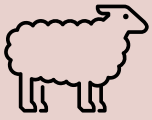
Innovation and Growth

EBH25, LECTURE 4

Lisbon School of Economics & Management
Universidade de Lisboa

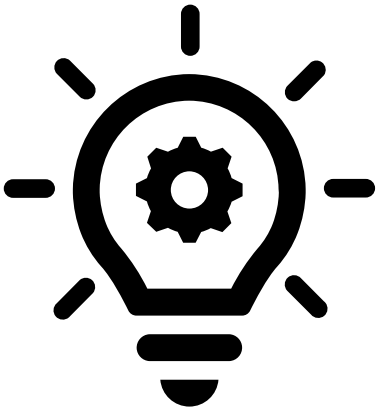
Innovation and Growth

Invention and Innovation



The Effect of the Effects

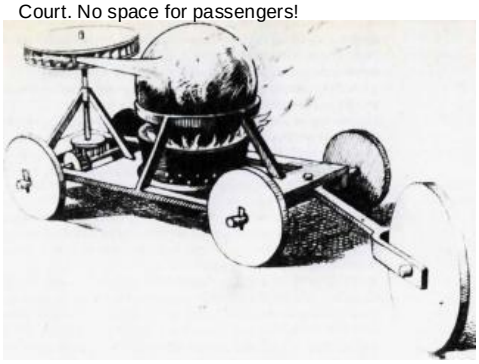
1. Invention and Innovation

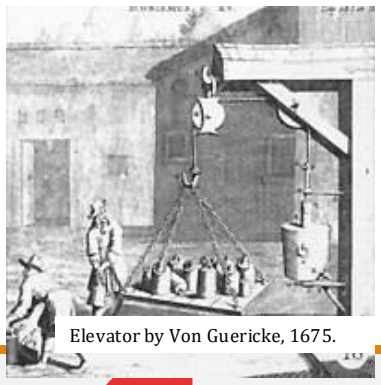


Invention OR Innovation?

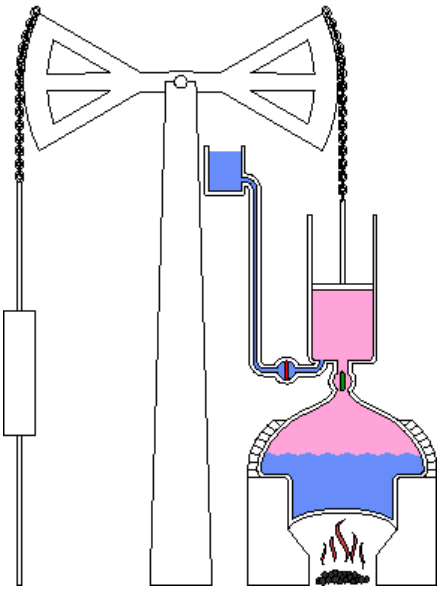
Steam engine by Hero of Alexandria ; 1st cent. AD

Steam car by Father Verbienst, 1678. Presented in the Chinese Court. No space for passengers!





Elevator by Von Guericke, 1675.



Newcomen's Steam Engine, 1712.

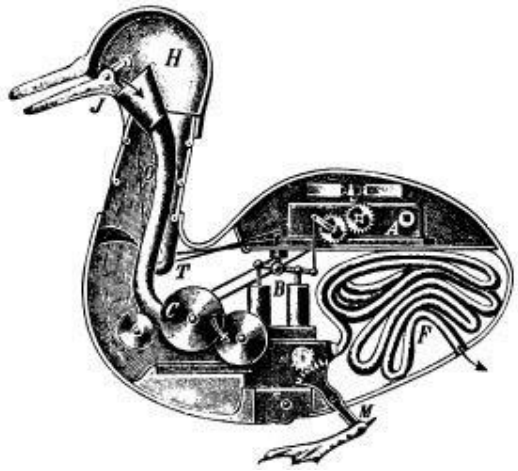
Science and Innovation

- The scientific foundations for steam had been known since the 1660s, thanks to the discovery of vacuum by Von Guericke
- A few functional steam machines were around since then
- Portugal, for instance, was not behind in terms of scientific knowledge
  - There was even a pioneer of steam machinery called Bento Portugal ;D)
  - Vaccum even was part of the curriculum of Portuguese universities (see tiles from the Un. of Évora, depicting the Marburg experiment)
- The difference was not in the SUPPLY of scientific knowledge, but on the DEMAND for innovations.
- In Great Britain, high wages and low interest rates stimulated innovation, something which did not happen in the continent

