

06. The Market Revolution

Econ 373: US Economic History

Taylor Jaworski

Fall 2023

The division of labor

In those great manufactures... which are destined to supply the great wants of the great body of the people, every different branch of the work employs so great a number of workmen, that it is impossible to collect them all into the same workhouse....

The division of labor

In those great manufactures... which are destined to supply the great wants of the great body of the people, every different branch of the work employs so great a number of workmen, that it is impossible to collect them all into the same workhouse....

Good roads, canals and navigable rivers by diminishing the expense of carriage, put the remote parts of the country more nearly upon the level with those in the neighborhood of the town. They are upon that account the greatest improvements.

The division of labor

In those great manufactures... which are destined to supply the great wants of the great body of the people, every different branch of the work employs so great a number of workmen, that it is impossible to collect them all into the same workhouse....

Good roads, canals and navigable rivers by diminishing the expense of carriage, put the remote parts of the country more nearly upon the level with those in the neighborhood of the town. They are upon that account the greatest improvements.

—Adam Smith, *The Wealth of Nations*

The division of labor

In those great manufactures... which are destined to supply the great wants of the great body of the people, every different branch of the work employs so great a number of workmen, that it is impossible to collect them all into the same workhouse....

Economic integration in the United States

- The US Constitution mandates economic integration:

No Preference shall be given by any Regulation of Commerce or Revenue to the Ports of one State over those of another: nor shall Vessels bound to, or from, one State, be obliged to enter, clear, or pay Duties in another.

Economic integration in the United States

- The US Constitution mandates economic integration:

No Preference shall be given by any Regulation of Commerce or Revenue to the Ports of one State over those of another: nor shall Vessels bound to, or from, one State, be obliged to enter, clear, or pay Duties in another.

- The effects of greater integration are:
 - Expanded markets for exports
 - Access to market for inputs into production
 - New ideas about demand or innovative processes
 - Competition from foreign producers

Navigable rivers

- In early settlement of North America, long-distance movement of goods was mostly waterborne
 - Portage—carrying a boat or cargo, over land, between navigable waterways, or to avoid obstacles such as rapids or falls—were a focal point for commerce
 - Traders were obliged to stop because of the natural obstacle to navigation

Navigable rivers

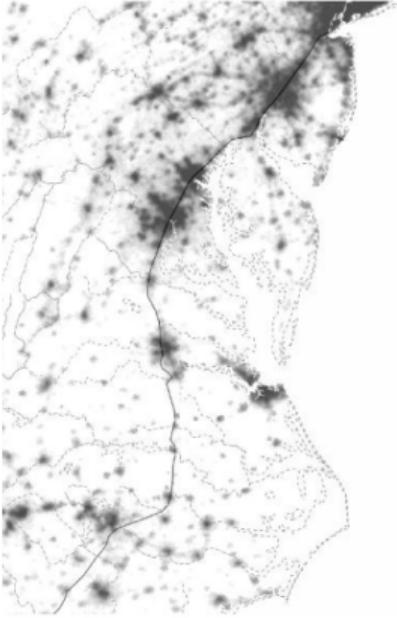
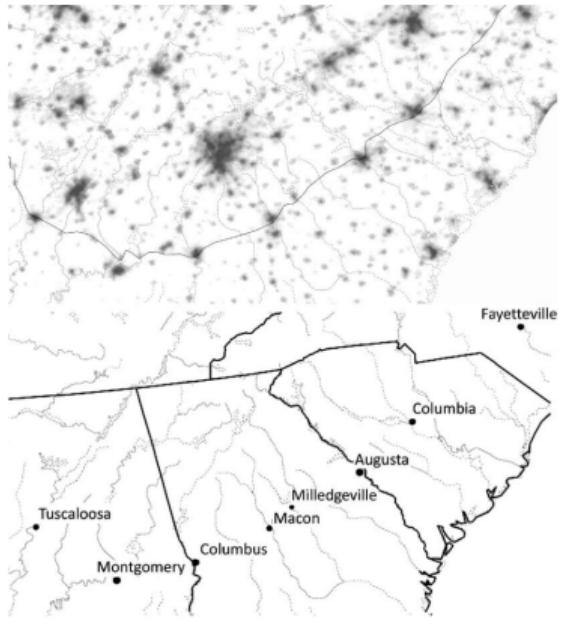
- In early settlement of North America, long-distance movement of goods was mostly waterborne
 - Portage—carrying a boat or cargo, over land, between navigable waterways, or to avoid obstacles such as rapids or falls—were a focal point for commerce
 - Traders were obliged to stop because of the natural obstacle to navigation
 - These sites offered easy opportunities for exchange and commerce

