Innovation Economics
Topic 1
Introduction

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Lecture highlights

- Economics and innovation: why ?
- Definition of innovation
- Economic properties of knowledge

Innovation and economics
Why ?

- Innovation drives economic growth. It is a factor of competitiveness

  Competitiveness = Business / Territorial / countries in competition

- Territories compete to attract business investment and create jobs
  ➔ existence of territorially delimited technology clusters which creates an endogenous dynamic of innovation and growth (eg Silicon Valley, Route 128 in the U.S.)

- Countries compete for the same reasons
  ➔ concept of national innovation system that focuses on performance differences from one country to another as regards to innovation

Saxenian, A.L., (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128, Cambridge, MA: Harvard University Press.* http://www.netvalley.com/archives/mirrors/sv&128.htm
Gu, S., Lundvall, B.A., (2006), "China's Innovation System and the Move Toward Harmonious /Growth and Endogenous Innovation", DRUID wp, No. 06-7. http://www.druid.dk/wp/pdf_files/06-07.pdf

Innovation and Economics
Who cares?

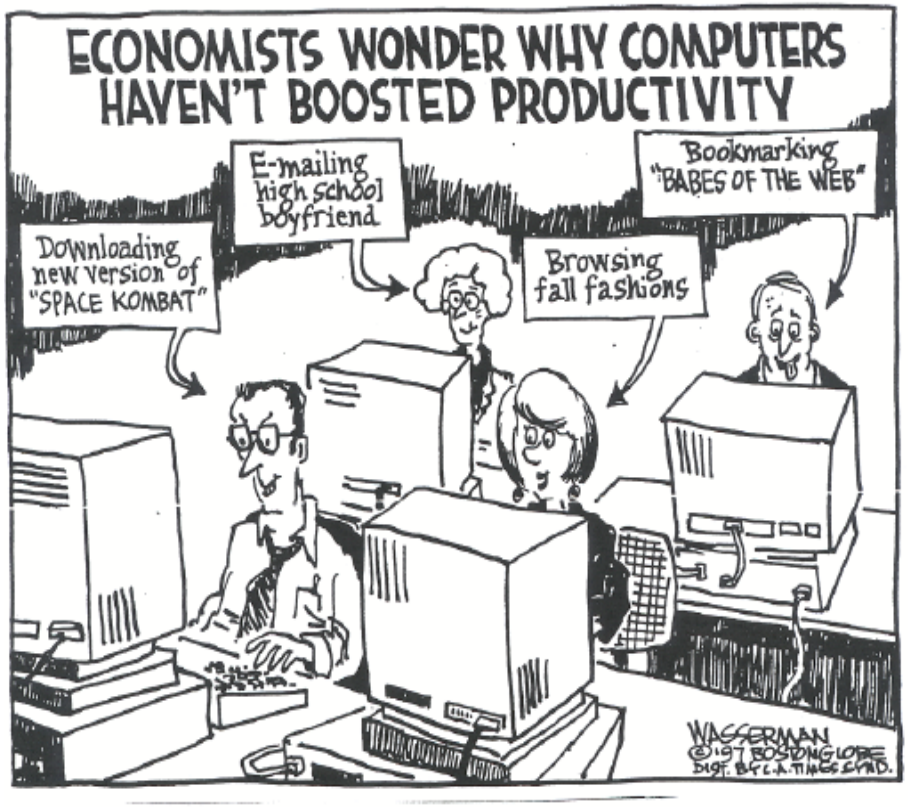
- Top managers & entrepreneurs
  - “competitive advantage lies in the ability to create an economy driven not by cost efficiencies but by ideas and intellectual know-how” (HBR 2007)

- National Leaders
  - “economic growth comes from effectively linking the twin powers of the competitive market & the scientific method” (Romer, 2004)
  - The economic downturn makes it imperative to find new sources of growth
  - Innovation is a means of dealing with global and social challenges

Innovation and business performance

During the 90's ...

