

Cradle of Modernity

Jesús Fernández-Villaverde¹

September 18, 2023

¹University of Pennsylvania

World circa 1870

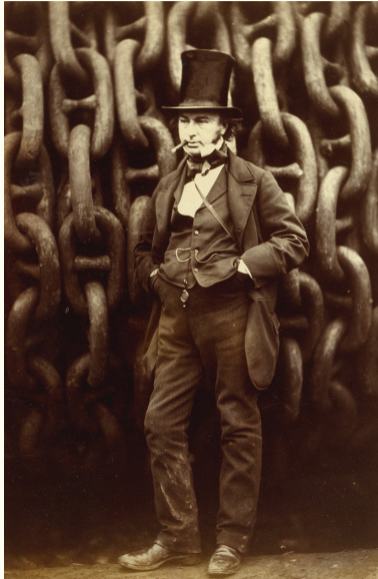
- One can argue the modern world was born around 1870.
- The world of 1869 would feel deeply odd to most of us. The world of 1914 (especially the life of an upper-middle-class family in Boston or London) would look familiar.
- Six revolutions:
 1. Revolution in transportation.
 2. Revolution in communication.
 3. Revolution in finance.
 4. Revolution in management and invention.
 5. Revolution in countries' relative standing in the world.
 6. Revolution in politics: democracy and populism.

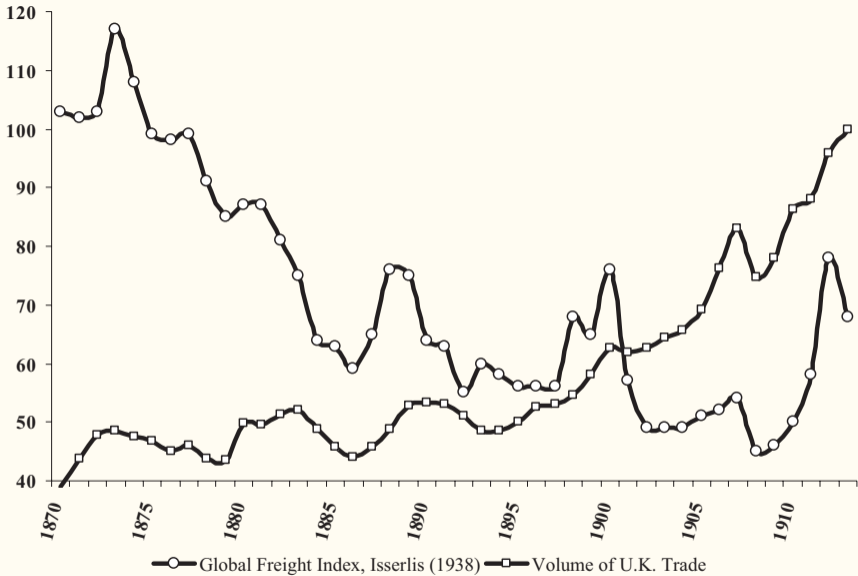


Revolution in transportation

- R.M.S. Oceanic ⇒ White Star Line's first liner:
 1. Iron-hulled.
 2. Steam-powered.
 3. Screw-propellered.
 4. Promenade decks, bathtubs with running water, and a dining room large enough for all first-class passengers.
- Suez (1869) and Panama (1914) Canals.
- Railroads.

Isambard Kingdom Brunel (1806-1859)





Kilometers by Country	1870	1913	1950
U.K.	21,500	32,600	31,350
U.S.	85,200	402,000	360,150
Germany	18,900	63,400	36,900
France	15,500	40,800	41,300
Japan	0	10,600	27,400
Argentina	730	33,500	42,900
Brazil	750	24,600	36,700
Chile	700	8,100	8,500
China	0	9,850	22,200
India	7,700	55,800	54,800
Indonesia	80	5,000	6,600
Mexico	350	20,500	23,300
Thailand	0	950	1,800
Turkey	200	5,450	7,700

