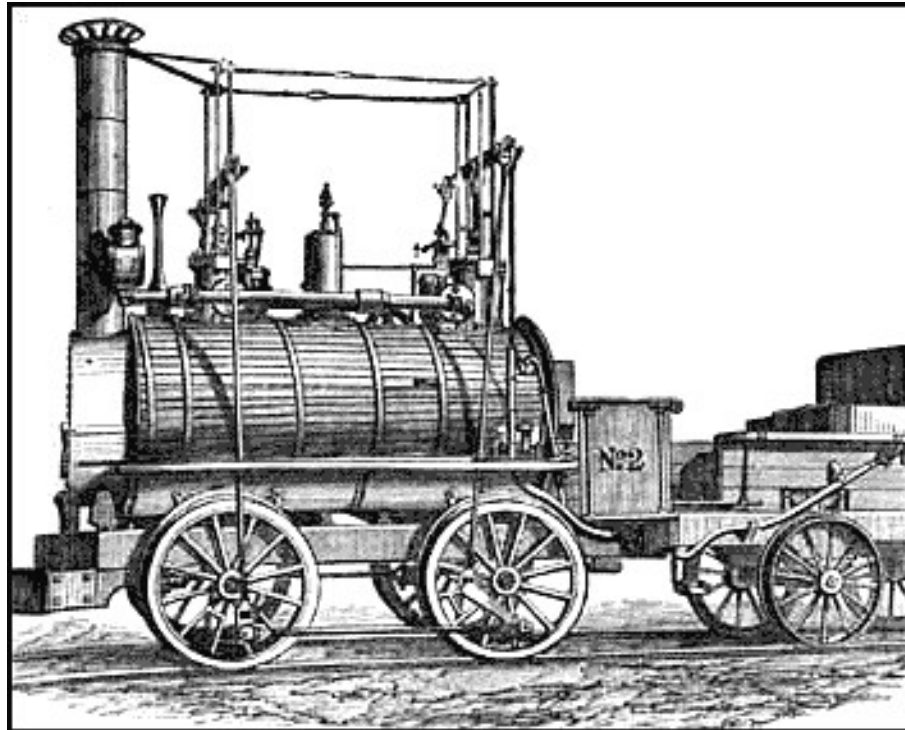


Evolutionary Theory

Economy and Technological Change



Karel Mulder

January 7, 2010

<http://www.answers.com/topic/railway>

Economy and Technological Change

Economic Determinism

Technology is to design the most efficient solution
to fulfill a need

Problems:

Time scale of judgment/technological change?

Innovations: Need only exists after the innovation

Need can be manipulated

New technology is often not most efficient

Availability of innovative resources (knowledge, etc) important?

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What does technology contribute to economic growth?

Residu method:

Economic growth determined by

growth labor

growth capital

quality of labor

rest: innovation

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**Economy was not much interested in technological change:
Manna from Heaven**

Business cycles

Period 8-9 years

Kondratieff waves

40-50 years

cluster of innovations that transforms society

Economy and Technological Change

Kondratieff examples

Cotton, iron, steam

1790-1840

Railroads

1840-1890

Electricity, cars, steel

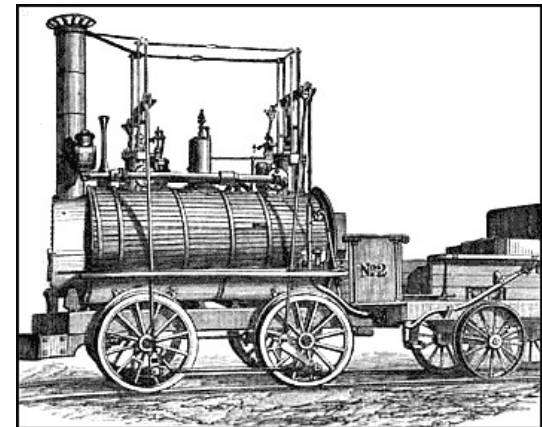
1890-1940

Chemistry, electronics

1940-1980

Information, comm.

