Europe Gets Ahead

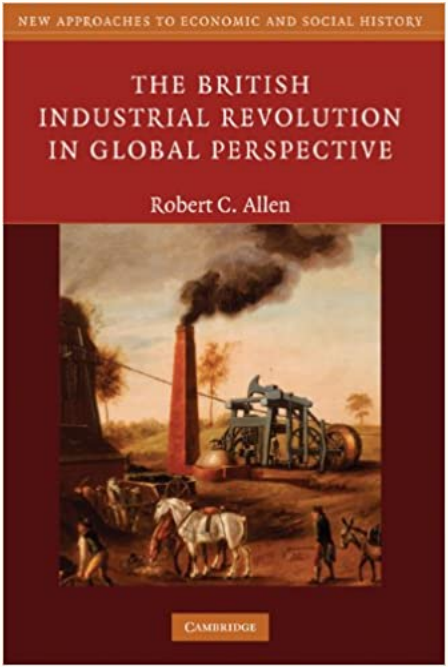
Jesús Fernández-Villaverde[1]

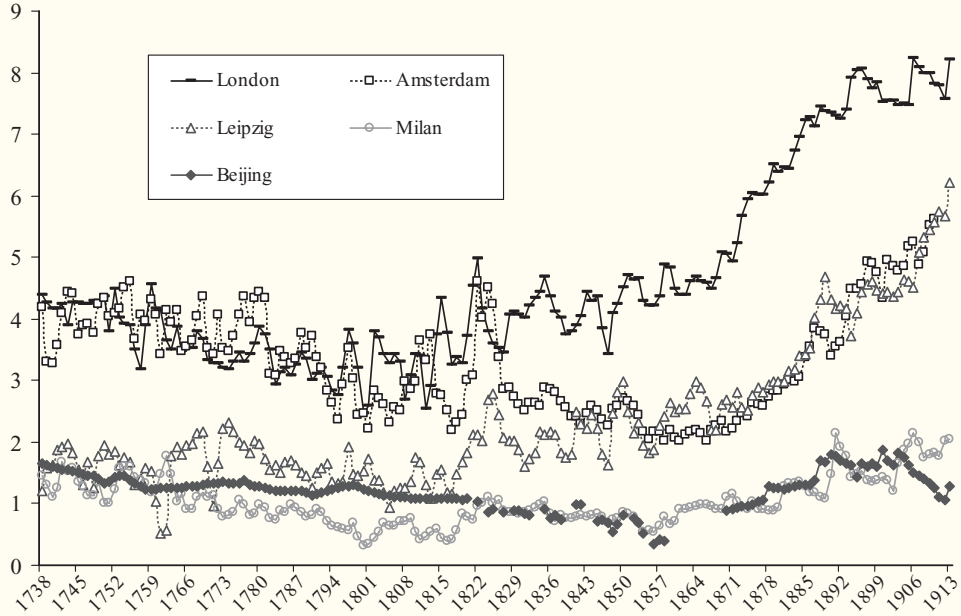
September 14, 2023

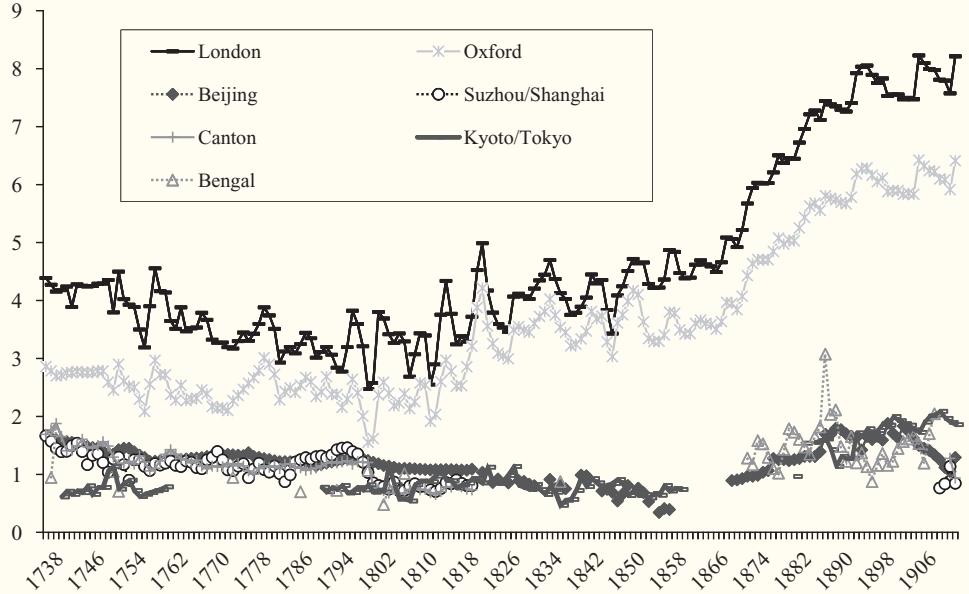
[1]University of Pennsylvania

Three questions

- Most fundamental (and classic) questions in economic history.
- Big question ("Great Divergence"): why was Europe first in achieving modern economic growth?
- Small question ("Little Divergence"): why, within Europe, was Britain first?
- Named "industrial revolution" by Arnold Toynbee (1852-1883), although 'révolution industrielle' had been used in French since the 1820s.
- Related, temporal, question: why did economic growth continue until today rather than peter out?

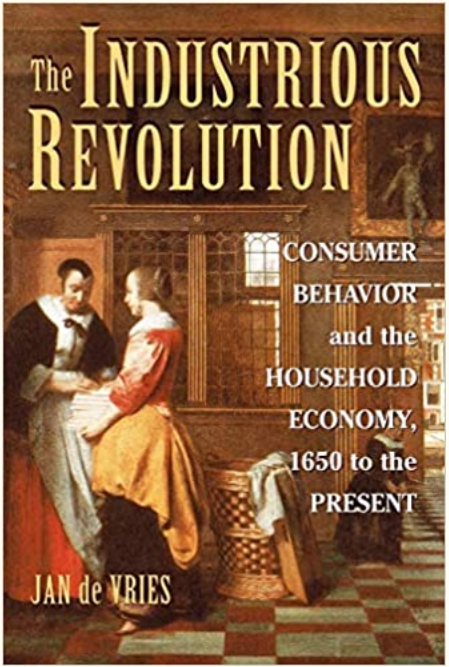

NEW APPROACHES TO ECONOMIC AND SOCIAL HISTORY
THE BRITISH INDUSTRIAL REVOLUTION IN GLOBAL PERSPECTIVE
Robert C. Allen
CAMBRIDGE


London
Amsterdam
Leipzig
Milan
Beijing
9
8
7
6
5
4
3
2
1
0
1738
1745
1752
1759
1766
1773
1780
1787
1794
1801
1808
1815
1822
1829
1836
1843
1850
1857
1864
1871
1878
1885
1892
1899
1906
1913


London
Oxford
Beijing
Suzhou/Shanghai
Canton
Kyoto/Tokyo
Bengal
9
8
7
6
5
4
3
2
1
0
1738
1746
1754
1762
1770
1778
1786
1794
1802
1810
1818
1826
1834
1842
1850
1858
1866
1874
1882
1890
1898
1906

The industrious revolution

- First, a prelude.
- Industrious revolution noted by De Vries (1994).
- Increase in hours worked since the end of the middle ages: longer days, fewer holidays, less "Mayday" Mondays.
- Particularly important in reformation countries.
- Reasons?
- Actually, increases in the hours of work seem a constant: Neolithic revolution.