Navigable rivers

- In early settlement of North America, long-distance movement of goods was mostly waterborne
 - Portage—carrying a boat or cargo, over land, between navigable waterways, or to avoid obstacles such as rapids or falls—were a focal point for commerce
 - Traders were obliged to stop because of the natural obstacle to navigation
 - These sites offered easy opportunities for exchange and commerce
- The fall line is a geomorphological feature dividing the Piedmont and the coastal plain

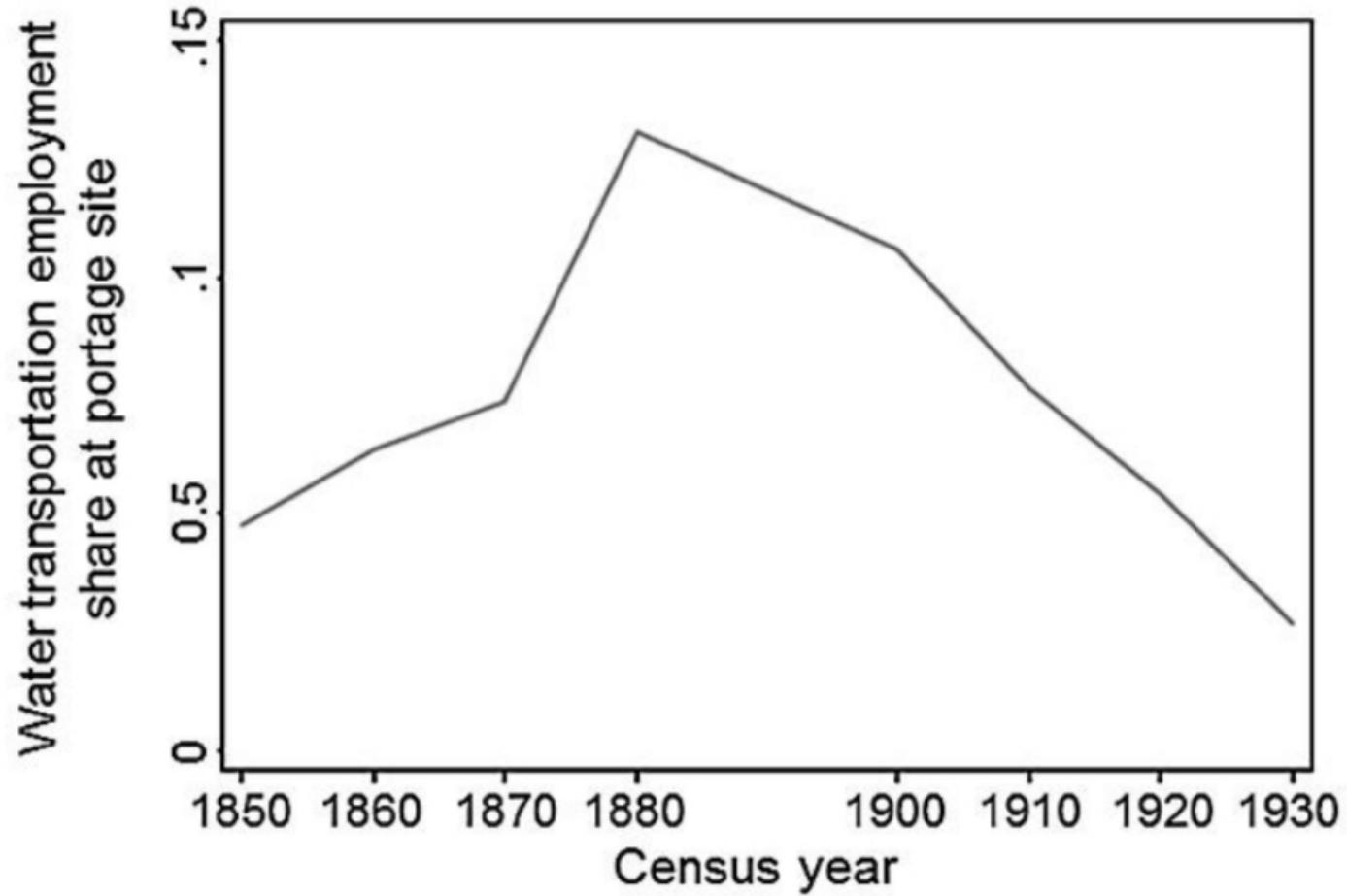
Navigable rivers

- In early settlement of North America, long-distance movement of goods was mostly waterborne
 - Portage—carrying a boat or cargo, over land, between navigable waterways, or to avoid obstacles such as rapids or falls—were a focal point for commerce
 - Traders were obliged to stop because of the natural obstacle to navigation
 - These sites offered easy opportunities for exchange and commerce
- The fall line is a geomorphological feature dividing the Piedmont and the coastal plain
- The intersection of the portage sites with the fall line were natural centers of population historically



Portage and path dependence

- The natural advantages of portage sites led them to specialize in water transportation