Source: Australian Paralympic Committee [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0)

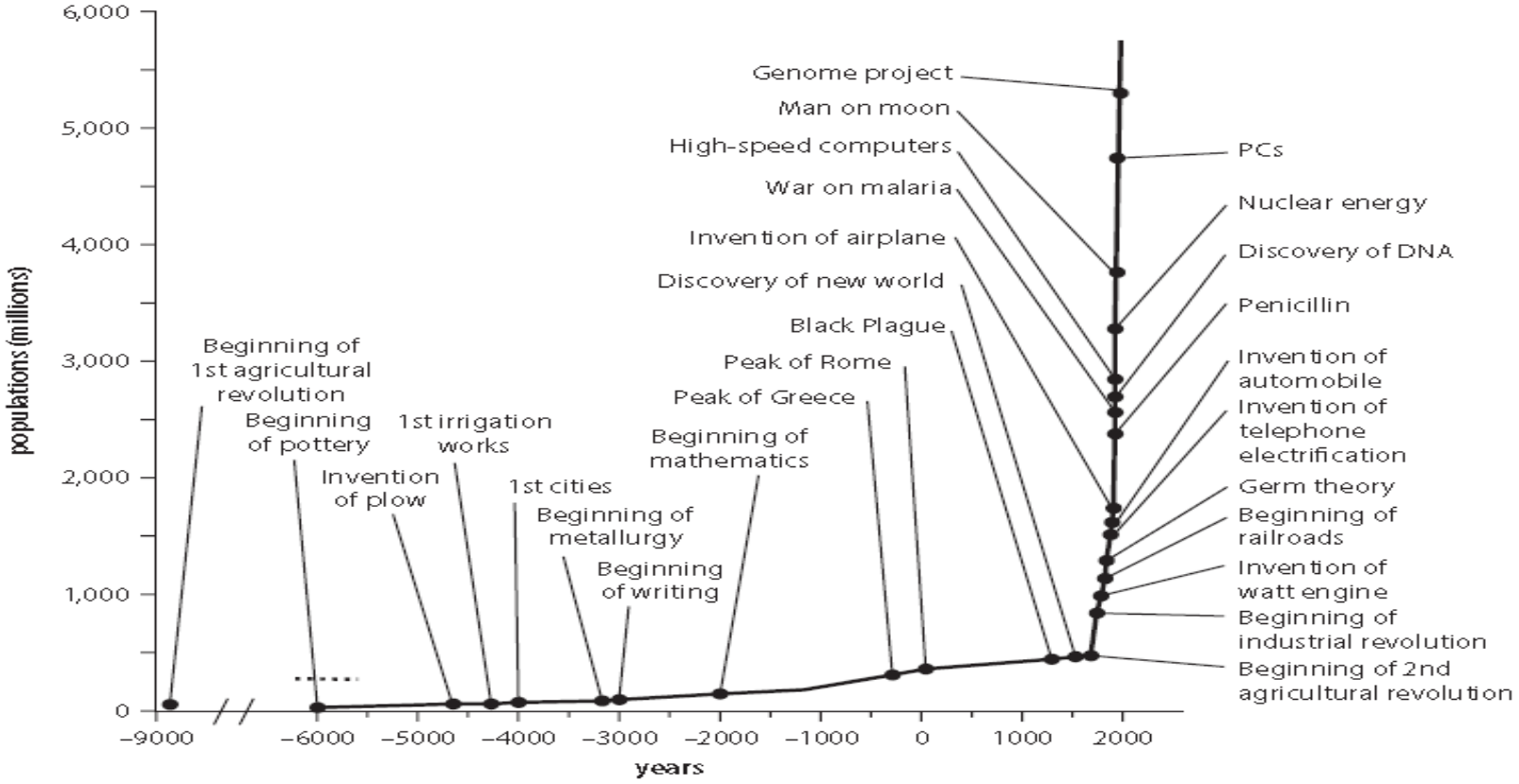


Source: Chicago Tribune, Saturday, August 23, 1997, p.25

Science and society

- Meet major challenges: climate change, fight poverty…
- Science and evidence based policy:
  climate change IS NOT a hoax ;
  vaccination protect from diseases
- Major challenges in healthcare to fight disease,
  conquest of space…

Figure 1.1 World Population Growth and Major Technological Events, 9000 BC to Present



Source: Commission on Growth and Development 2008, 108, based on Fogel 1999.
Note: DNA = deoxyribonucleic acid; PCs = personal computers.