The INDUSTRIOUS REVOLUTION
CONSUMER BEHAVIOR and the HOUSEHOLD ECONOMY, 1650 to the PRESENT
JAN de VRIES

Material culture

Past and Present

"In short, at the very deepest levels of material life, there is at work a complex order, to which the assumptions, tendencies and unconscious pressures of economies, societies and civilizations all contribute." Fernand Braudel, *Les Structures du quotidien: le possible et l'impossible*.

- Fork became popular in 14th century Italy. By 1600, commonly used for eating by merchant and upper classes. Extended later across Europe.
- Chairs also became popular in the 16th century. Before that, reserved for upper classes (we still call it "chair" in a professor).
- Brandy and other distilled liquors: 16th-17th centuries.
- Fashion.
- Multiplication of merchant ships by five.

Three popular answers to "Why Britain?"

1. Good institutions, in particular after the Glorious Revolution of 1688 (Daron Acemoglu and Jim Robinson).

2. Scientific/technological innovations created by a "culture of growth" (Joel Mokyr).

3. High wages created by international trade and urbanization induced technological innovation (Robert Allen).

Mixed answers

- We have many slightly different versions of each of these answers (and intermediate positions).
- For example, Allen emphasizes that: "an effective innovation system based on a high level of human capital, the appropriate engineering capability, and a few scientific breakthroughs" were necessary to respond to high wages.

The Glorious Revolution of 1688, I

- Overthrow of James II by William III.
- Invited by a substantial fraction of the English elite:

Letter of the Immortal Seven

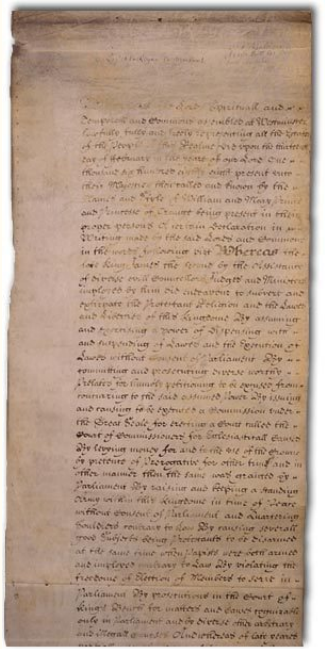
We have great reason to believe, we shall be every day in a worse condition than we are, and less able to defend ourselves, and therefore we do earnestly wish we might be so happy as to find a remedy before it be too late for us to contribute to our own deliverance...the people are so generally dissatisfied with the present conduct of the government, in relation to their religion, liberties and properties (all which have been greatly invaded), and they are in such expectation of their prospects being daily worse, that your Highness may be assured, there are nineteen parts of twenty of the people throughout the kingdom, who are desirous of a change; and who, we believe, would willingly contribute to it, if they had such a protection to countenance their rising, as would secure them from being destroyed.

The Glorious Revolution of 1688, II

- Army financed by Amsterdam.
- Crosses the Channel in October-November of 1688. Quickly defeats James.
- William III and Mary II officially replaced him on February 13, 1689.
- William is a weak ruler:
    1. War with France.
    2. Foreigner.

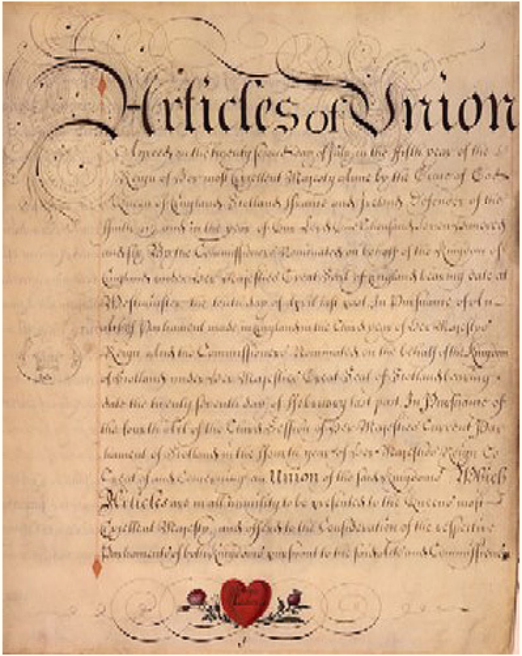
Institutional changes: political

- Bill of Rights of 1689:
  1. That the pretended power of suspending the laws or the execution of laws by regal authority without consent of Parliament is illegal;
  2. That levying money for or to the use of the Crown by pretence of prerogative, without grant of Parliament, for longer time, or in other manner than the same is or shall be granted, is illegal;
  3. That it is the right of the subjects to petition the king, and all commitments and prosecutions for such petitioning are illegal;
  4. That the raising or keeping a standing army within the kingdom in time of peace, unless it be with consent of Parliament, is against law;
  5. That election of members of Parliament ought to be free;
  6. That the freedom of speech and debates or proceedings in Parliament ought not to be impeached or questioned in any court or place out of Parliament;
  7. And that for redress of all grievances, and for the amending, strengthening and preserving of the laws, Parliaments ought to be held frequently.



Institutional changes: economics

- Act of Union 1707 between England and Scotland.
- Bank of England, 1694, stock and public debt market.
- Inclosures Acts.
- In general, inclusive set of economic institutions.
- Dynamic process to be developed over time.
- In fact, the "rise of the gentry" (as per R. H. Tawney's argument) goes back to the early Elizabethan era (1558-1603).