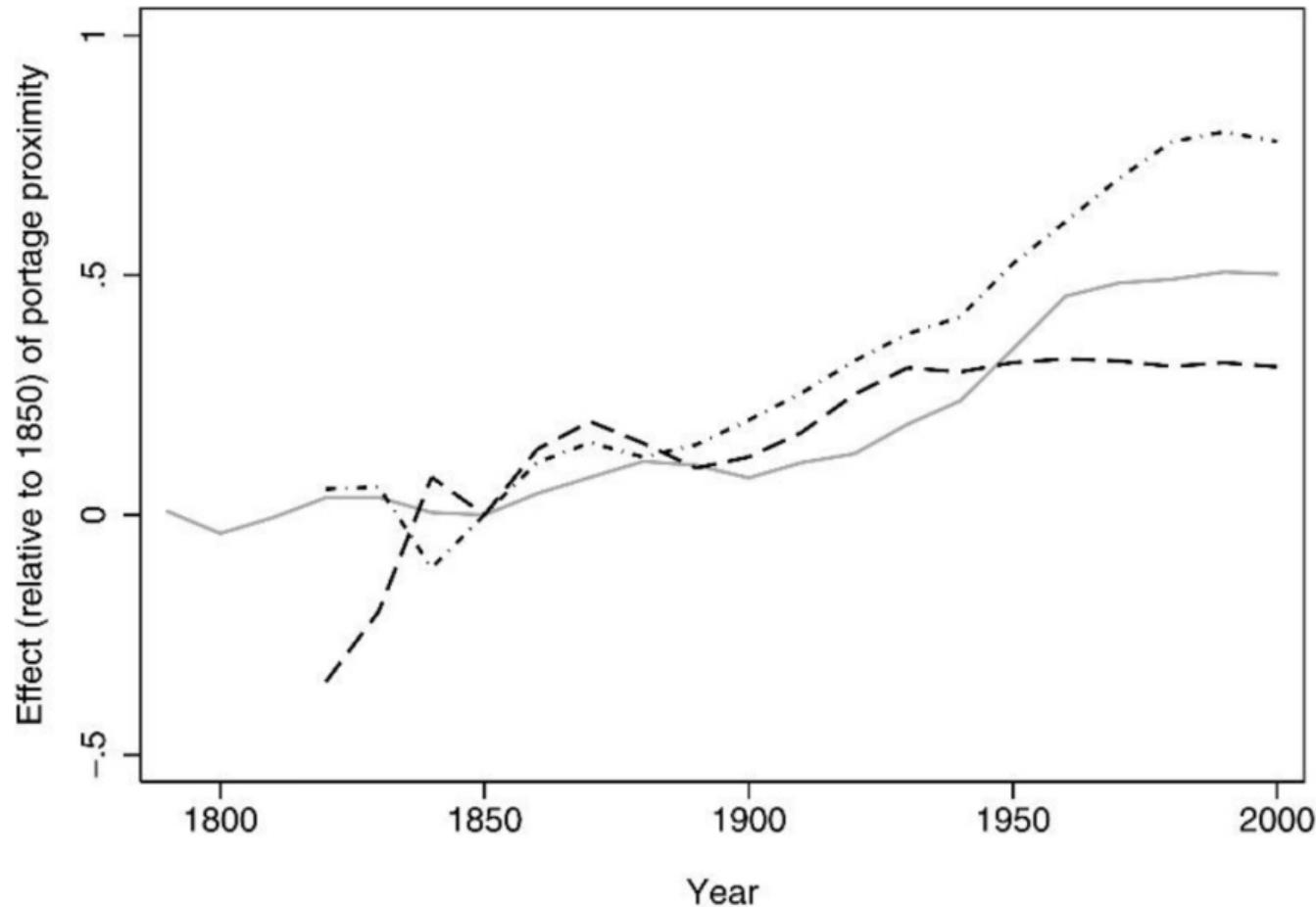


Portage and path dependence

- The natural advantages of portage sites led them to specialize in water transportation
- These locations became centers of population, exchange, and commerce

Portage and path dependence

- The natural advantages of portage sites led them to specialize in water transportation
- These locations became centers of population, exchange, and commerce
- And despite the emergence of alternatives over time, population density persisted until today



Portage and path dependence

- The natural advantages of portage sites led them to specialize in water transportation
- These locations became centers of population, exchange, and commerce
- And despite the emergence of alternatives over time, population density persisted until today
- This pattern highlight the historical importance of access to transportation networks
 - And is also consistent with increasing returns in local economic activity

Early transportation costs by the numbers

Commodity	Road	River Upstream	River Downstream	Ocean
<i>Farm Products</i>				
Corn	40	200	910	1,180
Wheat	80	410	1,900	2,300
Flour	130	670	3,080	4,000
Tobacco	300	1,500	6,920	9,000
Butter	780	3,900	18,080	23,500
Cotton	870	4,330	20,000	Anywhere
Tea	3,000	15,000	Anywhere	Anywhere
<i>Manufactured Products</i>				
Pig iron	90	460	2,120	2,760
Iron bar	230	1,170	5,380	6,990
Nails	420	2,080	9,620	12,510