RATES OF TRAVEL FROM NEW YORK
1800



RATES OF TRAVEL FROM NEW YORK
1830



RATES OF TRAVEL FROM NEW YORK, 1857



Panel A. 1860



Panel B. 1870



Panel C. 1880



Panel D. 1890



Panel E. 1900



Panel F. 1910



Panel G. 1920

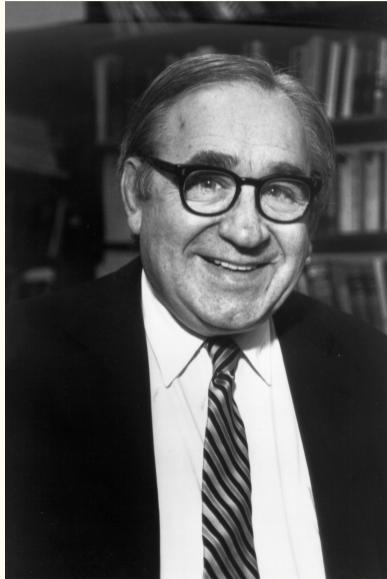


Panel H. 1930



A side discussion: Fogel and the railroad

- Robert Fogel (1926-2013; Nobel Prize in 1993) argued that railroads had not been indispensable for the U.S.'s economic growth during the second half of the 19th century.
- He calculated in 1964 that the social savings in the North Atlantic region of the U.S. from introducing the railroads amounted to only 2.8% of its output in 1890.
- Why? Substitution (canals, turnpikes, etc.).
- Big debate still going on. We could fill a semester reviewing it.
- Also, start of “cliometrics.”

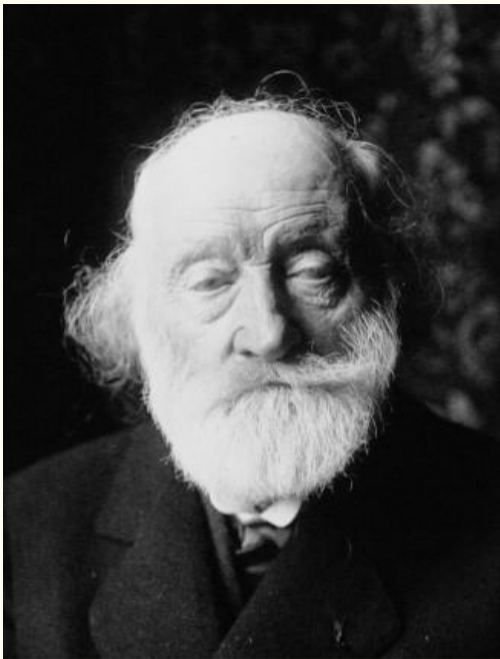


Indispensability vs. substitutability in economic life

- One essential lesson from economic history: to be highly skeptical of claims regarding the “indispensability” of one sector or another for economic growth, being this textiles, cotton, railroads, oil, or the automobile.
- The critical factor, from an economic perspective, is how substitutable different economic activities are.
- If, for whatever reason, the cotton industry could not have developed in the UK, what would have been the best alternative uses of capital and labor?
- Important, for example, to think about economic warfare and economic sanctions. Mancur Olson: *The Economics of the Wartime Shortage* (1963).

Refrigerated transportation, I

1. 1857: First shipment of refrigerated beef from Chicago to the East in a boxcar packed with ice.
2. 1867: First patent for a specialized refrigerator car.
3. 1873: T.C. Eastman exported chilled beef by ship from America to London (shortly annual tonnage of around 10,000 tons). The insulated cargo space was cooled by ice loaded on departure.
4. 1876-1877: C. Tellier and the steamship Frigorifique achieved the first overseas shipment of meat under artificial refrigeration (France to Argentina and back).



Refrigerated transportation, II

1. 1878: G.F. Swifts put into operation a refrigerator car to ship fresh meats. Fifteen years later, 97,000 cars.
2. 1879-1880: The Strathleven, equipped with an air machine and loaded with beef, mutton, butter, and kegs, sailed from Melbourne to London (9-week voyage of about 24,000 km).
3. 1885: Berries from the Norfolk (Virginia) area were shipped by refrigerator car to New York.
4. 1901: First refrigerated banana ship, the Port Morant.

1. Facilitates migration: one hundred million migrants between 1870-1925 $\approx 10\%$ of the world's population in 1870.
2. By 1850, perishable organics start to be traded overseas: by the 1900s, Europe's beef is raised in Argentina, its mutton and wool in Australia, and its butter in New Zealand.
3. World convergence of prices.
4. Agrarian crisis in Western Europe.