Invention and Innovation

- "Inventions" (see Vaucanson's duck) did not morph into innovations
- The contrast between the continent and England can be seen by the way how the technology behind an impressive mechanical duck by a gifted French inventor (Vaucanson) had no effect on the country's industry
- Yet, fame of this reached England where an illerate businessman (Arkrwright) tried to adapt the mechanism to perform a far simpler (spinning) movement
- Arkwright's succfessful spinning opened the path to successive improvements, which meant increasing profitability, even with lower wages

Invention



Vaucanson's duck 1740. Walked (M), ate (J), "digested" (B and F) and expelled "food" (F) by means of clockwork mechanism.

Innovation

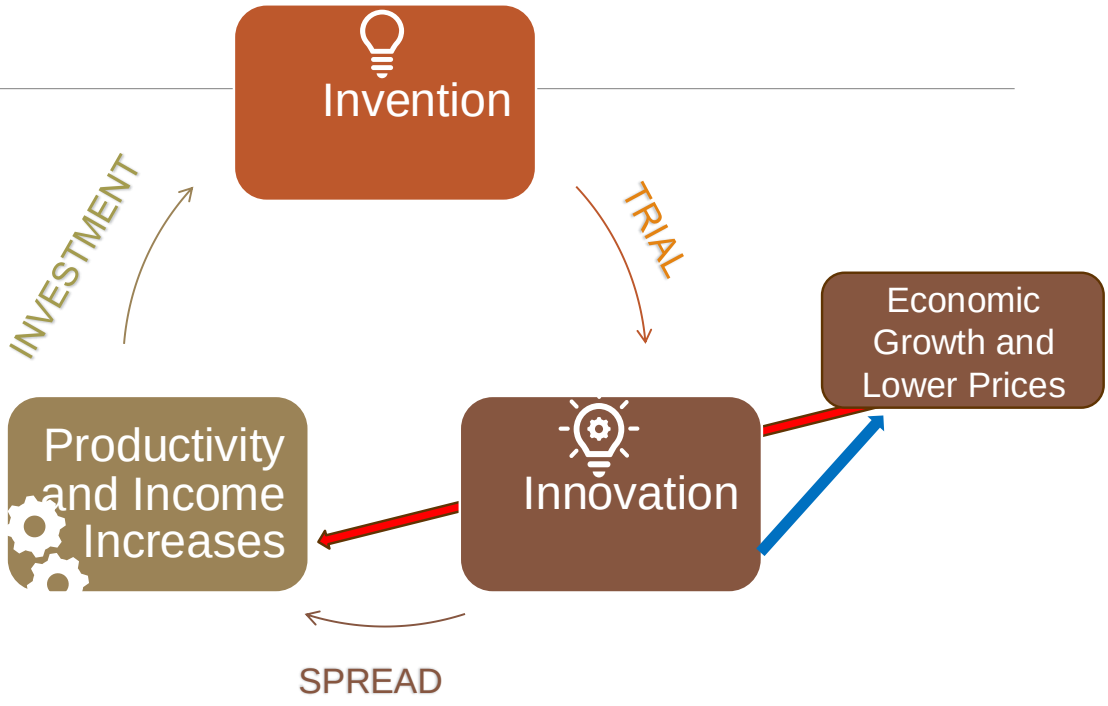
Spinning engine by Arkwright. Water powered. Research by Arkwright and his team of clockworkers from 1767 to 1771. Patented.

Productivity Increases in cotton spinning

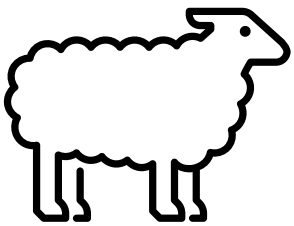
	Cost for spinning 100 lb of cotton in current GB pounds	Cost for spinning 100 lb of cotton INDEX	Hours for spinning 100 lb of cotton
1780	2.10	100	100
1795	0.57	23	15
1830	0.13	4	7

Fonte: Paulinyi (1989)