The effect of transportation costs

Limited competition and protected inefficient producers

The effect of transportation costs

Limited competition and protected inefficient producers



Raised the prices faced by consumers

The effect of transportation costs

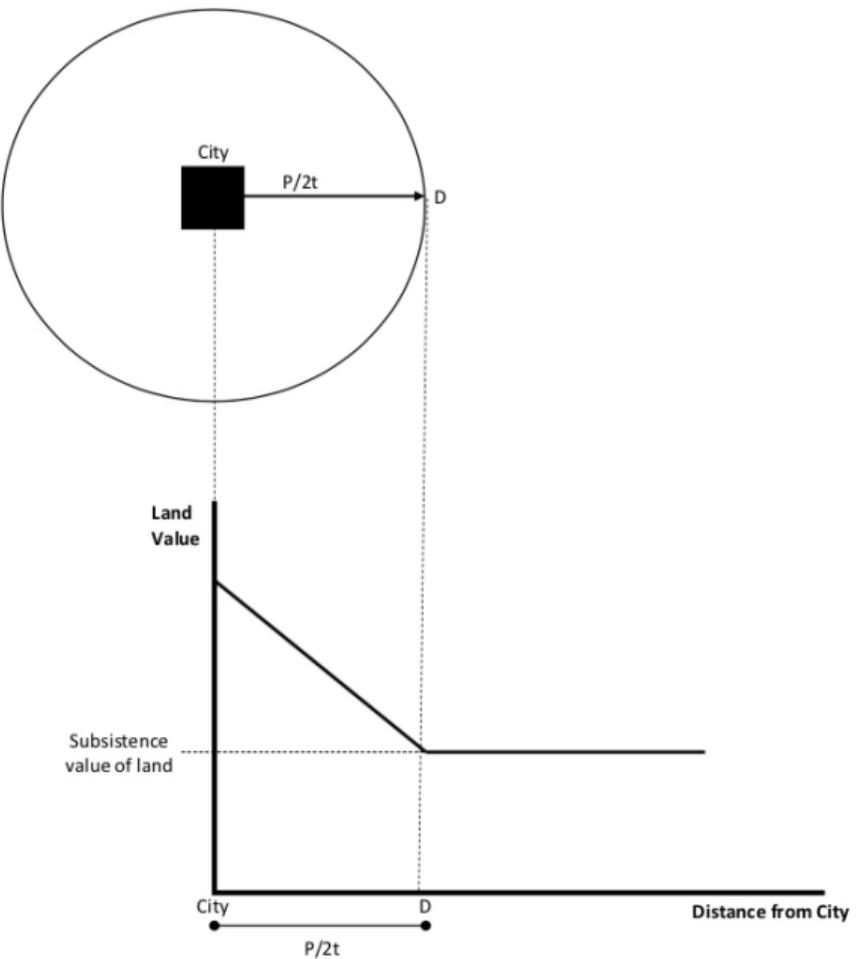
Limited competition and protected inefficient producers

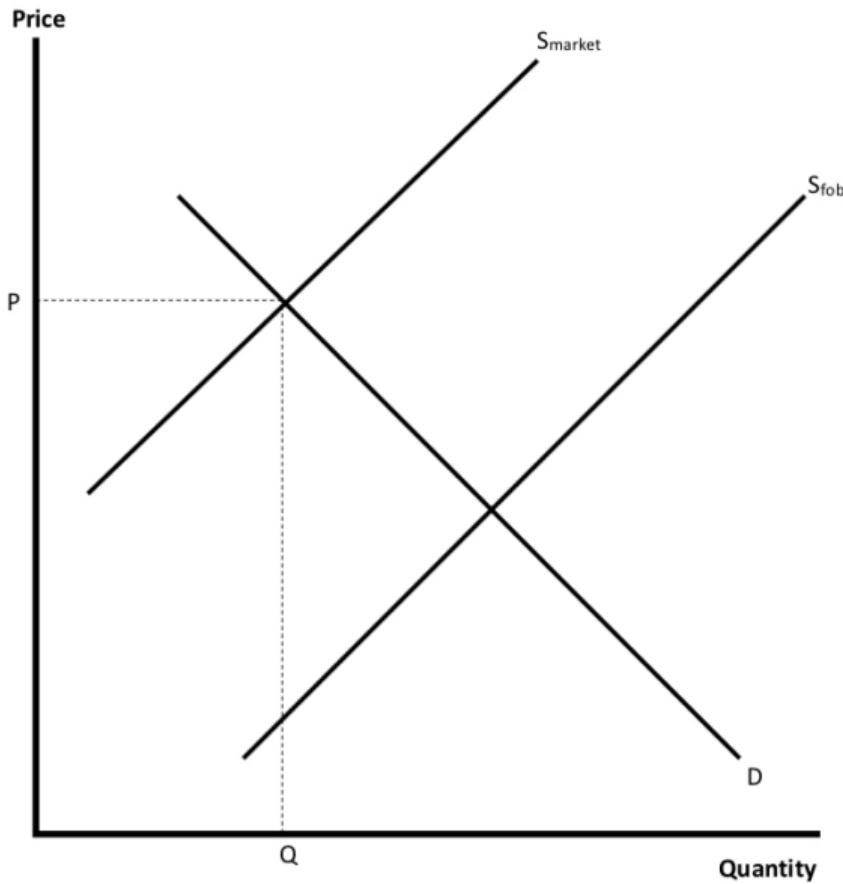


Raised the prices faced by consumers



Early transportation services were organized around ocean shipping and
navigable inland waterways