Figure 1
Gross Intercontinental Emigration from Europe, 1846-1939
(annual averages)

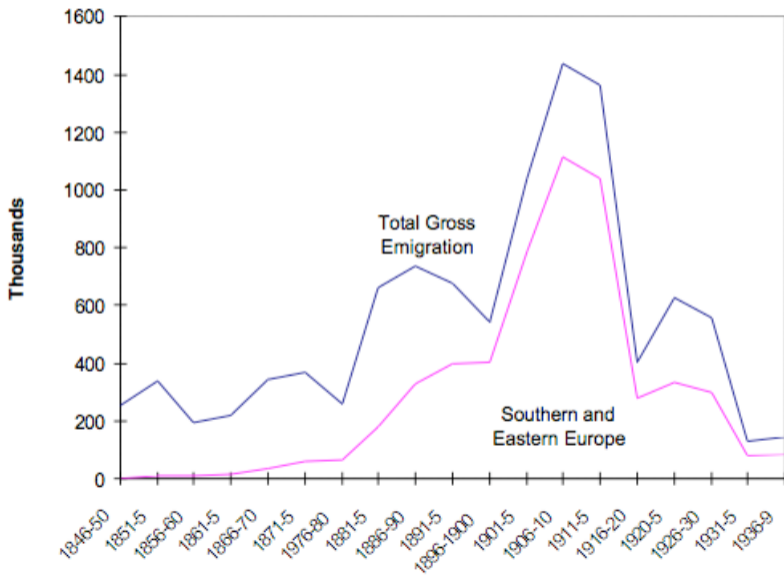
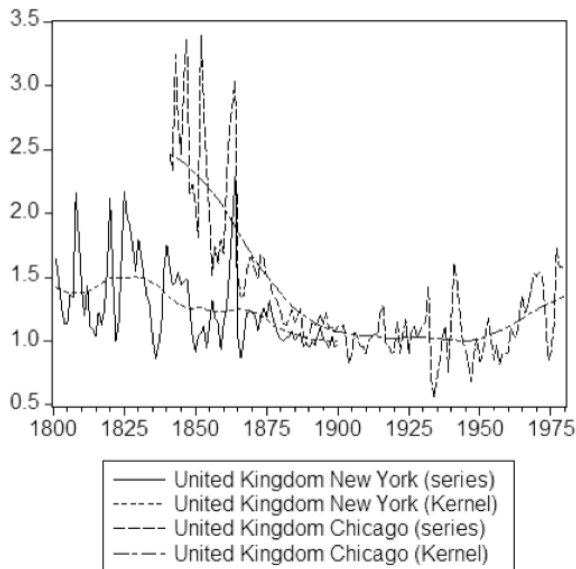


Table 3
Gross Emigration Rates from European Countries, 1850-1913
(Emigrants per 1000 population per annum, decade averages)

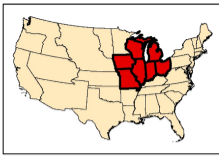
	1850-59	1860-69	1870-79	1880-89	1890-99	1900-13
Belgium	1.90	2.22	2.03	2.18	1.96	2.32
Denmark	--	--	1.97	3.74	2.60	2.80
France	--	0.12	0.16	0.29	0.18	0.15
Germany	1.80	1.61	1.35	2.91	1.18	0.43
Great Britain	4.83	2.47	3.87	5.71	3.92	7.08
Ireland	18.99	15.16	11.28	16.04	9.70	7.93
Italy	--	--	4.29	6.09	8.65	17.97
Netherlands	0.50	1.67	2.66	4.06	4.62	5.36
Norway	--	--	4.33	10.16	4.56	7.15
Portugal	--	--	2.91	3.79	5.04	5.67
Spain	--	--	--	3.91	4.63	6.70
Sweden	0.51	2.52	2.96	8.25	5.32	2.93

The price of wheat in London, New York, and Chicago 1800-1980



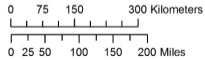
Price Gaps per Year

Commodity	Markets	1870	1895	1913
Wheat	Liverpool/Chicago	0.576	0.178	0.156
Meat	London/Cincinnati	0.925	0.923	0.179
Iron	London/Philadelphia	0.750	0.434	0.206
Cooper	London/Philadelphia	0.327	0.136	-0.001
Wool	London/Boston	0.591	0.659	0.279
Tin	London/New York	0.159	0.053	-0.023