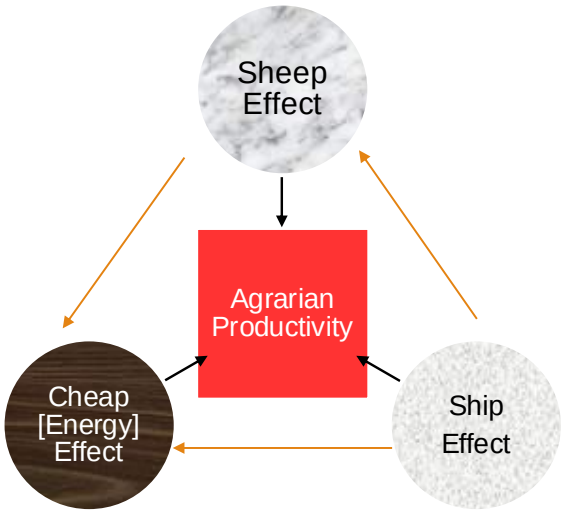
Invention and Innovation



2. The Effect of the Effects



English/British Succe



"The succes of the British economy [since the 17th cent.] is due to long-haired sheep, cheap coal and (…) rising volumes of international trade"
(Allen, The British Industrial, p. 130)

The Effect of the Effects

- With high urbanization level and cheap energy, labour productivity and wages were high
- High wages and productivity meant higher propensity for saving
- Hence, *ceteris paribus*, capital was abundant and interest rates were low
- High wages and low interests created a propensity for investing in labour-saving machines

RATIO WAGE/INTEREST RATE

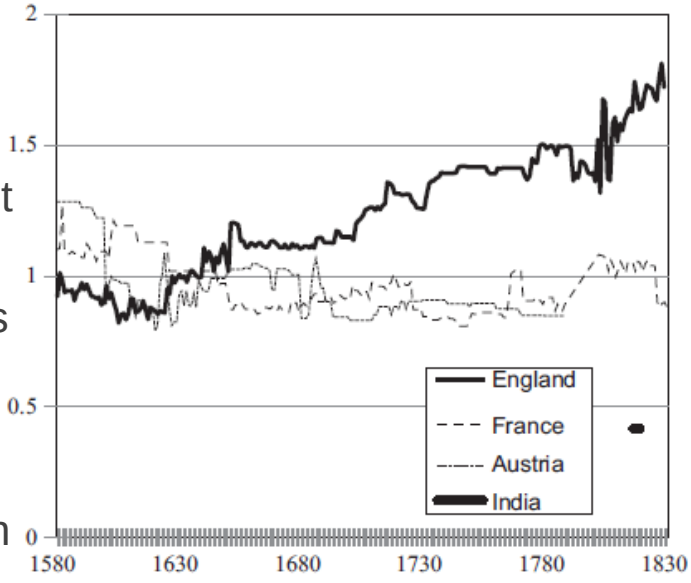
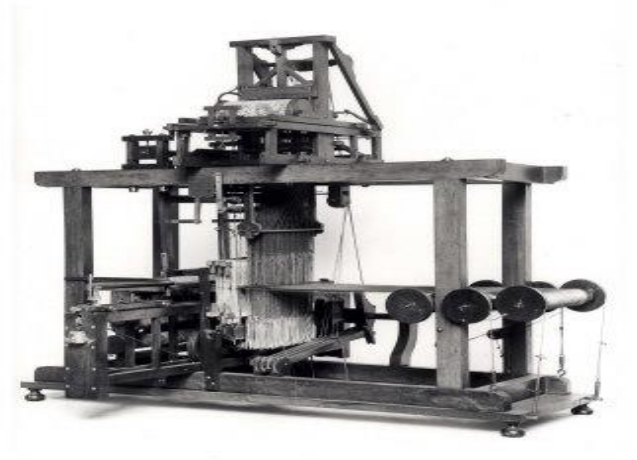


Fig. 4. Wage relative to price of capital.