Articles of Union

Agreed on the twenty second day of July in the fifth year of the Reign of Her most Excellent Majesty Anne by the Grace of God Queen of England Scotland France and Ireland Defender of the Faith etc. and in the year of Our Lord One thousand seven hundred and six By the Commissioners Nominated on behalf of the Kingdom of England under Her Majesties Great Seal of England bearing date at Westminster the tenth day of April last past In Pursuance of an Act of Parliament made in England in the Third year of Her Majesties Reign And the Commissioners Nominated on the behalf of the Kingdom of Scotland under Her Majesties Great Seal of Scotland bearing date the twenty seventh day of February last past In Pursuance of the fourth Act of the Third Session of Her Majesties Current Parliament of Scotland in the fourth year of Her Majesties Reign to Treat of and Concerning an Union of the said Kingdoms Which Articles are in all humility to be presented to the Queens most Excellent Majesty and offered to the Consideration of the respective Parliaments of both Kingdoms pursuant to the said Acts and Commissions

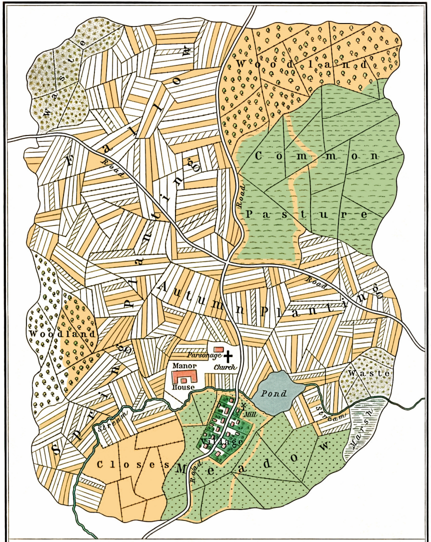
SEALING OF THE BANK OF ENGLAND CHARTER. 1694.

SIR JOHN HOUBLON. *Governor.*

SIR JOHN SOMERS. *Lord Keeper.*

MR. MICHAEL GODFREY *Deputy Governor.*

Plan of a Mediaeval Manor.



The Demesne

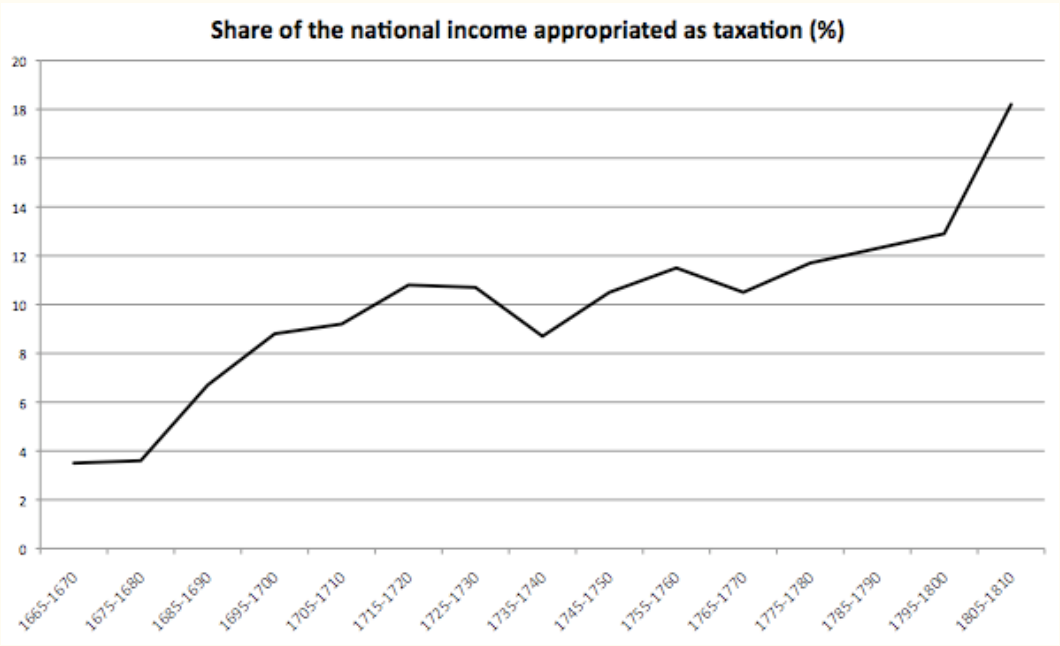
The glebe (i.e. strips in the open fields held by the parish church)

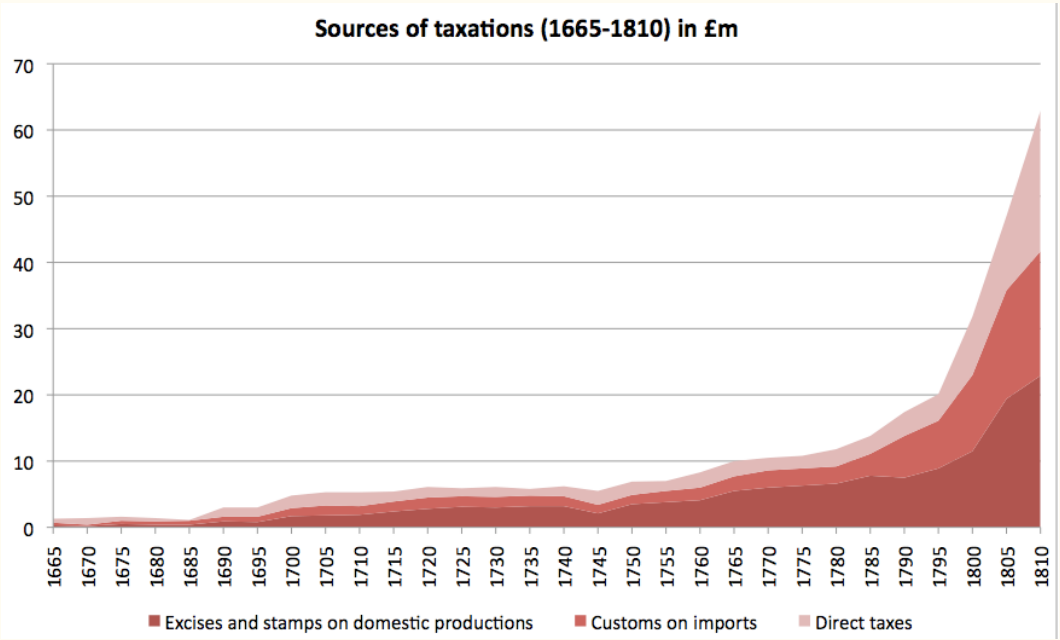
Later enclosures for farming and sheep-raising