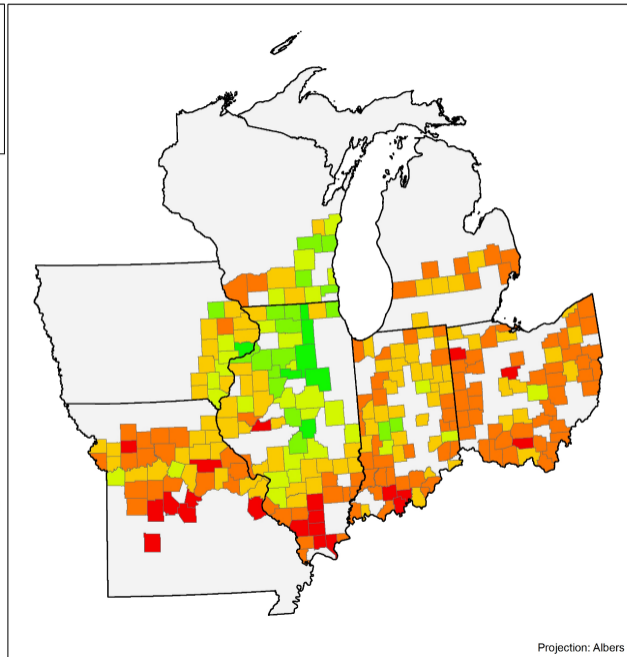


Change in Percentage of Improved Land, 1850-60

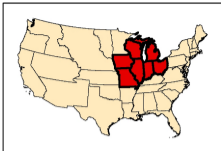
- Decrease
- 0 - 10 percentage point increase
- 10 - 20 percentage point increase
- 20 - 30 percentage point increase
- 30 - 40 percentage point increase
- Greater than 40 percentage point increase



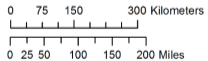
Data source: County data from ICPSR/Haines files (see text)



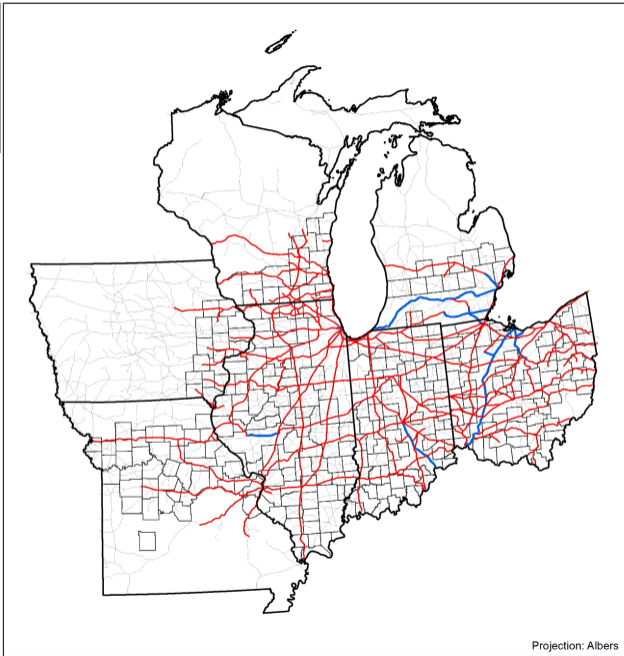
Projection: Albers



- Pre-1850 railroads
- Railroads built 1850-59
- 1880 rail network
- Sample counties



Data sources: Railroads from Atack-Margo and National Transportation database. County data from ICPSR/Haines files (see text)



Projection: Albers

OCEANS
of GRAIN



HOW AMERICAN WHEAT
REMADE THE WORLD

Scott Reynolds Nelson

Revolution in communication

- Modern postal service: Rowland Hill in 1836.
- Electrical telegraph: Samuel Morse in 1838.
- Telephone: Alexander Graham Bell in 1876.
- First submarine cables are laid across the English Channel in the early 1850s.
- *Great Eastern* lays down a telegraphic cable between Yemen and Bombay, completing a transformation of the world.
- von Reuter creates in Aachen (1851) the first news agency in the world.