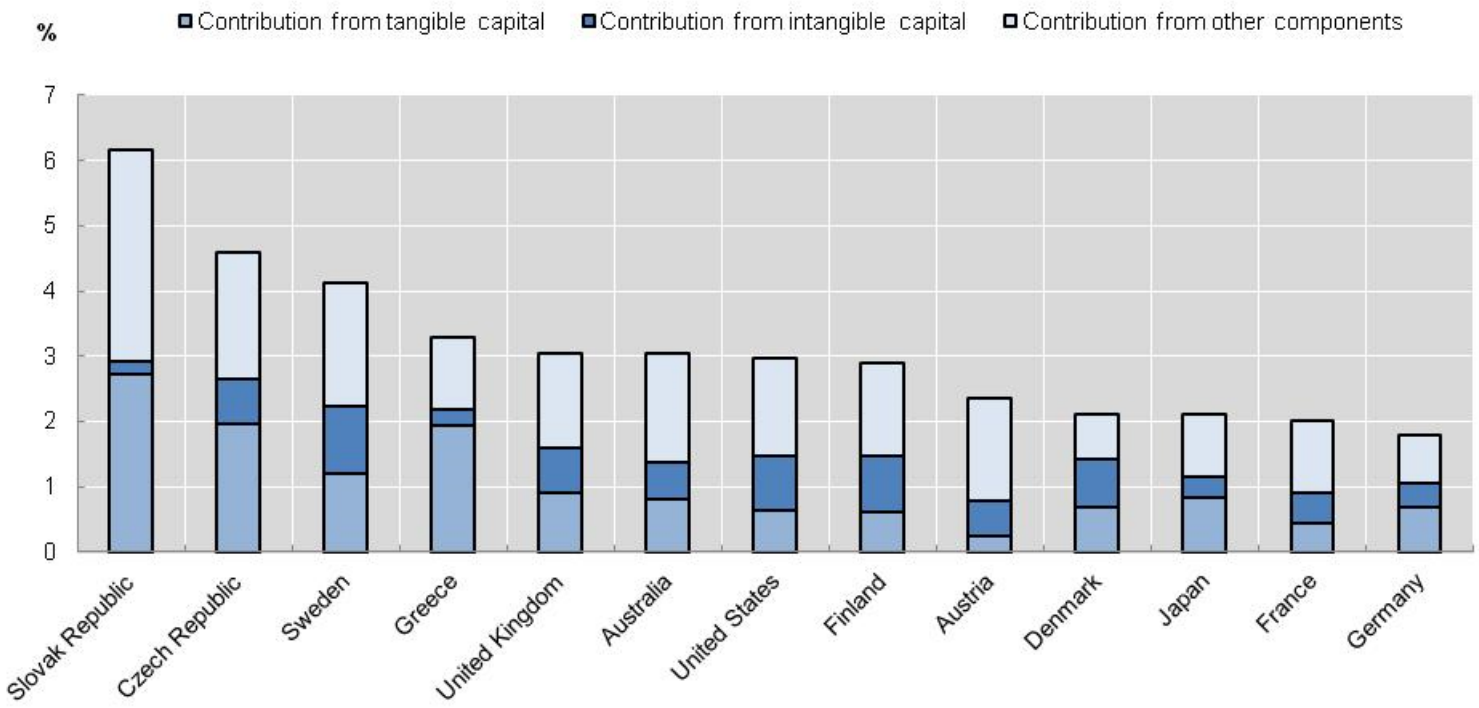
Innovation and growth
Macro-perspective

- Early theories of economic growth (**Solow**, 1956) postulated that the source of the growth is a technical progress disconnected from any economic considerations (exogenous)
- Inability to explain certain observations
- Since 1980, new macroeconomic models of endogenous growth =
  - innovation is endogenous (**Romer**), it is a decision of firm
  - innovation produce a knowledge that irrigates the whole economy (externalities)
  - Patents and intellectual property rights guarantee a return on investment in innovation while ensuring the dissemination of knowledge

