Economics and Policy of Innovation

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The Innovative Firm
[in history – part II]

(Chapter 2)

Summary of previous lecture

- Neo-classical vs. Evolutionary Economics
- The innovative firms in history:
  - Great Britain, XIX century (chapter 2.3)
  - US, XX century (chapter 2.4)
- Readings: history (Hobsbawm) and classical theory (Adam Smith)
- Schumpeter: Mark I vs. Mark II

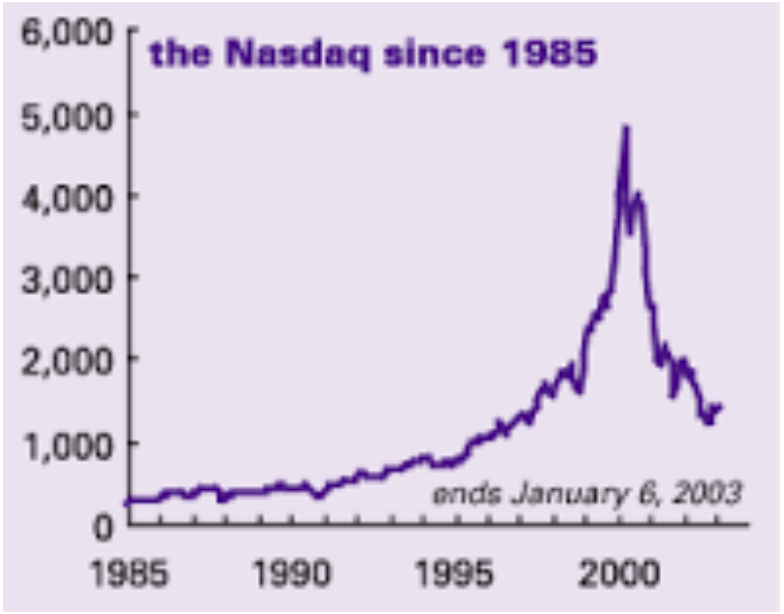
Readings

- David Ricardo: on machineries
- Karl Marx: capitalistic use of machineries
- Schumpeter (Mark II, from “Business Cycles”)

Chapters 2.5 and 2.6

The Japanese challenge

The New Economy



The Japanese challenge

- Three institutions: involvement of workers (and managers); bank system; lifetime employment.

- Organisational innovation (Toyota!).

- Moving from copying existing technology from abroad (like China over the past years) to becoming top R&D spenders (as in the Scoreboard).

The new economy model (’90s)

Everybody thinks of small new firms in the Silicon Valley, but the model is also based on:

- The large investment by the US Government (and Army) after the Second World War (remember cold war?),
- In collaboration with University Departments and large firms (e.g. IBM)

At the end of ’50s: first generation of computers. Then in the ‘60s: ARPANET (INTERNET “father”).

- The development of computers (based on silicium chips) pushed the demand of semiconductors, giving origin to a wave of new innovative firms

- Until mid ’60s, such a demand was coming from the US Government only, then also from a new generation of ***venture capitalists***

- New firms in the sector were born, founded by engineers and university professors, mainly around Stanford University -> Silicon Valley, since the ’70s

The innovative firm in history: conclusions

Therefore, only following this sequence, putting innovative firms in historical perspective (including some features of the *old economy*) we can understand the specificities of the *new economy* (kind of Schumpeter Mark I revised):

- Informal networks of learning
- Former employees founding their own ventures
- Salaries based also on stock options, not only for managers but also for simple employees

The innovative firm in history: conclusions (2)

However, again also in the *new economy*:

- Many firms die,
- Top ones become giants,
- Performing huge amounts of R&D and patenting their inventions,
- With many cases of Mergers and Acquisitions, also among giants,
- With top managers getting even richer, selling their stocks just before the bubble started to burst, and many employees fired…

(more in line with Schumpeter Mark II)

Innovation Processes

(Chapter 4)

3 main blocks

- Production of scientific knowledge

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- Translation of knowledge into products

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- Response to the market

In chapter 4, many recalls to previous lectures

4.2: Joseph Schumpeter

4.3: Adam Smith

4.3.3: the linear model (Input -> Innovation -> Output)

4.4.2: ICT pushed by US Government

But additional concepts are needed ->

The innovative firm in the evolutionary theory

Main concepts:

- **Technological learning and routines**
- **Path dependence and technological lock-in**
- Absorptive Capacity
- Technological paradigms and trajectories

Introduction

- Historical evidence: institutionalisation of R&D in firms has been one of the most central change in the way in which firms compete and change their technologies
- Nature of the R&D activity of the firm: expand technological possibilities and create own technology
- But: technology is constrained by a number of factors and technological possibilities are not an infinite set
- Links between technical change and firm behaviour:
    - Technological imbalances
    - Technological opportunities
    - Technological capabilities

Evolutionary view

Industrial competition is shaped by the rate and directions of technological change in a sector, which in turn depend on the nature of technology

The sources and nature of knowledge influences the decisions to enter the industry

Technological learning and market selection determine the growth and survival of a firm

- Cumulative learning from sources inside the sector (e.g. in-house R&D) and knowledge specific to industrial applications ⇒ low entry and high concentration
- New opportunities from sources outside the sector (e.g. academic research) and generic and non-systemic knowledge ⇒ high entry and low concentration

In a very “extreme” synthesis, for the Evolutionary approach, the key drivers for R&D and Innovation in firms are:

A. The evolution of scientific and technological **opportunities**
B. Research organisation and procedures -> **routines**
C. The **learning** process
D. External **linkages** and **complementarities**

A. The evolution of scientific and technological **opportunities**

- **Scientific and technological contexts** outside the firm (e.g. public research)…
- …but also other **sources** external (suppliers, clients, other firms) and internal (R&D, other firm divisions, etc.):

  →**Between external and internal opportunities there might be high complementarities;**

  →**Opportunities strongly change across sectors.**

B. What is a ROUTINE?

In the evolutionary approach, firm activities can be represented with repetitive behavioural schemes, used under specific circumstances.

Routines are **repetitive patterns of activity** in an entire organisation. In other words, *actions* which are:

- *Recurrent,*
- *Invariable,*
- *Context-specific,*
- *Embedded in the firm.*

C. The learning process

- Acquisition and accumulation of **knowledge** through: R&D, production and marketing;
- Not a simple acquisition of **information** (as in the neo-classical theory);
- Acquisition and accumulation (as routines) are not just a matter of time passing by: it is an activity aimed at **solving specific problems**;
- It is an *evolutionary* process which is:
  - **multidimensional**,
  - **cumulative** (depends on past knowledge and generates new knowledge),
  - with local and **contextual characteristics** (deriving from direct experience),
  - With a strong **cognitive dimension.**

Many learning processes do exist:

- Learning by **doing** (neo-classical model);
- Learning by **using**;
- Learning by **searching**;
- Learning by **learning**;
- Learning by **interacting**.

D. External **linkages** and **complementarities**

- Research and innovation -> *interactive and collective process*
- Generation of new knowledge -> ***chain process,*** characterised by:
  - Interdependence
  - Complementarity
  - Feedbacks

  Among different phases, both **internal** to the firms, and between the firm and **external** actors (universities, research centres, suppliers, clients…)

Path dependence: Once a firm has chosen to follow an innovation path, there is a cost to abandon it!
Therefore a firm can be dependent on that choice -> leading to success…

… but also to its **technological lock-in** (entrapment) for the firm which has chosen the “wrong” path.