Rowland Hill



Great Eastern



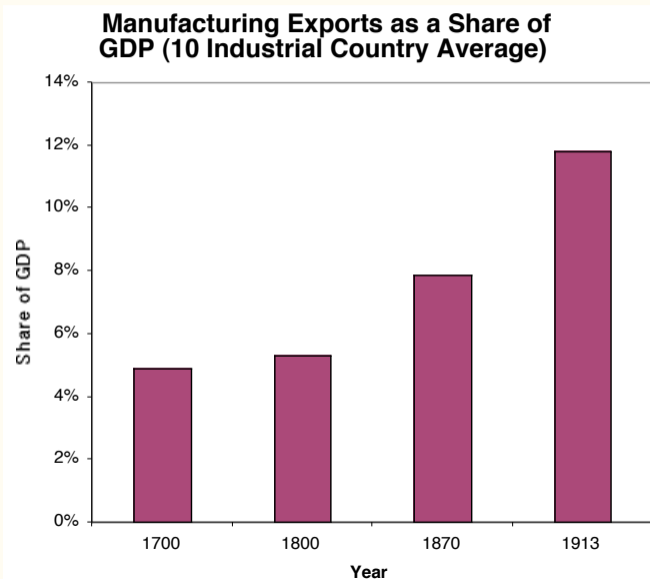
- Faster communications:
 1. Governments.
 2. Companies.
 3. Families.
- Together with transportation leads to changes such as Montgomery Ward Catalogue.
- Also, introduction of standard time: Greenwich Mean Time (GMT) in the UK (1855), US and Canada (1883), and International Meridian Conference (1884).



Global division of labor

- First truly global division of labor. As late as 1865, world trade is 7% of world GDP.
- Three areas:
 1. Core: England, Belgium, Northeast of United States.
 2. Areas of European settlement: West of the United States, Canada, Australia, New Zealand, Argentina.
 3. Areas of commodities: Malaysia, Colombia, Cuba, Brazil, or Ghana (and, to some degree, the U.S. south).

The growth of North Atlantic manufacturing exports



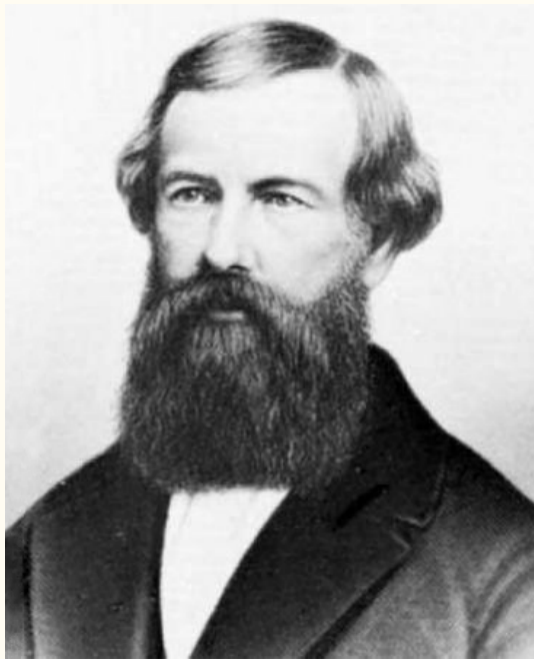
- How do economists explain trade?
 1. Comparative advantage (Ricardo).
 2. Different endowments (Heckscher-Ohlin).
 3. Increasing returns to scale (Dixit-Krugman).

Cities

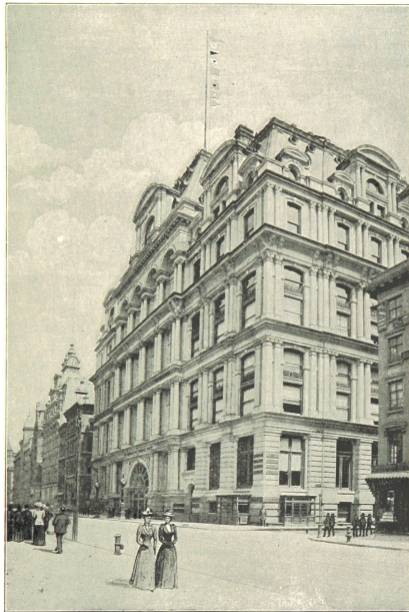
- New York: from 60,000 inhabitants in 1800 to 3.5 million in 1900 ⇒ port of U.S. trade.
- Melbourne: settled in 1837, by 1900 800,000 inhabitants, third largest city of the British empire ⇒ gold.
- Calcutta: a small village in 1800, 700,000 inhabitants by 1900 ⇒ export of dyes and coarse fibers from Bengal.
- Alexandria ⇒ Egyptian cotton.
- Lagos ⇒ palm oil and cocoa.
- Buenos Aires ⇒ refrigerated meat.
- Shanghai ⇒ Western traders in China.
- Smyrna (current Izmir) ⇒ Ottoman empire, opium exports to China.

