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RESEARCH, INNOVATION AND INDUSTRY

IN EU-JAPAN COOPERATION

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- HISTORY OF SCIENCE SINCE THE INDUSTRIAL REVOLUTION

D. TENTATIVE LESSONS

A. STRENGTHS AND WEAKNESSES IN EUROPE, JAPAN AND EU-JAPAN COOPERATION

I. WEAKNESSES

*1. **EUROPE***:

a. Lisbon's time horizon (2010 far too short)
b. Reducing R&D expenditure in industry as a management strategy?
c. Decline of fiscal allocations to science and technology in periods of economic contraction
d. Brain drain or lack of a professional strategy of continental European universities to attract the best and the brightest from abroad
e. Institutional impediments of Rhenish capitalism?

*2. **JAPAN**:*

a. Neglect of basic research?
b. Under-funding of universities?
c. Overemphasis on industrial research?

*3. **EU-JAPAN COOPERATION**:*

a. More policy than performance?
b. More cooperation in science than in industry?
c. More competition than cooperation in industry
d. Some highly visible failures

II. STRENGTHS

1. ***EUROPE*** :
    a. A great tradition in science and industry
    b. Some remaining and some new centers of excellence
    c. Neo-liberal vigor in the UK, Ireland and Eastern Europe
    d. 7th European Framework Program: € 53 bn for seven years amounting to 5 % of total European R&D
    e. The surprising recent recovery of Germany's economic growth

2. ***JAPAN*** :
    a. The structural propensity of Japanese industry to high degrees of investment in R&D
    b. The pattern of pre-competitive research cooperation of industrial firms promoted by government
    c. The broad diffusion and lasting effect of the micro-electronic revolution of the 1970's
    d. The functional qualities of the Council on Science and Technology
    e. Vigorous dynamics in the emerging sector of small and medium enterprises focusing on high tech products

3. ***EU-JAPAN COOPERATION*** :
    A huge potential of mutual stimulation

B. FOUR CASES OF ANECDOTICAL EVIDENCE

1. FUJITSU-SIEMENS

a. The six leading Japanese firms of electric engineering (Fujitsu, Hitachi, NEC, Toshiba, Mitsubishi Electric and Oki) decided in the early 1970's to venture into the mainframe computer business and break the monopoly of IBM in this sector.

b. Prodded by MITI, they entered an agreement of pre-competitive research cooperation.

c. Research was supported by government subsidies, which were to be paid back in case of success from the profits of the sales of the product resulting from the research.

d. Fujitsu, which at that time still regarded Siemens as its "grandparent", invited Siemens to participate in this cooperation. President Kobayashi went to Munich to make the proposal to Siemens' Vorstand. Siemens declined…
In his book *Fortune Favors the Brave,* Tayou Kobayashi tells a story worth reading.

e. The six Japanese firms succeeded in breaking IBM's monopoly and reaped massive Schumpeterian profits from global distribution of their mainframes.

f. Siemens was allowed to distribute Fujitsu computers in Europe with a modest share in added value and hence, profits. A case of huge potential and missed opportunity

g. On the similar case of semiconductor development, see Henrik and Michèle Schmiegelow, *Strategic Pragmatism: Japanese Lessons in the Use of Economic Theory* (New York: Praeger,1989), pp.65-69

2. INFINEON-PANASONIC

a. In the early 2000s, Siemens spin-off Infineon supplies hardware platforms and basic software to Panasonic for its cell phones which constitute 30 % of the Japan's cell phone market

b. The most interesting aspect of this case is extensive cooperation in DRAM chip design, software development, error tracking and fine tuning. Teams in Germany, Austria, Denmark and Japan come together as the need arises.

c. As production process know-how has gained a growing importance next to technical know-how, the case shows that EU-Japan cooperation can be successful and rewarding for industry on both sides**.**

3. MERCK'S LIQUID CRYSTALS IN ASIAN FLAT SCREENS

a. Liquid crystals were discovered by the Austrian botanist Friedrich Reinitzer in 1888. A year later, the German physicist Otto Lehman described the physical properties of these crystals and defined them as a new state of aggregation between solid and liquid.

b. Uninfluential scientists at Merck KgaA were unable to win the interest of the firm's leadership for this substance, but were allowed to register patents for it in the name of the firm. This obscure story continued for a century. Only in 1980 did Merck develop the "Viewing Independent Panel" (VIP), basis of all later active matrix flat panels.

c. Thanks to Japan's microelectronic revolution, liquid crystals became a useful material for countless types of instruments of numerical controls. Its value became huge with the development of flat screen color TV.

d. Merck realized the value of its patents and began to defend and extend them strategically Its near monopoly for liquid crystals became a major source of its profits.

e. The case shows how well advised industry would be to pay attention to seemingly useless basic science.