  ➔ in line with the insights of **Schumpeter** that made innovation (creative destruction) the driver of development

Innovation drives growth

Contributions to labour productivity growth, 1995-2006, in %



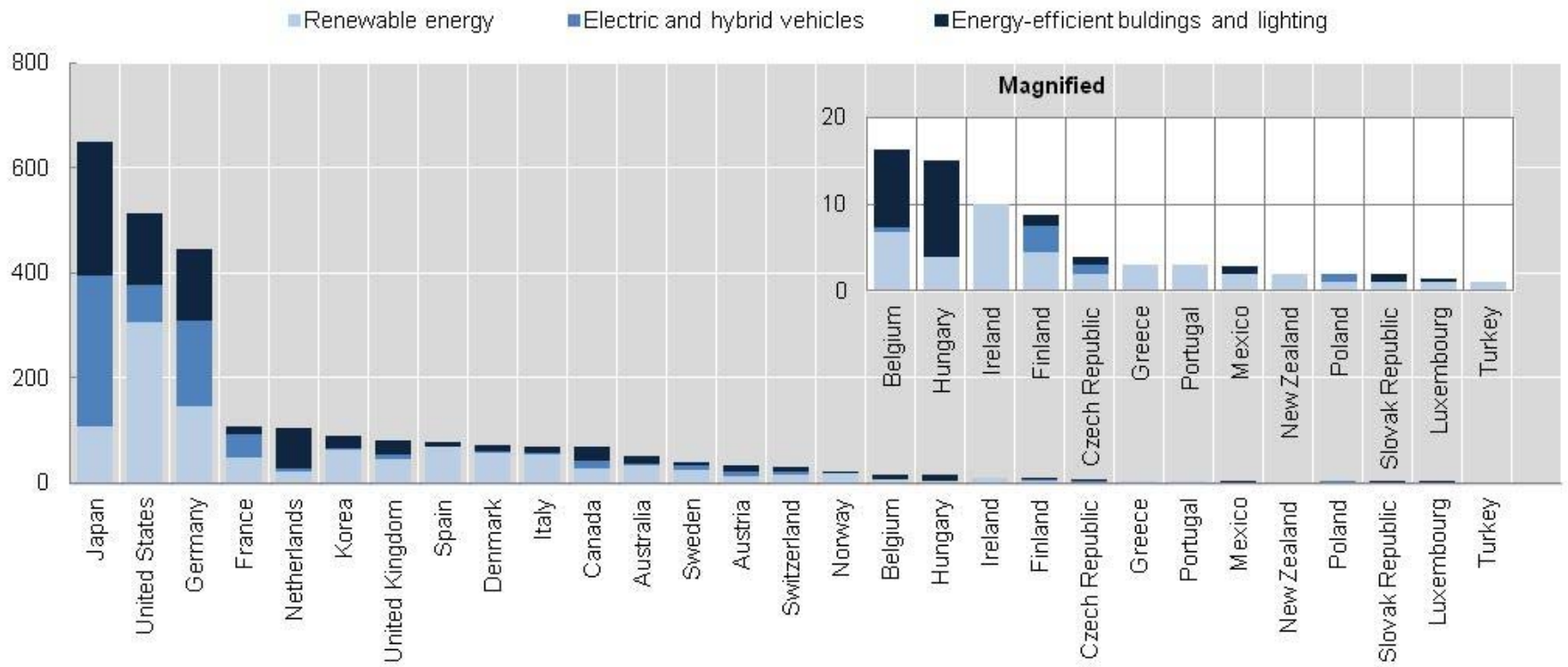
Innovation explains a good portion of labour productivity growth.