Cities and elevators, I

- A key invention: the elevator **Lifted: A Cultural History of the Elevator** by **Andreas Bernard**.
- No elevator, no downtown skyscrapers (natural limit of buildings without elevators is 4/5 floors).
- Hoisting devices existed since antiquity.
- Elisha Otis: invents the “safety elevator” in 1852, founds the Otis Elevator company in 1853, and makes an impression in the 1854 New York Industry exhibition.
- March 23, 1857: First passenger elevator: Haughwout and Company porcelain and glass shop.
- May 1st, 1870: First office elevator: Equitable Life Assurance Building (40 meters), built by Henry Baldwin Hyde.
- Automatic doors (1887) and electric buttons (1903) allow for quick extension.







THE EQUITABLE LIFE-ASSURANCE SOCIETY OF THE UNITED STATES.
BROADWAY, BETWEEN PINE AND CEDAR STREETS.

Cities and elevators, II

- Consequences:
 1. Cities can grow vertically. Development of new complementary techniques such as the steel skeleton.
 2. Social re-arrangement. Top floors go from being the ones for servants to being the premium ones.
- Importance of policy: you can think about the last 100 years as a struggle between the elevator and the car.
- Related inventions:
 1. Escalator: Harrods (London) in 1898.
 2. Flush toilet: S-trap invented by Alexander Cumming in 1775, commercialized by George Jennings in the mid-19th century.

“Penthouse” at La bohème



“Penthouse” at Succession



Other key developments

1. Department store (Paris, 1838).
2. The price tag (Philadelphia, 1861).
3. The cash register (1879).
4. Modern chemical industry.

A NEW YORK TIMES BESTSELLER

ROBERT J. GORDON

THE RISE AND FALL OF AMERICAN GROWTH

WITH A NEW AFTERWORD BY THE AUTHOR

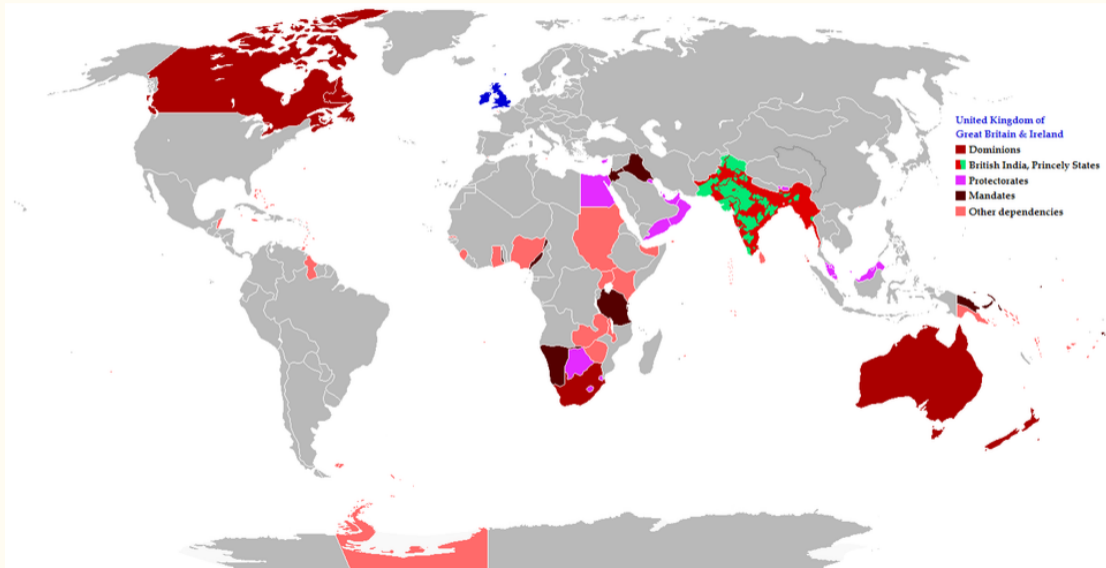
THE U.S.
STANDARD OF
LIVING SINCE
THE CIVIL
WAR