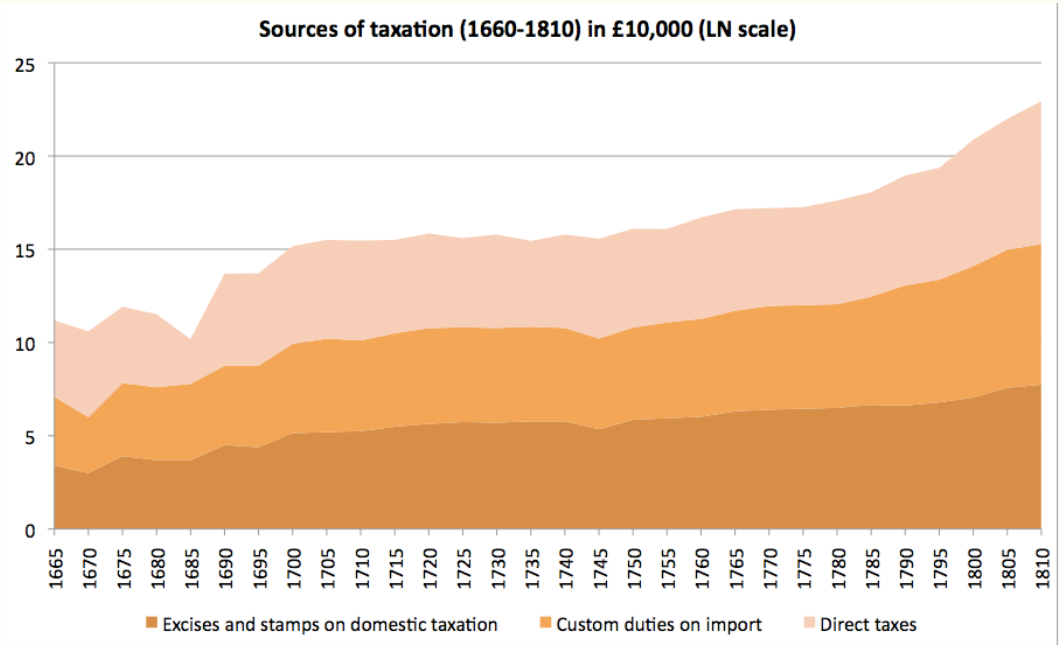
This plan of a manor is wholly conventional. It is intended to show: (1) the various features that might be found in English manors (or vills) of the mediaeval period; (2) the more important changes in the agricultural system which occurred in England from the fourteenth century onward. Many of these manorial features, of course, appeared in similar domains on the continent.

Critics of institutional view

- Interest rates did not fall.
- Property rights were more secure and taxes were lower in France.
- Important point was that 1688 gave England an effective government, not a limited government.
- For example, the Royal Navy could be properly financed.
- Fiscal-military state $\Rightarrow$ big success during the Seven Years War (1756-1763).
- Growing literature on state capabilities.


Share of the national income appropriated as taxation (%)
20
18
16
14
12
10
8
6
4
2
0
1665-1670
1675-1680
1685-1690
1695-1700
1705-1710
1715-1720
1725-1730
1735-1740
1745-1750
1755-1760
1765-1770
1775-1780
1785-1790
1795-1800
1805-1810


Sources of taxations (1665-1810) in £m
70
60
50
40
30
20
10
0
1665
1670
1675
1680
1685
1690
1695
1700
1705
1710
1715
1720
1725
1730
1735
1740
1745
1750
1755
1760
1765
1770
1775
1780
1785
1790
1795
1800
1805
1810
Excises and stamps on domestic productions
Customs on imports
Direct taxes


Sources of taxation (1660-1810) in £10,000 (LN scale)
25
20
15
10
5
0
1665
1670
1675
1680
1685
1690
1695
1700
1705
1710
1715
1720
1725
1730
1735
1740
1745
1750
1755
1760
1765
1770
1775
1780
1785
1790
1795
1800
1805
1810
Excises and stamps on domestic taxation
Custom duties on import
Direct taxes

Technological innovations

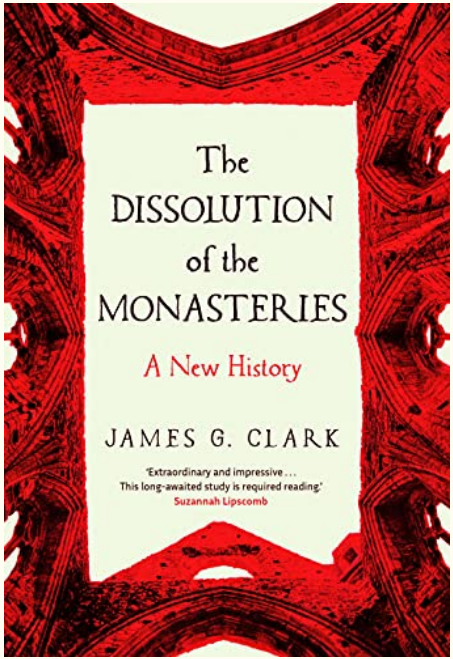
- 1688-1815 is a period of fast technological innovation.
- Moreover, an organized system of technological innovations appears.
- Most of them were engineering innovations, not scientific innovations.
- Even if relatively easy to copy, most ideas do not spread much away from Britain.

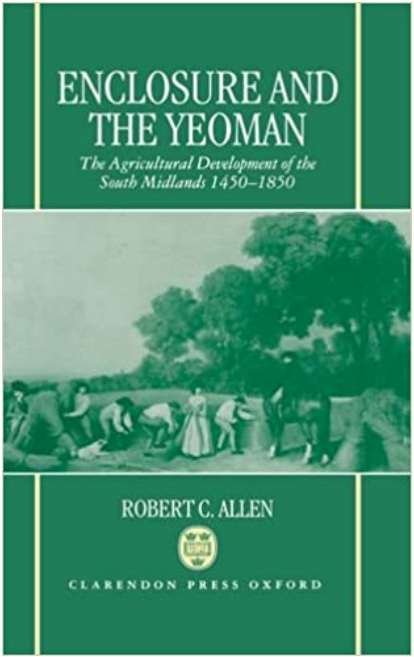
The canonical examples

- Traditional account: agriculture, textiles, and steam engine.
- Today, we have a much broader view.
- For instance, many advances appeared first in the Royal Shipyards.
- But it is still worthwhile to review some of canonical examples.
- We have already talked about the steam engine, so let's concentrate on agriculture and textiles.

Changes in land property

- Henry VIII breaks with the Catholic Church with the Act of Supremacy, passed by Parliament in 1534.
- Thus, England undertakes between 1536 and 1541 a massive change in land ownership: the dissolution of the monasteries.
- It creates a market for land and labor: "commercialization hypothesis."
- However, idea is disputed.


The
DISSOLUTION
of the
MONASTERIES
A New History
JAMES G. CLARK
'Extraordinary and impressive …
This long-awaited study is required reading.'
Suzannah Lipscomb


ENCLOSURE AND THE YEOMAN
The Agricultural Development of the South Midlands 1450–1850
ROBERT C. ALLEN
CLARENDON PRESS OXFORD

Innovations in agriculture, I

- Norfolk four-course system:
  1. Wheat for humans.
  2. Turnip for animals.
  3. Barley with clover and ryegrass undersown.
  4. Clover and ryegrass were grazed or cut for feed.
- Developed first in Flanders. Introduced in England in 1730 by Charles Townshend.
- Eliminates fallow, incentivates enclosing.


Charles
eVis^t Townshend

Innovations in agriculture, II

- Better plowing: Rotherham plow, successors with iron plows.
- Better seeding: Jethro Tull (1674-1741)'s seed drill (1701) replaces broadcasting.
- Selective breeding: Robert Bakewell (1725-1795) breed the New Leicester sheep.
- Agricultural shows.
- Trade publications.