4. BAYER'S AND SCHERING'S JAPANESE RESEARCH LOCATIONS

a. Bayer and Schering, long associated with Germany's fame as the "pharmacy of the world", began to face a drying up of the "pipelines" of new patentable drugs.

b. So impressed were they by Japan's global reputation as the new leader in industrial research that they looked for Japanese locations for parts their own research activities. In addition, Schering felt impeded by Germany's legal impediments against stem cell research.

c. Both found locations in the Kansai area, but neither seems as yet to have made a breakthrough.

d. In the course of its restructuring, Bayer gave up its Kansai location and concentrated its research activities in Wuppertal.

e. So far the case suggests that for European enterprises reducing investment in R&D at home, it is not sufficient to seek a Japanese location in order to obtain results. The thresholds to scientific discovery are not any lower in Japan than elsewhere. To emulate the prowess of Japan's industrial research, European firms located in Japan might also have to lengthen their time horizon and their strategic commitment to R&D.

C. THEORETICAL APPROACHES TO TECHNOLOGICAL INNOVATION

1. Economics

a. *Neoclassical Economics*:
Technological progress is assumed as a constant

b. *Growth Theory (Leontieff, Kuznets*)
Technology is an unexplained « residual » of input-output analysis

c. *New Growth Theory (Romer)*
Technology is endogenized in growth theory. Growth is driven by technological change that arises from investment decisions for which the classical law of diminishing returns does not apply. The stock of human capital determines the rate of growth.

d. *Theory of the Firm (Aoki)*
It is healthy for a firm to adopt a long-term strategy of technology-driven growth, and rational for shareholders and stakeholders to seek long-term capital gains, thanks to such growth, rather than short-term dividends and wages rises.

e. *Theory of Economic Development (Schumpeter)*
Economic development is driven by entrepreneurs seeking “Schumpeterian” profits from exclusive supply of innovative products not offered by any competitors.

II. Political Economy Studies

1. *German Ordo-liberalism (since 1949):*
The freedom of society depends on the freedom of markets. The freedom of markets needs to be preserved by strong antitrust laws as in Germany

2. *Mancur Olsen's "Rise and Fall" Theory (1970's):*
Japan's and Germany's postwar economic miracles were due to the abolishment of special interest groups by the Allies, whereas the US and UK themselves suffered relative declines because of the pervasive influence of special interest groups.

3. *Rhineland Capitalism vs Anglo-Saxon Capitalism (Michel Albert*, *1991*):
Germany's and Japan's superior economic performance in the 1980's was due to coordination between government, industry and interest groups as well as a high degrees of investment in R&D (3 % of GDP).

4. "*Les Cinq Capitalismes" (Bruno Amable)*:
Neoliberal capitalism scores in biotechnology because of individualism and flexibility, "Asiatic" capitalism is superior in high tech products requiring complex production processes (electronics). Continental European, Scandinavian and Mediterranean forms of capitalism score modestly as they are non-salient mixtures of the former two.

III. History of Science and its Funding since the Industrial Revolution

1. *The British Case:*
    a. Ample capital and an efficient capital market
    b. The invention of the steam engine
    c. The onset of the industrial revolution

2. *The German Case*:
    a. Humboldt's reforms liberate German science
    b. Bank lending substitutes the (lacking) capital market (Gerschenkron's theory of "backwardness")
    c. The Prussian crown's ownership of the Ruhr mines and the French war indemnity after 1871 enable Germany to fund the most advanced public education system of the time (Christopher Clark)

3. *The US Case*:
    a. Capital accumulation from wealth in natural resources channeled through great foundations to science
    b. Unrivaled excellence of America's private elite universities since the 1930's

4. *The Japanese Case*:
    a. The Gerschenkron case of bank-lending financing investment as in Germany
    b. Unrivaled excellence of industrial research since the 1970's

D. TENTATIVE LESSONS:

- For the EU:

Lengthen the time horizon of Lisbon

- For both European and Japanese governments:

Increase fiscal allocations to basic research

- For both European and Japanese scientists:

Realize Schumpeterian profits from scientific discoveries

- For European industry:

Increase investment in R&D

- For EU-Japan cooperation:

Encourage pre-competitive research cooperation, joint ventures, and joint projects of SME