Source: OECD (2010), *Measuring Innovation: A New Perspective*, Paris.

The costs of meeting climate challenge depend crucially on the pace of innovation in mitigation technologies

Patents for climate change mitigation technologies, 2007

PCT patent applications



Source: OECD (2010), *Measuring Innovation: A New Perspective*, Paris.

Definition

http://www.youtube.com/watch?v=2NK0WR2GtFs

- Technology in an economic sense:
  - The goods and services produced and the means by which they are produced in a firm, an industry or economy (Stoneman 2002)
  - Technology in its purest form is knowledge – knowledge to pursue our goals and solve our problems (Simon 1973)
  - To *innovate means to generate and to apply new knowledge / new technology that solves practical problems*
- No innovation without new knowledge, but not vice versa

Definition of innovation

The classic definition of innovation by S*chumpeter* (1934): “carrying out of new combinations”

- Five possible cases
  - Introduction of a new good
  - Introduction of a new method of production
  - Opening of a new market
  - Opening of a new source of supply
  - Carrying out of the new organization of an industry, like the creation or breach of a monopoly position
- This is largely compatible with the more precise, modern microeconomic definition of innovation

Seminar Question 1

Definition of innovation

"Innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Some innovation activities are themselves innovative, others are not novel activities but are necessary for the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation." (OECD, 2005)

Oslo Manual
for measuring innovation
(OECD)

- Product Innovation.
- Process innovation
- Marketing Innovation
- Organisational Innovation

OECD, 2005, "The Measurement of Scientific and Technological Activities: Guidelines for Collecting and Interpreting Innovation Data: Oslo Manual, Third Edition" prepared by the Working Party of National Experts on Scientific and Technology Indicators, OECD, Paris, para. 149.

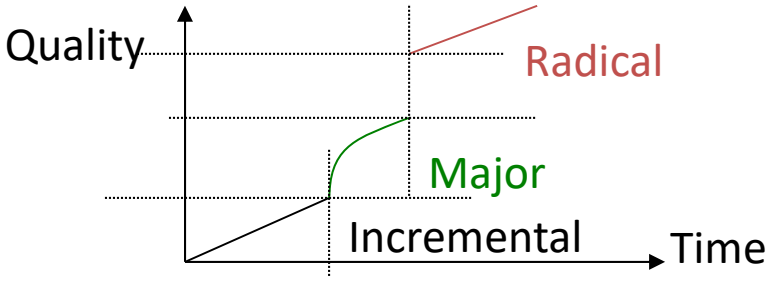
Definition of innovation

RADICAL (ex. steam engine, electricity, computer)
→ industrial revolution

vs. **INCREMENTAL**

GLOBAL (ex. antibiotics)

vs. **LOCAL** (ex. Implementation of a new system)



Seminar Question 2

Actors

- Individuals : role of inventors and entrepreneurs
- Firms / organisations: private production of knowledge (a market of property rights ?)
- Universities : public knowledge
- Networks (of innovators)
- States : what to do to unleash innovations ?

Basic dilemma of knowledge economy

- It is a **non rival good** that can expand infinitely

➔ We are not competing to use it: giving it away is a positive sum game

➔ The most efficient use of knowledge is when there is **no restriction in use : price should be zero**

- Producing it is (very) expensive

➔ The most efficient use to produce knowledge requires that the cost of all the input needed is covered by the economic value of the final product : **a price must be paid**

➔ **The use of knowledge should be restricted**

How to protect the inventor yet distribute the invention

Tension between production and use of a public good

Basic dilemma of knowledge economy

A typology of economic goods

	Rivalrous good	Non rivalrous good
Degree of excludability / Degree of control: High		
Low		

Romer (1993)

- A **non excludable** commodity

A lot of leaks and disclosure (intentional and unintentional)

- A low degree of control does not mean that knowledge will diffuse rapidly
  - Secret
  - Tacit knowledge