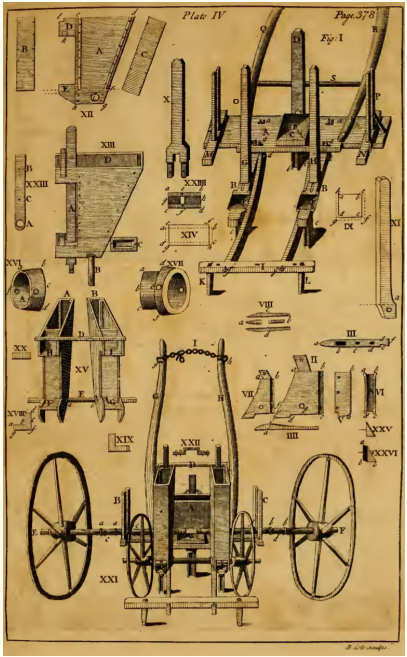
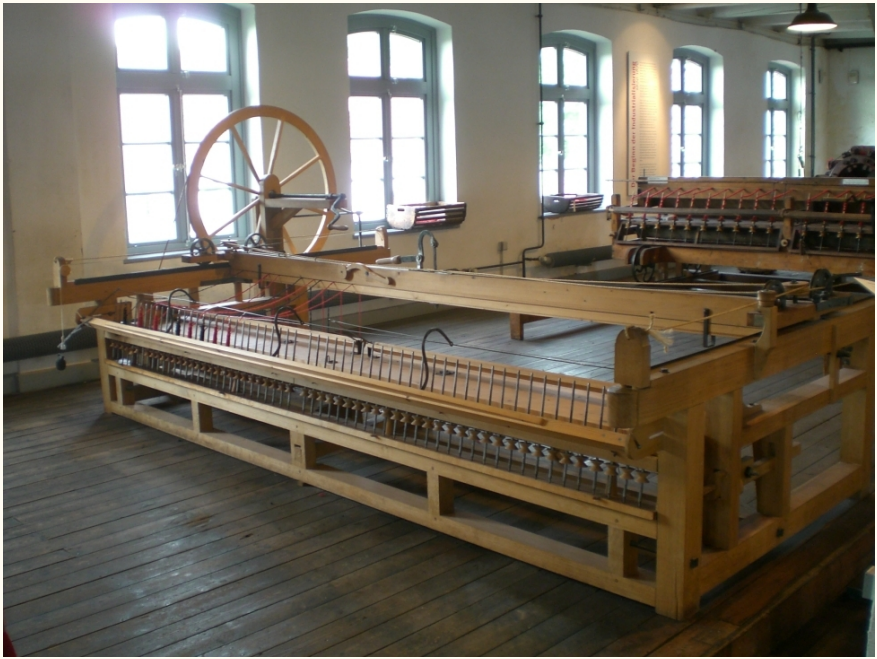


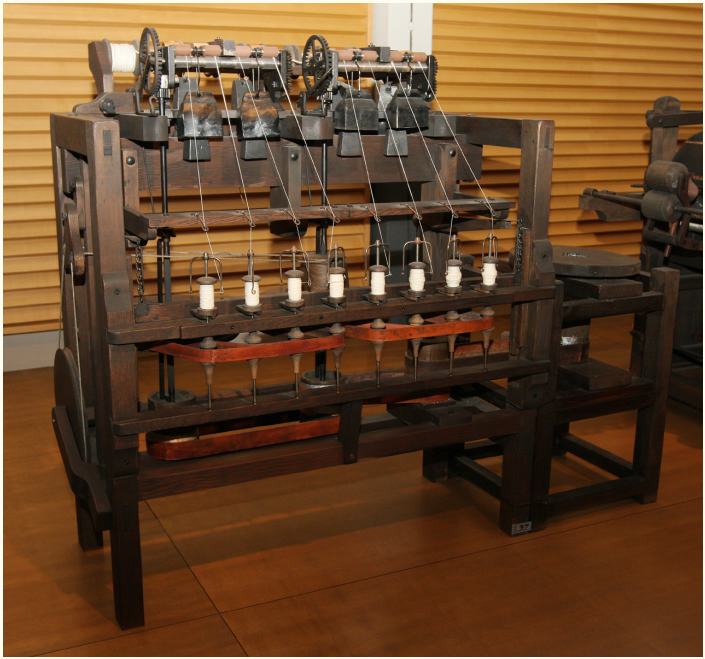
Plate IV
Page 378
Fig. I
XII
XIII
XXIII
XIV
XXVII
XVI
XX
XV
XVII
XIX
XXII
XXI
VIII
III
II
VII
VI
IIII
XXV
XXVI
IX
XI

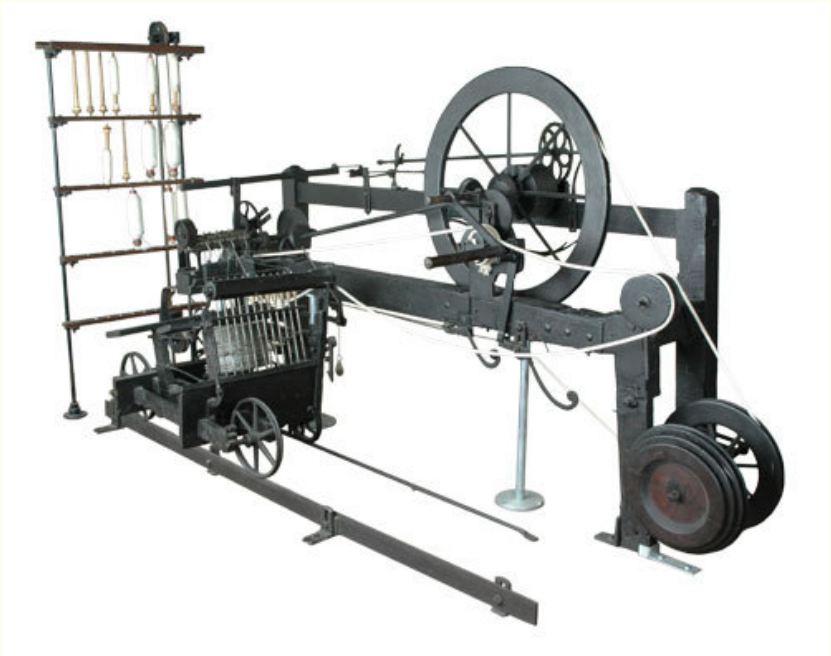

C. Barrand del.
Dishley Ram.
Published for Richard Phillips, 71, St. Paul's Church Yard, Oct. 1st 1804.

Textiles

- Old tradition of clothing trade in wool in England.
- Flying shuttle, by John Kay in 1733 $\Rightarrow$ weaving.
- Spinning jenny, by James Hargreaves in 1764 $\Rightarrow$ spinning.
- Water frame, by Richard Arkwright in 1767 $\Rightarrow$ factory.
- Mule, by Samuel Crompton in 1779.
- Self-acting mule, by Richard Robert in 1825 and 1830.
- Other advances in bleaching, pattern printing, ...







Other technological innovations

1. Gears, rollers, and flyers.
2. Longitude.
3. Lights.
4. Ceramic.
5. Iron and steel.
6. Cement and concrete.
7. Canned food.