1980-

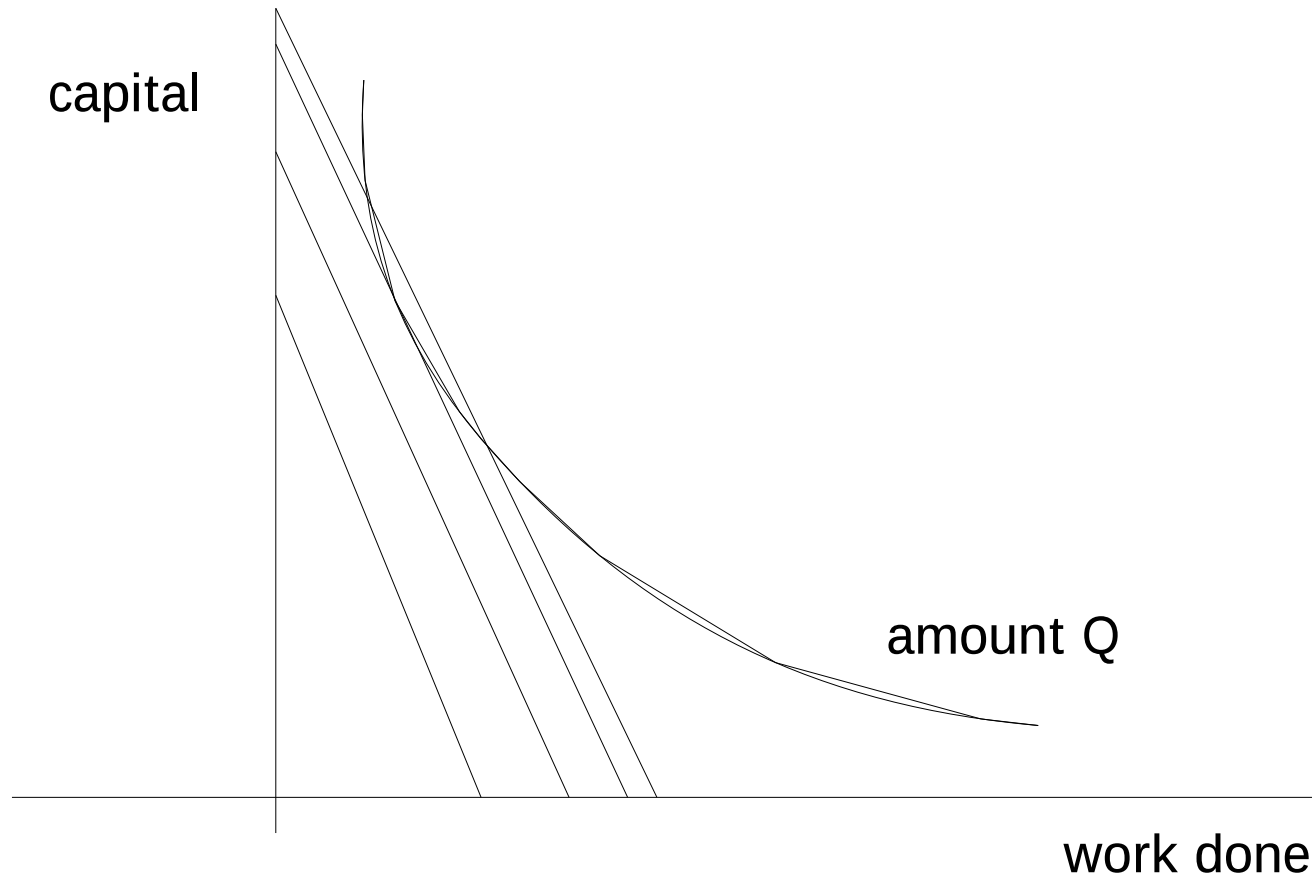


Blücher, an early railway locomotive built in 1814 by George Stephenson.

<http://www.answers.com/topic/railway>

Economy and Technological Change

Production Function



Economy and Technological Change

Production Function

Explains substitution labor, capital, resources

Explains development of different economies

Critique:

Limited to on the shelf (process) technology

No 'real innovation'

Economy and Technological Change

1940, Schumpeter

Technology is endogenous to economy:
Companies might invest more in their research
and thereby achieve higher profits

Example Du Pont: innovation as part of
economic strategy

What drives technology?

Market demand or technology push

Background: is Basic Research or Applied
Research to be stimulated?