Seminar Question 3

Basic dilemma of knowledge economy

A typology of economic goods

	Rivalrous good	Non rivalrous good
Degree of excludability / Degree of control (High ↑ Low)	Lawyer services, machines	Encoded satellite TV transmission
	Fish in the sea	Basic R&D Mathematical formula

Romer (1993)

- A **non excludable** commodity

A lot of leaks and disclosure (intentional and unintentional)

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  - Secret
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Seminar Question 3

Basic dilemma of knowledge economy

Economic solutions

- Restriction of use : creation of property rights which give the inventor a temporary monopoly (private management)
- Freedom of use : public financing

➔ The solution depends on what CAN or CAN NOT , what SHOULD or SHOULD NOT be left in private hands

Private / public management of knowledge production

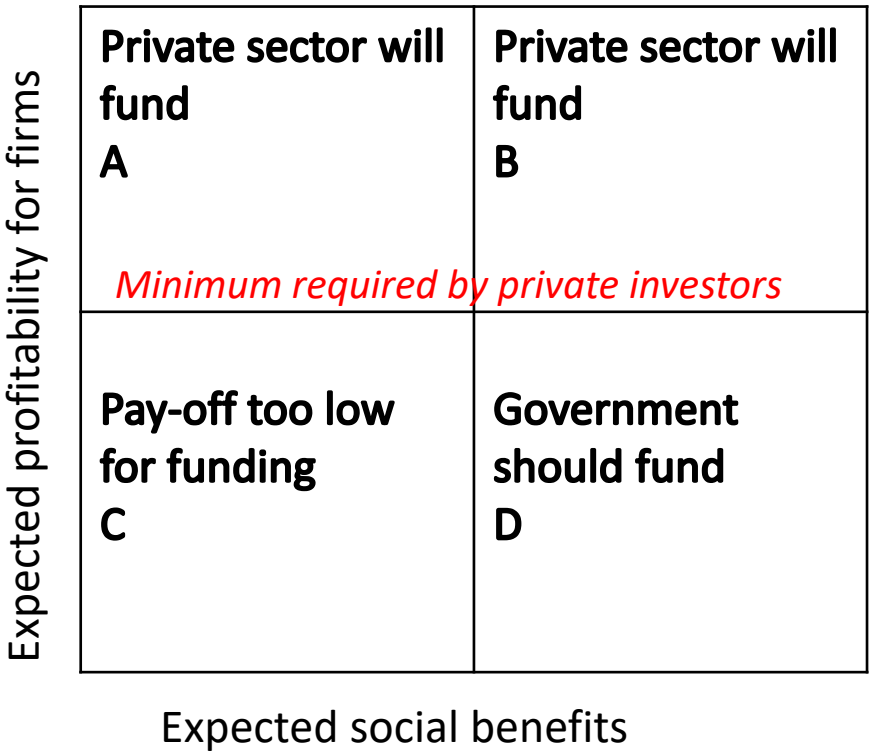
A market of property rights

- A patent gives a temporary monopoly over a technique or a device in exchange for disclosing to the world of the nature of the invention; ownership for a set period of time, over a stated geographical area and covering a specified technical application.
  - Juridical limits of a patent : differentiation between something that is a pure product of human ingenuity and something that is mainly the result of working with nature
  - Economic limits of a patent
- A balance between incentives to diffuse knowledge and protection of inventor

Open science, open knowledge

- Public financing is provided in exchange for a full and immediate disclosure of the findings

Private / public management of knowledge production



Source : K. M. Brown (1998) *: Downsizing Science*, Washington, D.C., The AEI Press, p.45;

- The two models are closely linked : private sector R&D draws on the pool of open knowledge

Seminar Question 4

References

Essential reading:

- Handbook: chapters 1
- Arrow, K.J. (1962) “Economic Welfare and the Allocation for Resources for Inventions”, in Nelson (ed.*), The rate and the direction of economic activity : economic and social factors*, Princeton University Press.