The effect of transportation costs

Limited competition and protected inefficient producers



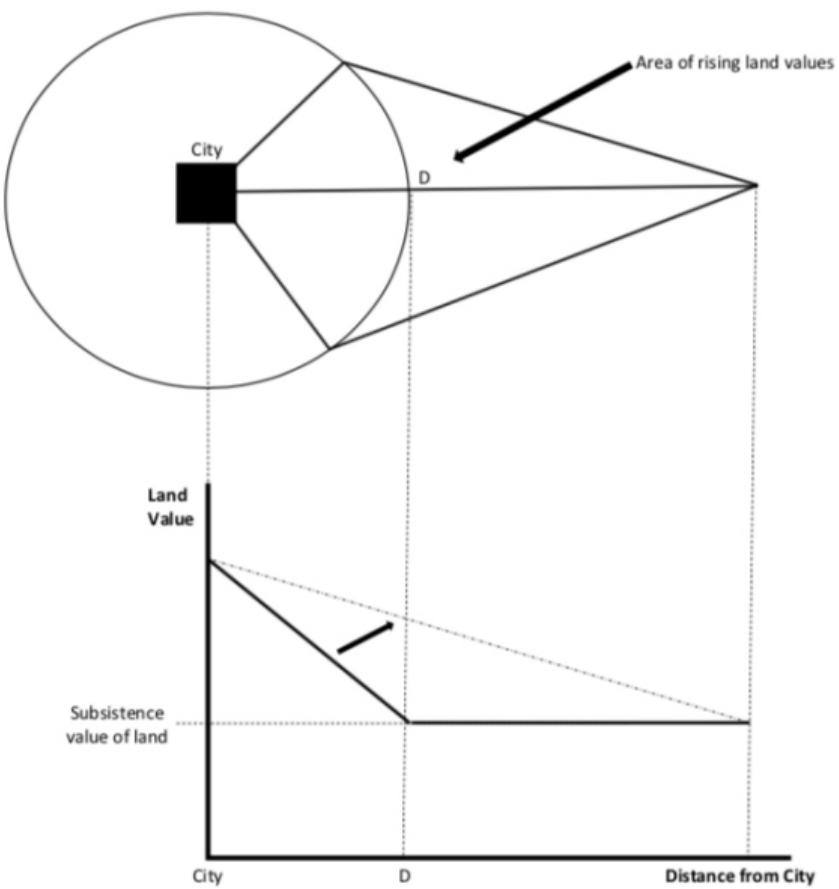
Raised the prices faced by consumers

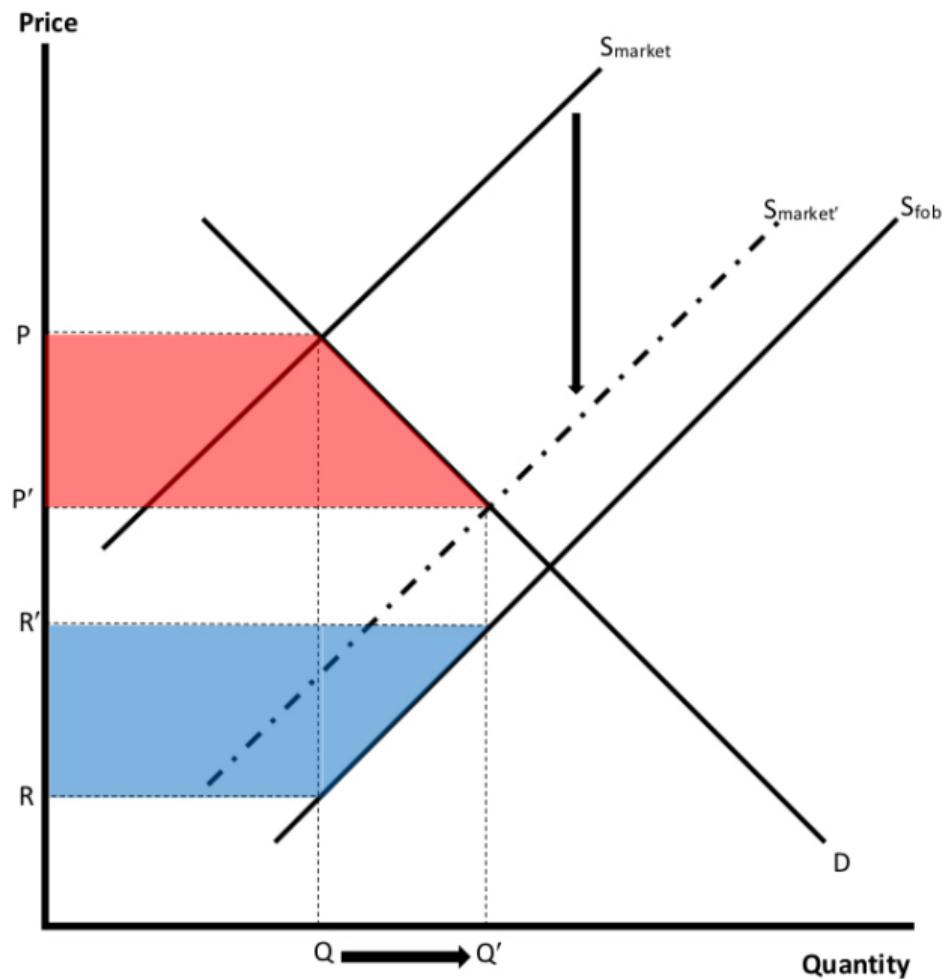


Early transportation services were organized around ocean shipping and
navigable inland waterways



The transportation revolution dramatically altered the cost of commerce and
communication over distance





Monopolies and competition in transportation