The book cover features a detailed illustration of several men in work clothes and hats, engaged in manual labor on a large, curved wooden structure, likely the hull of a ship. The men are positioned at different heights, some standing on beams and others leaning over. The background is a light, hazy sky. A prominent red circle is overlaid on the lower right portion of the illustration, containing white text. The title and author's name are printed in large, bold, dark blue letters on the left side of the cover.

Role of the British Empire

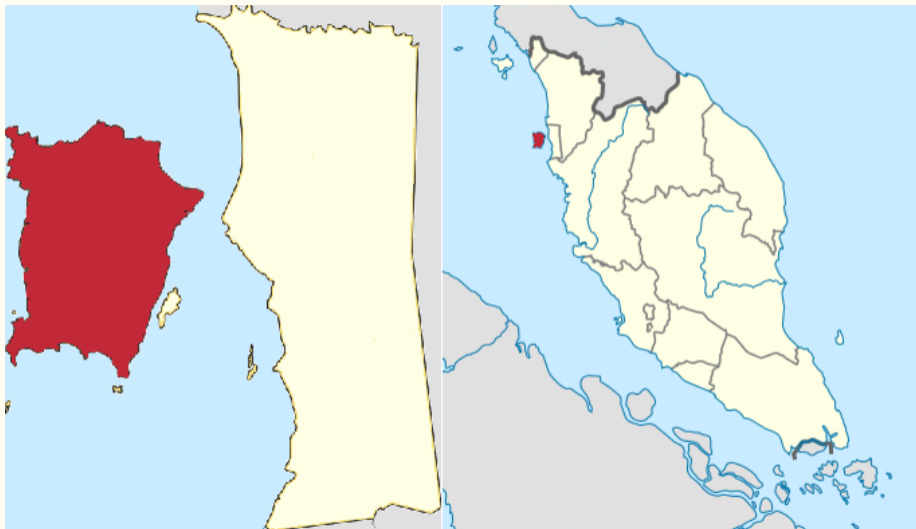
- After Napoleon is defeated, the United Kingdom is the world hegemon.
- Often called the Second British Empire.
- Pax Britannica ⇒ role of the Royal Navy ruling the seas. That is why the Battle of Antietam is so important.
- Dominion vs. colonies:
 1. Lord Durham report after Canada's rebellions of 1837-1838.
 2. Key role of India and the Indian Army.

British Empire, c. 1919



1. Gold standard. How did it work?
2. Property rights.
3. Contracts and legal system.
4. Banking and insurance.

Penang Island



- GeorgeTown was established on Penang Island in August 1786.
- The East India Company wanted a base to challenge the Dutch spice trade and maritime supremacy in the Straits of Malacca.
- When the British come, they build:
 1. Fort.
 2. Dock.
 3. Botanic garden, subordinated to the Kew Gardens in London.
- Why do you want to do that?

Rubber

- In 1876, 70,000 seeds of the rubber tree, painstakingly collected by botanists in the Amazon rain forest, were brought to Kew Gardens and planted in a greenhouse.
- About 2,800 of them germinated and were shipped to the botanical gardens in Sri Lanka and Penang.
- They propagated explosively and were used to establish rubber plantations on the neighboring Malay Peninsula.
- Until the Germans invented synthetic rubber, it was a key commodity for the world economy.
- Chinese move in and establish businesses. Tamils and Sikhs came from across the Bay of Bengal to work at the rubber plantations. Political economic consequences.
- Similar examples with tea shrub to Ceylon and coffee tree to Kenya.

