Innovation and Growth

EBH26, LECTURE 4

Lisbon School of Economics & Management
Universidade de Lisboa

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Innovation and Growth

Invention and Innovation

The Effect of the Effects

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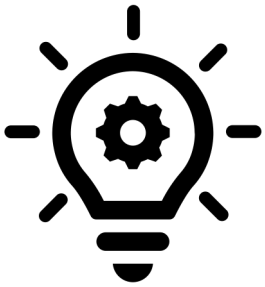
1. Invention and Innovation



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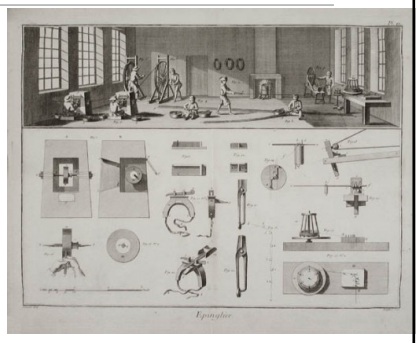
Growth in Labour Productivity: all industrial sectors?

- Adam Smith's model of economic growth implies the increase of output per worker (or hour worked) as his/her work is improv
- This envolves training, discipline, specialization and coordination
- However, the effects of the division of labour are limited and is some energy-intensive sectors (ironworking) or in sectors demanding already specialised tasks (textiles)
- In these sectors, there is need for drastic improvements that exceed the capacity of "organic assets" (fire, humans, animals)



A 18th-cent. pin factory, Adam Smith's example of how the labour specialization in the factory multiplied productivity by a very large factor … in one **industrial** sector. But does it work in all sectors?

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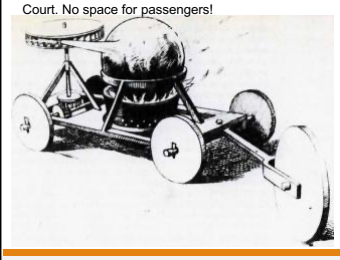
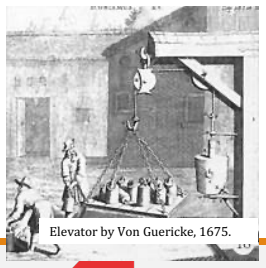
Invention OR Innovation?

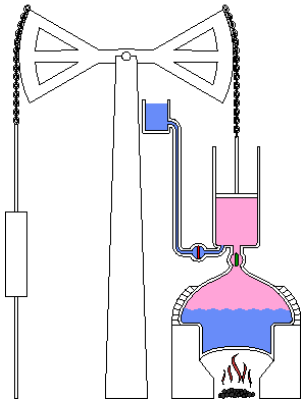
Steam engine by Hero of Alexandria ; 1st cent. AD

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





Elevator by Von Guericke, 1675.



Newcomen's Steam Engine, 1712.

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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

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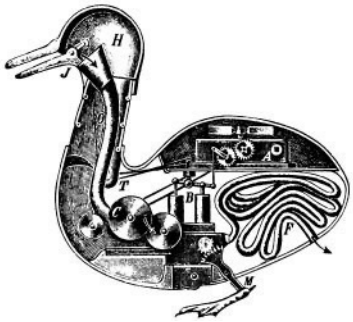
Invention Innovation



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

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

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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

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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)

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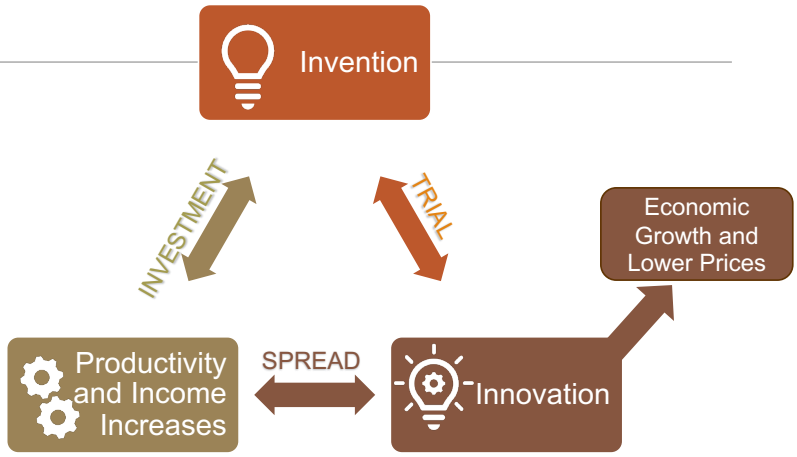
Invention and Innovation



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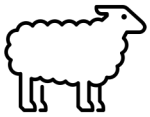
2. The Industrial Effect of the Agricultural Effects



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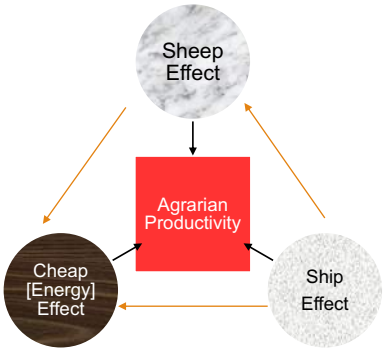
English/British Succe



''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)

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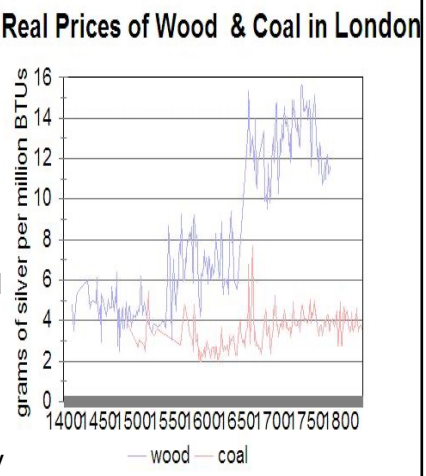
"Cheap [energy] Effect"

- Cheap Effect (or Wrigley Effect or Coal Effect)
- Urbanization 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
- Also, Cheap Energy for the industry



Source: Allen (2012), op cit

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

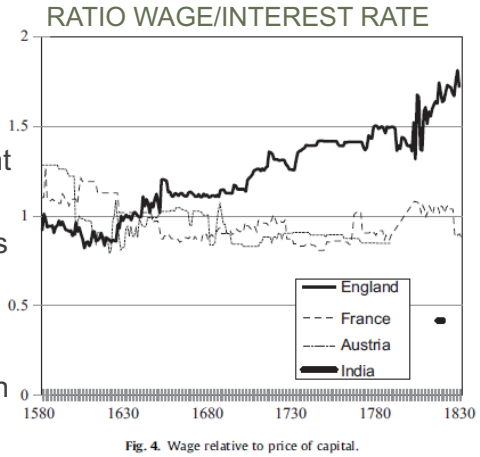


Fig. 4. Wage relative to price of capital.

Source: Allen (2012), op cit

Return on Investment, *spinning Jenny,* 1800

Factor of Labour Productivity Growth	% availability	GB	France	India	Portugal
3	50	51,2%	10,7%	3,0%	22,1%
3	40	38,0%	2,5%	-5,2%	14,8%
3	30	24,0%	-8,2%	-17,3%	7,3%

Source: Allen, The Ind. Rev. Min., tabela 1
Note: duration of machine 10 years (t)

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