- As we've seen, high cost of transportation was a major constraint on settlement and economic growth

Monopolies and competition in transportation

- As we've seen, high cost of transportation was a major constraint on settlement and economic growth
- In general, lots demand for roads, bridges, other improvements, but limited willingness to pay taxes

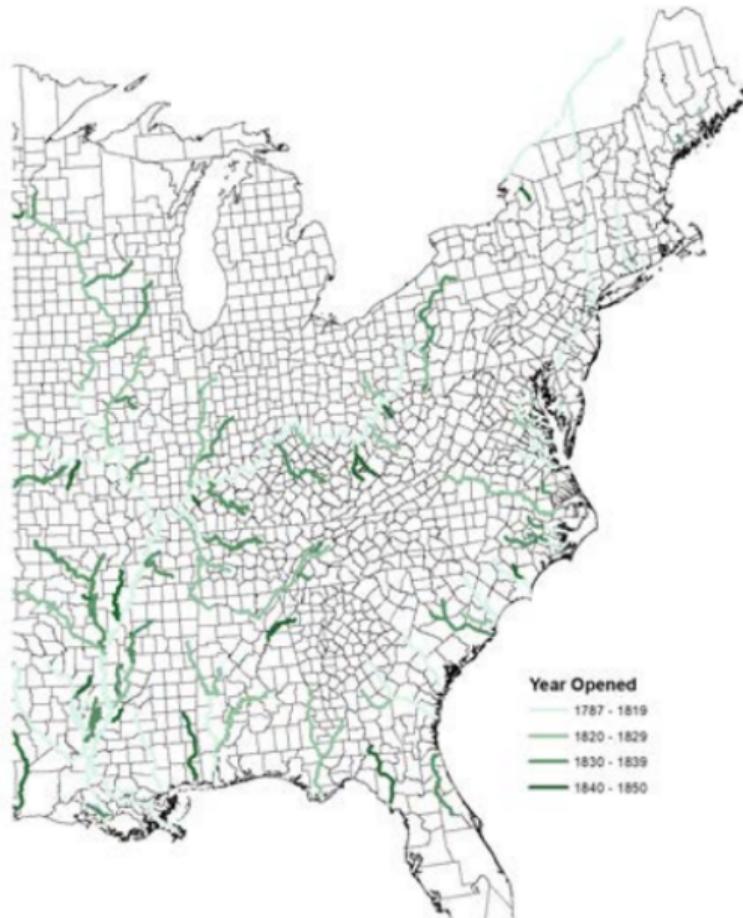
Monopolies and competition in transportation