Historians of science vs. economists

- Many historians of science focus on the autonomous role of science in developing inventions and progress (the "Newton paradigm").
- However, economists emphasize the role of profit.
- Classical study of Schmokler: Invention and Economic Growth, 1963).
- Innovation is determined by the size of the market and profit.
- Examples:
  1. Horseshoe, many innovations in the late 19th century and early 20th century, stop afterward.
  2. Air conditioners sold at Sears, between 1960 and 1980 and between 1980 and 1990.
  3. Drugs for Malaria versus drugs for male impotence.

Reasons

1. Patent system.
2. Enlightenment.
3. Higher rate of return due to relative prices.

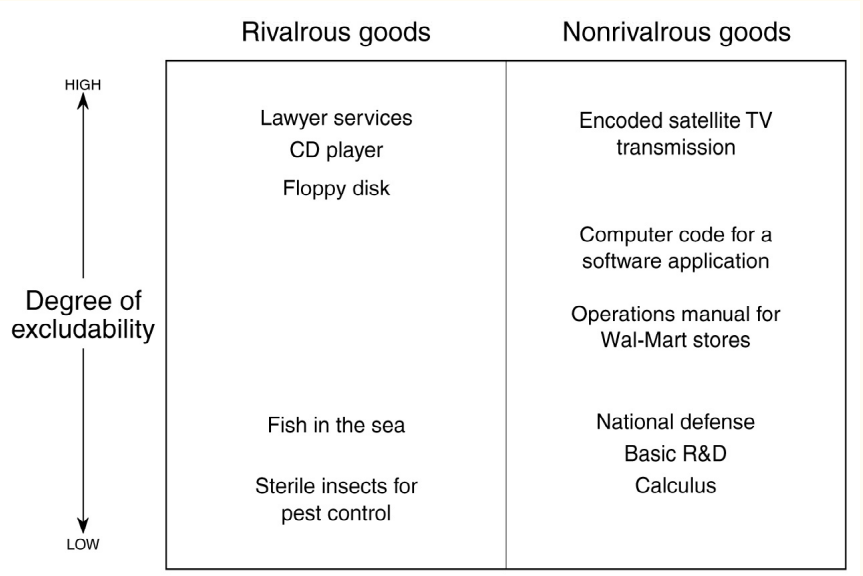
Ideas

- What is an idea?
- What are the basic characteristics of an idea?
    1. Ideas are *nonrivalrous* goods.
    2. Ideas are, at least partially, *excludable*.

Different types of goods

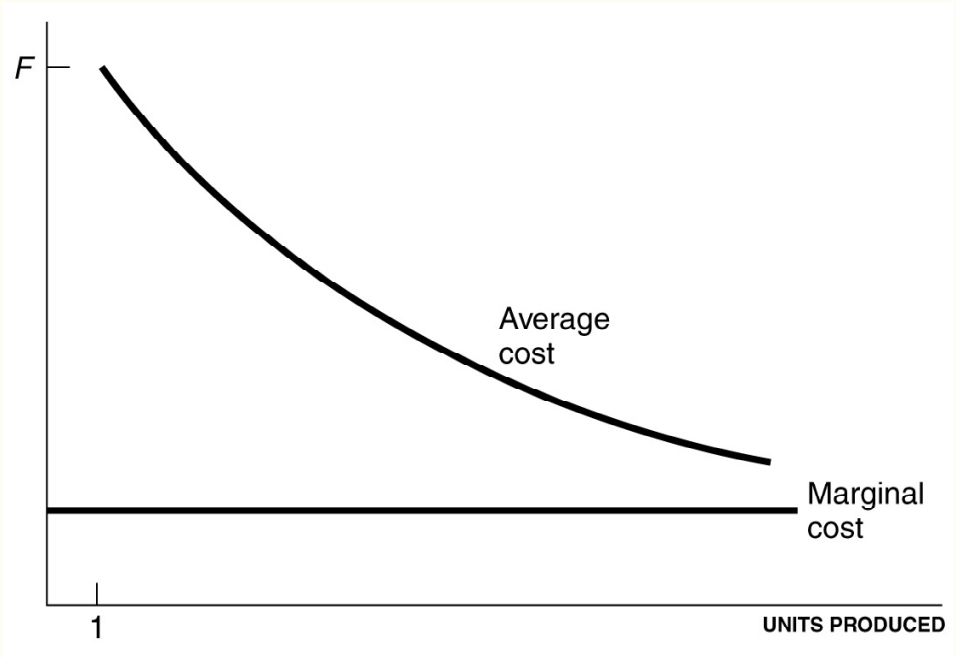
1. Rivalrous goods that are excludable: almost all private consumption goods, such as food, apparel, consumer durables fall into this group.
2. Rivalrous goods that have a low degree of excludability: tragedy of the commons.
3. Nonrivalrous goods that are excludable: most of what we call ideas fall under this point.
4. Nonrivalrous and nonexcludable goods: these goods are often called public goods.

Examples of different goods



Nonrivalrousness and excludability of ideas

- Nonrivalrousness: implies that the cost of providing the good to one more consumer, the *marginal cost* of this good, is constant at zero. Production process for ideas is usually characterized by substantial fixed costs and low marginal costs. Think about software.
- Excludability: required so that firm can recover fixed costs of development. Existence of intellectual property rights like patent or copyright laws is crucial for the private development of new ideas.


F
Average cost
Marginal cost
1
UNITS PRODUCED

Intellectual property rights and the industrial revolution

- Ideas engine of growth.
- Intellectual property rights needed for development of ideas.
- Sustained growth recent phenomenon.
- Coincides with establishment of intellectual property rights.

Data on ideas

- Measure technological progress directly through ideas.
- Measure ideas via measuring patents.
- Measure ideas indirectly by measuring resources devoted to development of ideas.

Important facts

- Number of patents issued has increased: in 1880 roughly 13,000 patents issued in the U.S., in 1999 150,000.
- More and more patents issued in the U.S. are issued to foreigners. The number of patents issued to U.S. firms or individuals constant at 40,000 per year between 1915 and 1991.
- Number of researchers engaged in research and development (R&D) in the U.S. increased from 200,000 in 1950 to 1,000,000 in 1990.
- Fraction of the labor force in R&D increased from 0.25% in 1950 to 0.75% in 1990.

Is the level of R&D optimal?

- Sources of inefficiency:
  1. Monopoly power of intermediate good producers.
  2. Externalities in research.
- Possible remedies.
- Implications for antitrust policy.

Is the level of R&D optimal?