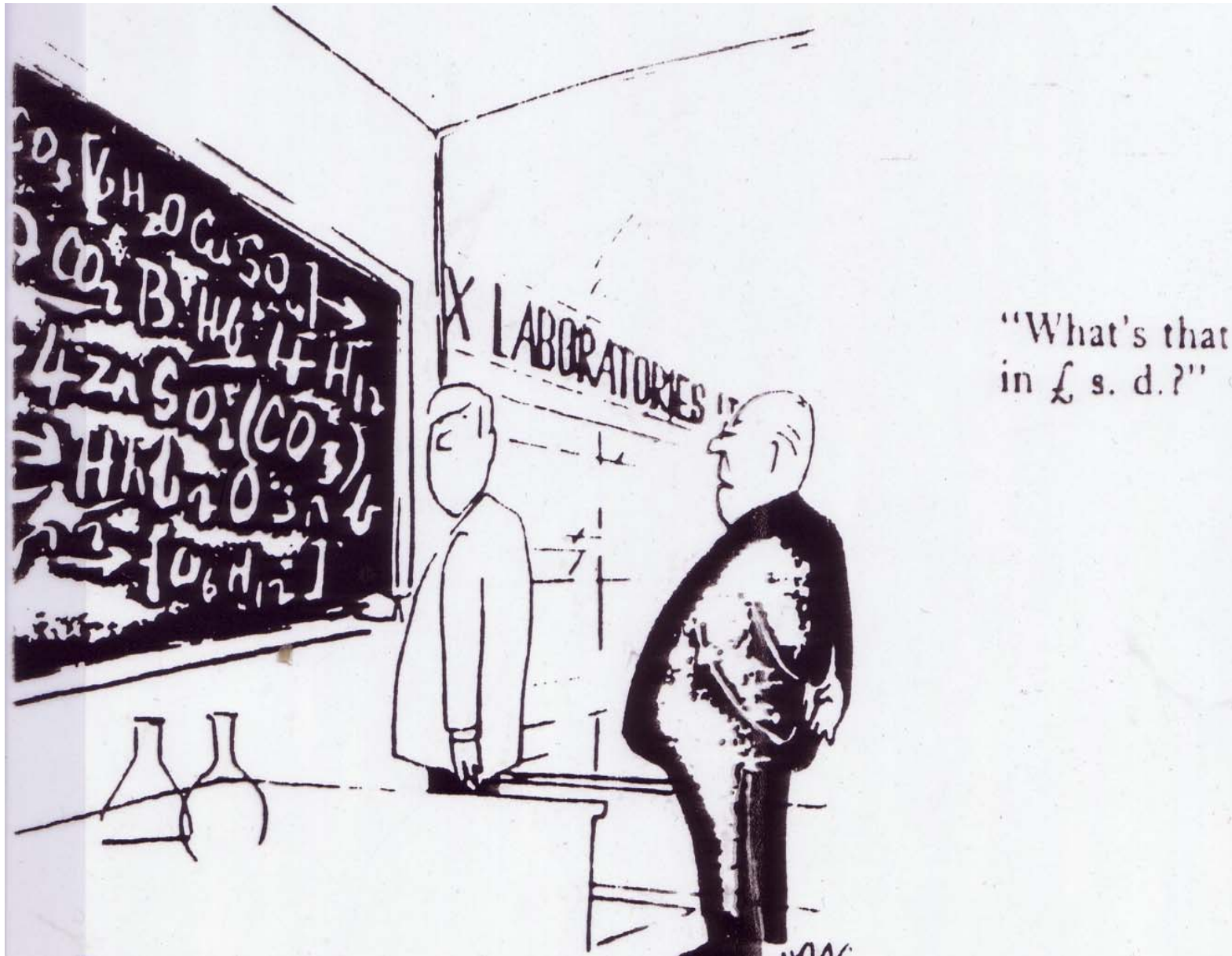
<http://en.wikipedia.org/wiki/Image:1schumpeter.jpg>

Economy and Technological Change

Technology Push vs. Market Pull

technology push vs market pull
as determinants of technological change

Why relevant question?





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push and pull examples

Technology Push:

Stirling Motor, Tracy Kidder: The soul of a new machine, DSM lysine

Market Pull:

Replacement for silk, indigo dye, continuous catalytic cracking

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Schmookler:

Patents are filed after the introduction of new products

Research follows a need discovered by an individual

Project Hindsight etc

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Push vs. Pull undecided

Problem:

What is need?

Initial stages push, later pull?

Both important:

market is crucial, but a pushing project champion too

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Evolutionary Theory of Technological Change

Path dependency

Variation / selection

Biological metaphor:

Random variation based existing technology,
(market) selection,

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Variation guided by:

Paradigms (Kuhn)

Exemplar

Experiences of the past

Future expectations

Adjacent technologies



Exemplar, defined technological regime

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Evolutionary Theory of Technological Change

Selection guided by:

Cost/performance

Expectations

Regulation

Interconnection to other technologies

Demographic & cultural change

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Technological trajectories

Technological variation guided by:

Technological regime (set of rules for technological designers), Paradigm, exemplars

Cultural matrix, dominant beliefs in society (70s growth, synthetics)

Available methods, equipment, education

Examples:

DC 3, application of aluminum in aircrafts, Moore's law

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What is wrong with the biologic comparison ?

Lamarck, purposeful change?

Coupling between variation and selection:

- Steering of selection environment

- Anticipating changes in selection environment

Quasi evolutionary model

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Quasi Evolutionary Model

Nexus: a link between variation and selection

advertising, standardization etc influ-selection

marketing, insurance, etc influ-variation

Niche: a separate (protected) part of the selection environment

example: municipal cars

Public transport on an island

Chipknip in Woerden

Eco-neighbourhoods

Evolutionary Theories

Strategic Niche Management / Niche Marketing

- ***Niche***: a separate (protected) part of the selection environment
 - Market niche, technological niche
 - Learning: improving design, adapting to demands
 - Going beyond the niche

Evolutionary Theories V:

Current Developments in regime theory

Regimes as a (broader) set of rules for designers

Different boundaries: device, artefact, systems

Multi-level model: different levels in society

Regime shifts: When are they possible? The management of
Transitions

Economy and Technological Change

Regime Shifts Possible?

Factors

- Belief in progress of current regime is low (example Tenax)
- Availability of accumulated knowledge and experience for a new alternative
- Presence of niche markets
- Scope for considerable 'learning effects'
- Network creation

1) Positive Feedback loops and Entrenchment processes both lead to lock in.

a) What is lock in?

b) The result of Positive **Feedback loops/Entrenchment processes** (mark right answer) is that the “winner takes all”.
Motivate your answer?

4) Energy System, Reverse Salient, Critical Problem

In Hughes system theory of innovation, what is the meaning of the concept ‘Reverse Salient’?

Mention a main reverse salient for the European road transport system, and briefly describe 2 critical problems that could (if solved) make an end to the reverse salient