-emption of scarce assets
 - (3) pre-emption of buyers: switching costs

- (4) setting technical standards
 - more important in fast-moving & complex technologies
 - cf. IT vs. automobile
- Constraint
 - have to keep innovating
 - always face bigger uncertainties in being at the forefront of technologies

Follower's advantages

(1) Technology transfer

- imitation cost less than creation cost

e.g. Mansfield et al. (1981)

“imitators could duplicate patented innovations for about 65% of innovators' cost; imitation was fairly rapid, with 60 percent of the patented innovations [imitated] within 4 years.”
(quoted in Lieberman & Montgomery 1988: 43)

(2) No technological lock-in

- sub-optimal choice was often rational when heavy investments were already made

eg. the leadership change in the steel industry

(3) Bug-free

eg 1. commercial jet aeroplanes

- Britain: introduced Comet 2 years before Americans began developing and 4 year before they introduced their jets to the market. But ..
- “Their delay allowed them to offer airplanes that could carry up to 180 passengers when the Comet IV carries up to 100, and a cruising speed of 550 mph instead of 480 mph ... because they were designing for later and more powerful engines. But they were also aided by the delay of four years in making the Comet safe after its accident from metal fatigue.” (Rosenberg 1982: 110)

(3) Bug-free

eg 2. Sony vs. Matsushita

eg 3. General practice in the machinery industry

3.4. Learning

- Technology = knowledge
: Knowledge should be learnt.
- Learning-by-doing (Arrow 1962)
eg. Horndal effect
- Learning-by-using (Rosenberg 1982)
learning accrued from utilisation of
products by final users

Characteristics of learning process

- (1) gradual process of accumulation of knowledge

"Innovation is, economically speaking, not a single well-defined act but a series of acts closely linked to the inventive process. An innovation acquires economic significance only through an extensive process of redesign, modification, and a thousand small improvements which suit it for a mass market ..." (Rosenberg 1976: 76).

“So technological progress may well be described as an incremental and a continuous process. Even major innovations which appear to be discontinuous, may be the result of the cumulative impact of small improvements. (Shin 1992:55)

(2) purposive goal-seeking activity

- technological progress is attained through intentional efforts.
- learning should be motivated and focused

(3) importance of information flow

→ 'learning-by-interaction' (Lundvall 1988)

3.5. Institutional dependence

Basic functions of institutions

: shaping social behaviour by providing incentives and some regularities

(1) mark off the boundary of uncertainty

eg1. patent system

eg2. public R&D support

- important esp. when no market potential is seen by the private sector

Basic functions of institutions

(2) Determining the intensity and direction of learning

eg. incentive structure, codes of information

→ Development to the studies of national innovation system (NIS)

Big questions to answer

(1) Global trend

- How and where the world is moving?

(2) Strategy of firms & countries

- How do they utilise the global trend for their own benefits at their given conditions?