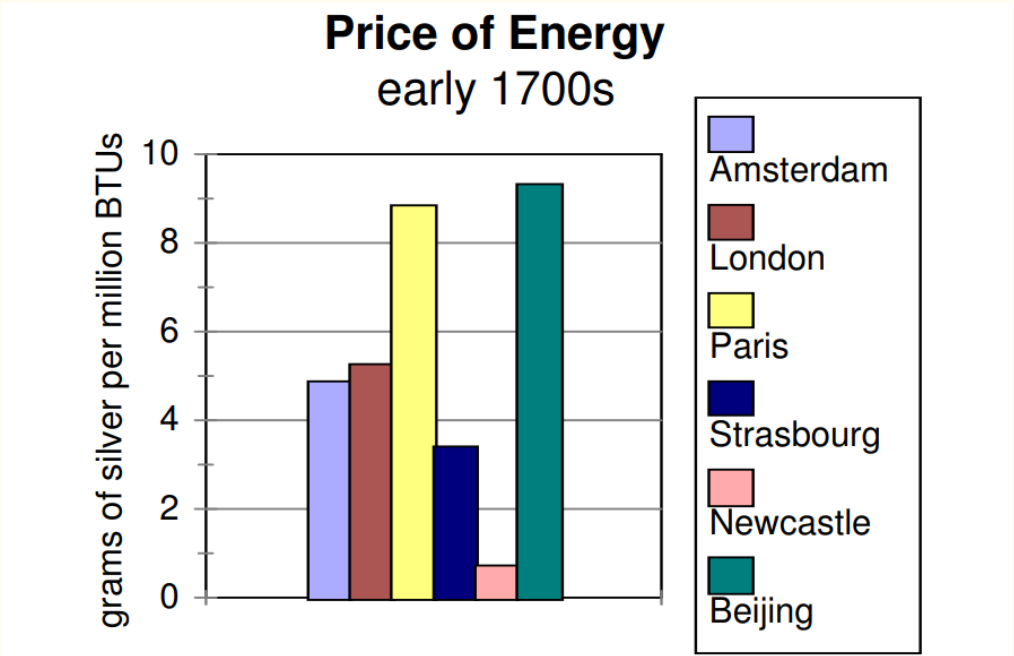
- Will we have innovation in the absence of a patents system?
- Boldrin and Levine (2003) have argued that we would.
- Why? Time between new invention and other competitors can produce the same good.
- Evidence from the market of generics versus brand drugs.
- Alternative route: trade secrets. Evidence by Petra Moser (2007).

Schumpeterian growth

- There is an alternative view of growth: Schumpeterian models of creative destruction.
- Loosely based on the insights of Joseph Schumpeter.
- New products replace old products: Ipod replaced CDs, CDs replaced LPs, LPs replaced Wax cylinders.
- Contribution by Aghion and Howitt (1992) and Grossman and Helpman (1991).
- An interesting aspect of these models is that they generate growth cycles.

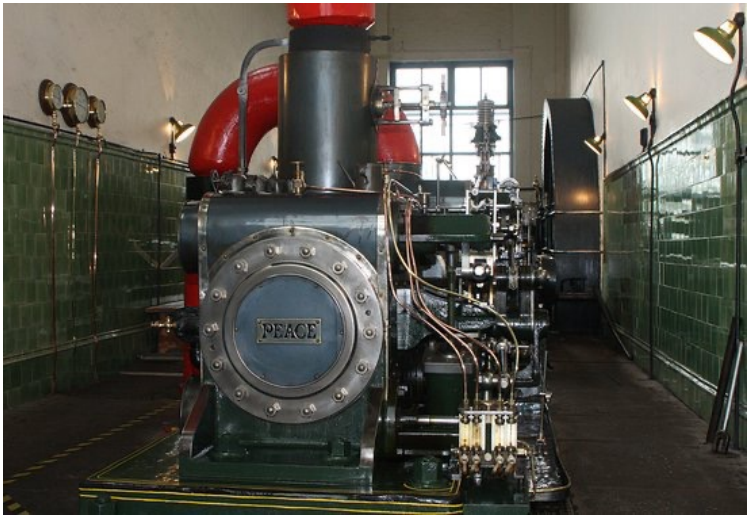
Proportion of adults that could sing their names

	1500	1800
England	6	53
Netherlands	10	68
Belgium	10	49
Germany	6	35
France	7	37
Austrian Empire	6	21
Poland	6	21
Italy	9	22
Spain	9	20

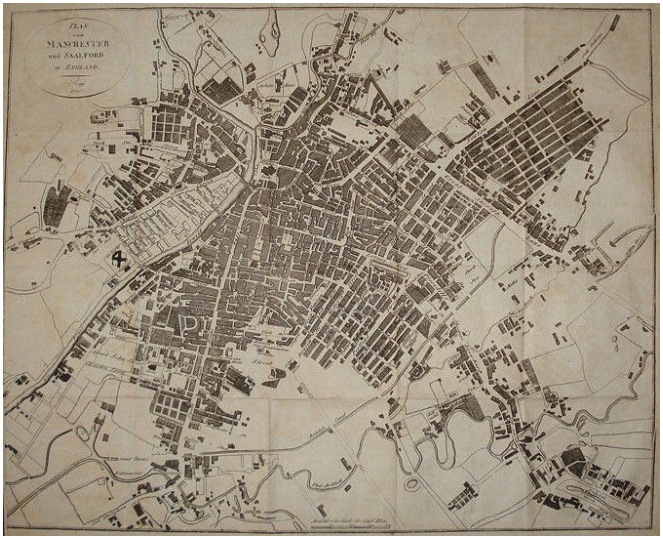

Price of Energy
early 1700s
grams of silver per million BTUs
10
8
6
4
2
0
Amsterdam
London
Paris
Strasbourg
Newcastle
Beijing