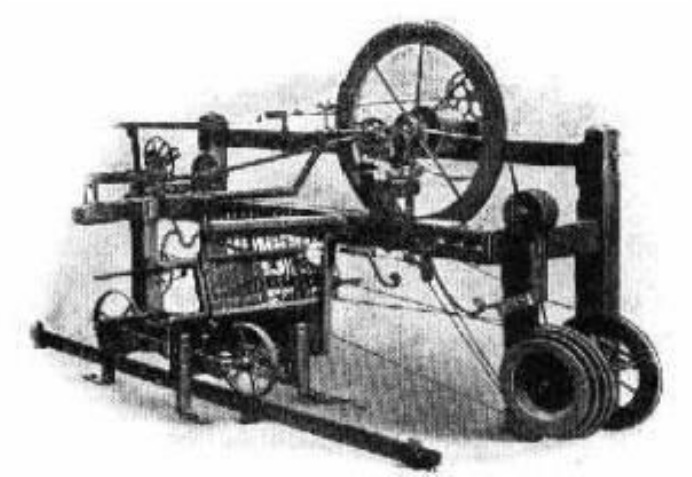
Source: Allen (2012), op cit

Invention



Silk loom inveted by Vaucanson, 1745, by order of the king for 'helping' the silk industry. Yet, the great manufacturers rejected, because it was more expensive than the wages it saved

Innovation



Authomatic Loom by Cartwright, 1789. Inspired by Vaucanson, Reverend Cartwright was able to create and patent a loom. Widely spread in England, because wages were higher

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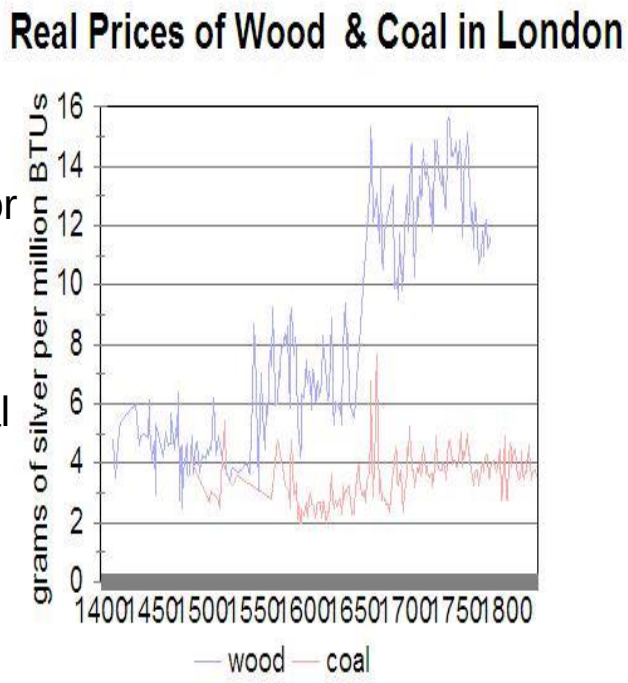
For Steam, the "Cheap [energy] Effect" is important

- Cheap Effect (or Wrigley Effect or Coal Effect)
- Urbbanization increased demand for heating and industry
- Urban demand led to the exhaustion of wood and increasing demand for (dirtier, but cheaper) coal in the 'underground forest'
- Adoption of coal saves forest, helping agriculture to obtain more room, and supports urbanization



Source: Allen (2012), op cit

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Steam and the “Cheap [energy] Effect”

Additionally, England had abundant (and cheap) supply for the most promising form of energy: steam!

Thus, English businesses had for more incentives to experiment with steam machines and with technology in general

However, steam was not decisive in the most important factor in 18th-century English economic growth and industrial development: the textile sector.

RATIO WAGE/ENERGY PRICE

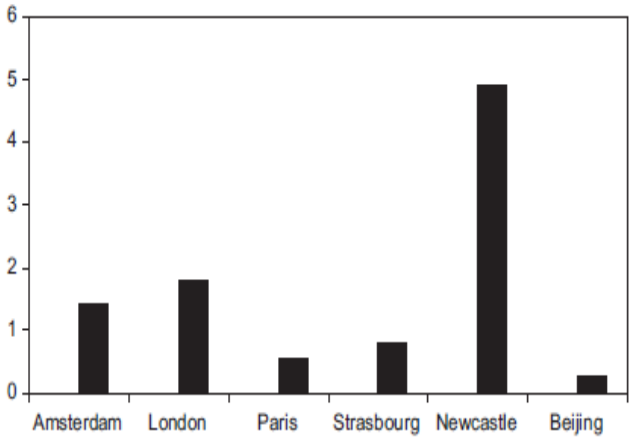

Fig. 6. Price of labour relative to energy.

Source: Allen (2012), Backward into the future: The shift to coal and implications for the next energy transition, Energy Policy, 50 (17-23).