DEFENSE needs RUBBER



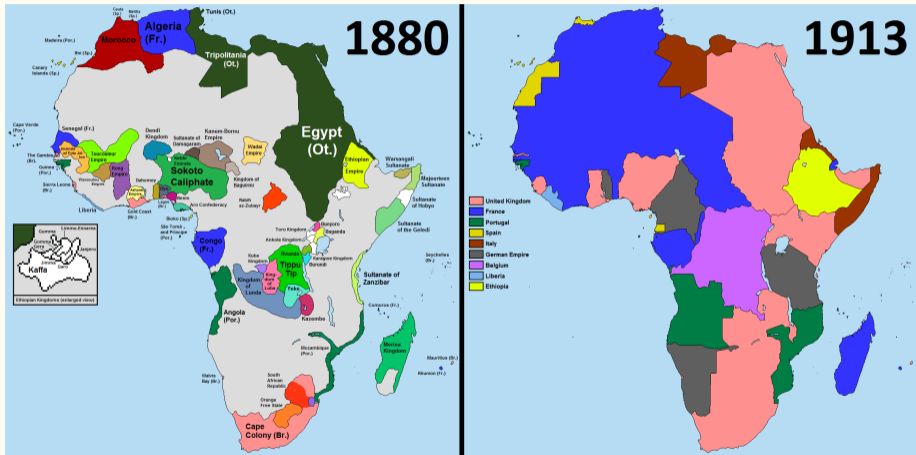
YOUR PART ▶

GET THE MOST OUT OF YOUR TIRES
ASK ATTENDANT TO TELL YOU HOW



- 1870-1914 is the high watermark of European imperialism:
 1. Scramble for Africa: Berlin Conference (1884 - 1885) between Britain, France, and Germany.
 2. Asia.
 3. Informal empire in South America by the U.K. and the U.S. (Cuba, Panama,...).
- Motivation for empire:
 1. Empire as a rat race.
 2. Empire as a protected area for exports of goods and capital (**John Hobson**, *Imperialism: A Study*).
 3. Military-aristocratic interest (**Lance Davis and Robert Huttenback**, *Mammon and the Pursuit of Empire: The Political Economy of British Imperialism, 1860-1912*): Spain in Morocco.

Scramble for Africa, 1880-1913





Revolution in finance

- A. Drexel and J.P. Morgan create modern investment banking
- **Drexel, Morgan & Co.** founded in 1871 to be an agent for Europeans investing in the United States (at Drexel death, the company becomes **J.P. Morgan & Co.**).
- Integration of financial markets.
- Role of finance:
 1. Intermediate between savers and investors.
 2. Distribute risk.
 3. Transform short-term debt into long-term loans.

Anthony Drexel



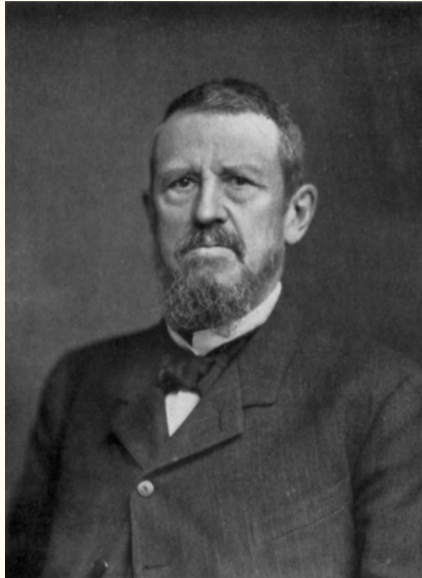
The Visible
Hand The
Managerial
Revolution
in American
Business
Alfred D.
Chandler, Jr.

The
Pulitzer Prize
and
The Bancroft
Prize

The rise of the modern corporation

- Original problem for railroads: coordination and control.
- Cost accounting, HR, marketing, etc.
- New technologies inherent increasing returns to scale.
- Externalities.
- Appearance of modern management schools and the profession of manager.
- How do economists think about this? **Coase, Hart.**

Joseph Wharton



The invention of invention, I

- Before 1870, universities and formal institutions had played a limited role in invention.
- Instead, more inventions and research is done by individuals.
- Modern library: Sir Anthony Panizzi in the British Museum.
- Modern research university: John Hopkins in 1873 based on a previous German model.







The invention of invention, II

- Modern research lab: Menlo Park and Edison.
- Integration of industry and universities.
- National labs.
- Perhaps, even deeper, conceptual change: innovation as a product.
- Patent and copyright versus open-source.

Thomas Edison