Queen Street Mill

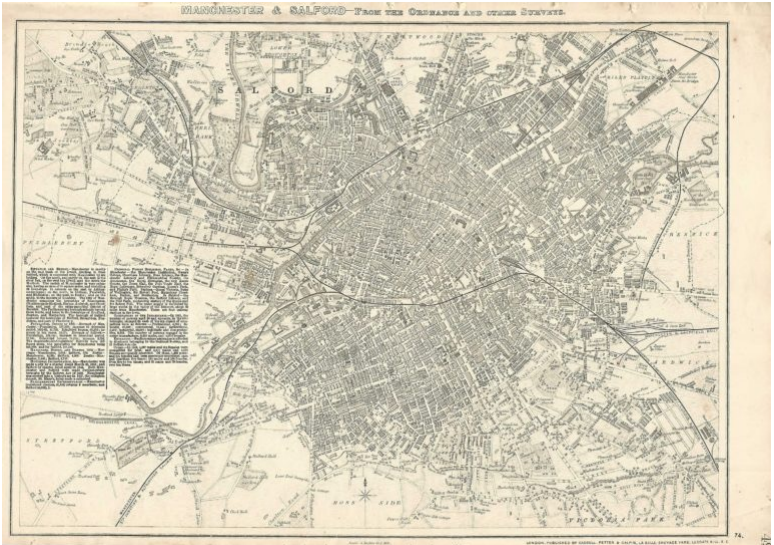
Queen Street Mill



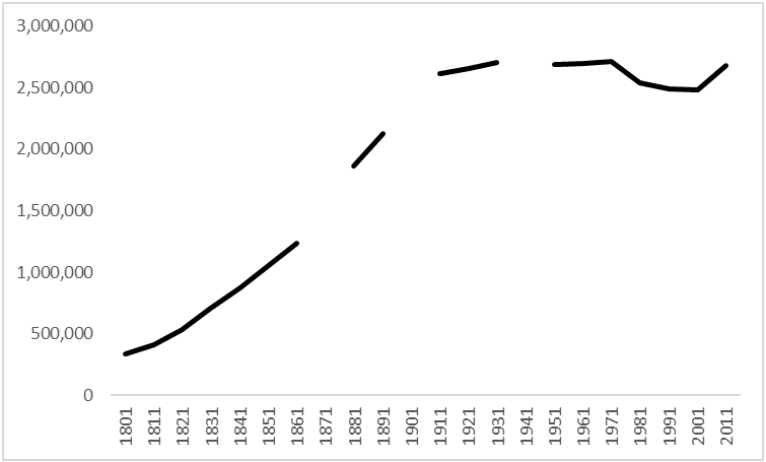
Manchester and Salford 1801



Manchester and Salford 1864



Manchester Population

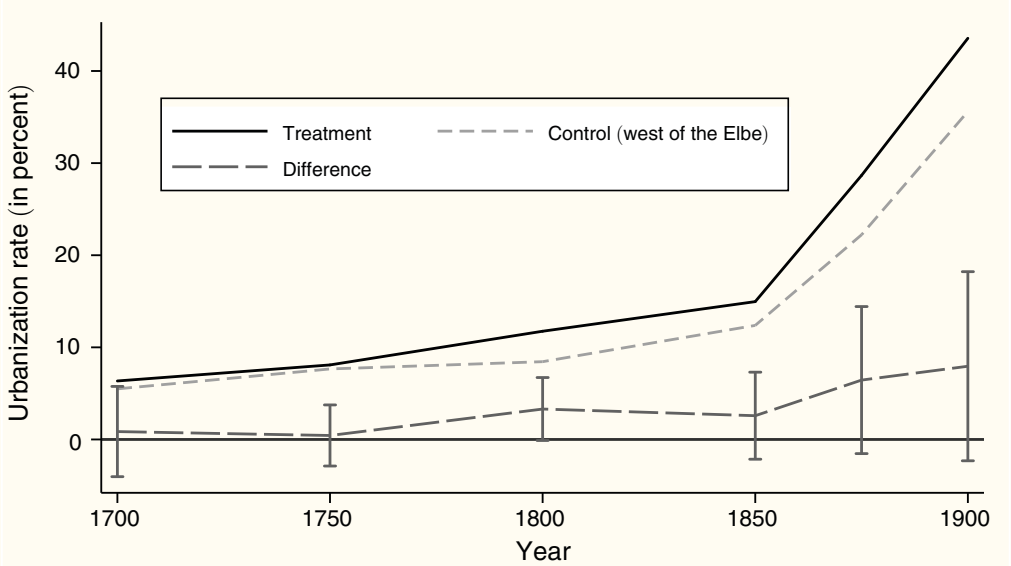


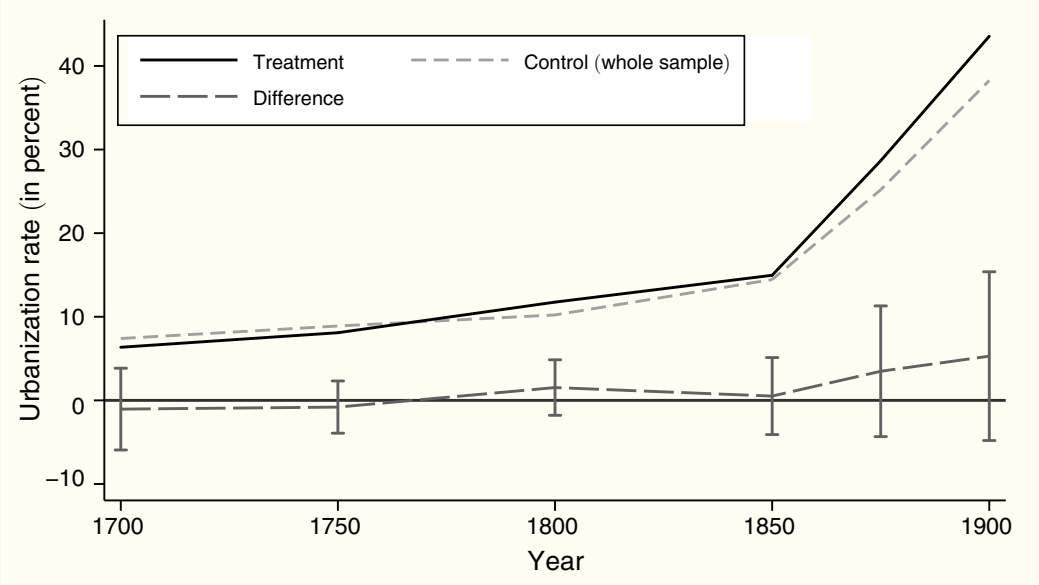
Source: GB Historical GIS, University of Portsmouth


SILKS
SILKS
LINENS

Spread to Europe

- Belgium, early 19th century.
- France, Germany.
- Only later in 19th century to the south and east of Europe.
- Role of the French Revolution? Acemoglu, Cantoni, Johnson, and Robinson (2009).
- U.S. is a somehow different case.


Urbanization rate (in percent)
40
30
20
10
0
Treatment
Control (west of the Elbe)
Difference
1700
1750
1800
1850
1900
Year


Treatment
Control (whole sample)
Difference
Urbanization rate (in percent)
40
30
20
10
0
−10
1700
1750
1800
1850
1900
Year

	Dependent variable: urbanization rate				
	West of the Elbe			All	
	Weighted (1)	Weighted, overid (2)	Unweighted (3)	Weighted (4)	Unweighted (5)
Panel A. OLS estimation					
Reforms index	0.281	0.281	0.220	0.268	0.191
	[0.114]	[0.114]	[0.122]	[0.110]	[0.105]
Panel B. First stage					
French presence × post1800 × trend	1.166		1.116	1.006	0.960
	[0.107]		[0.143]	[0.108]	[0.145]
F-statistic excluded instruments	119.7	121.6	61.85	87.57	43.71
p-value *F*-statistic	0.000	0.000	0.000	0.000	0.000
Panel C. 2SLS estimation					
Reforms index	0.291	0.321	0.204	0.284	0.193
	[0.102]	[0.112]	[0.124]	[0.112]	[0.143]
Observations	74	74	69	109	109
Number of states	13	13	12	19	19
p-value overidentified test		0.328			

Notes: All regressions have full set of territory and year dummies. Robust standard errors clustered by territory. Weighted regressions are weighted by territories' total population in 1750. The overidentified regression in column 2 uses a full set of interactions of "Years of French presence" and year dummies as excluded instruments.