- As we've seen, high cost of transportation was a major constraint on settlement and economic growth
- In general, lots demand for roads, bridges, other improvements, but limited willingness to pay taxes
- The solution was for states to charter corporations to channel private investment or financed projects directly
 - from e.g., steamboats and bridges in highly-trafficked areas

Example: steamboats

- Navigable rivers were the most economical form of transportation at the time of the American Revolution
- The steamboat had potential to lower transportation costs dramatically (faster and move goods upstream!)
- Inventors worked to develop workable steamboat and financial backing depended on securing a monopoly
- State after state granted various types of monopolies to one or another of the contenders, and new charters were granted when political circumstances changed

Steamboat-Navigable Rivers



Example: canals

- Early private roads (turnpikes) were effective
 - reduced cost of overland freight from 40 cents per ton mile in 1780s to about 15 cents per ton mile in 1820s

Example: canals

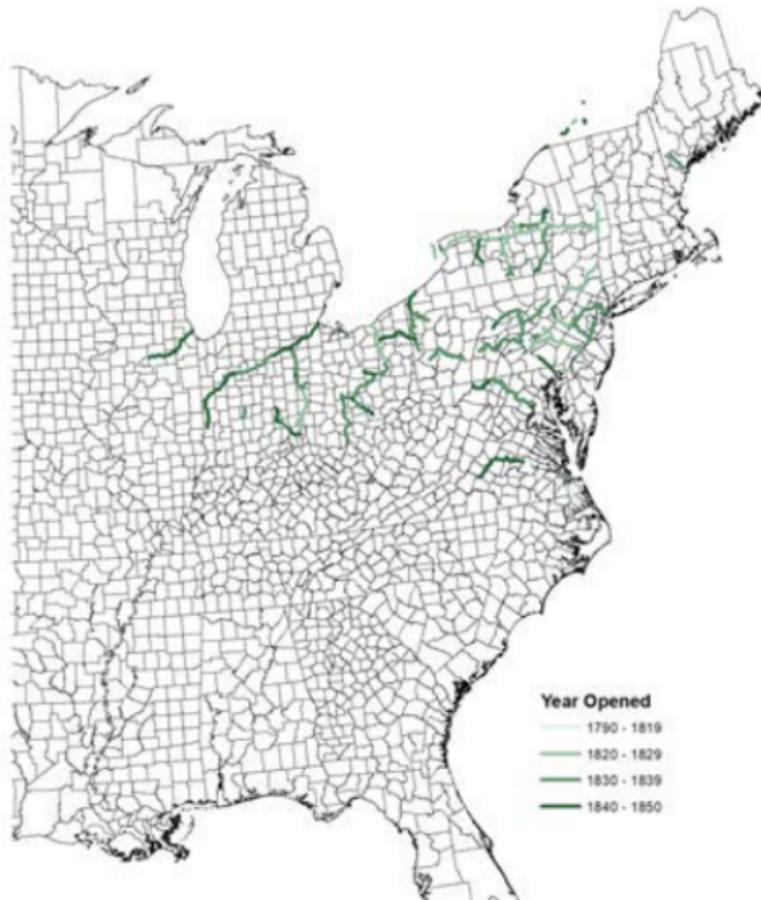
- Early private roads (turnpikes) were effective
 - reduced cost of overland freight from 40 cents per ton mile in 1780s to about 15 cents per ton mile in 1820s
- But roads were not useful for shipping bulky goods, or over long distances
 - canals brought very large reductions, with the per ton mile rate falling below 1 cent by 1840s

Example: canals

- Early private roads (turnpikes) were effective
 - reduced cost of overland freight from 40 cents per ton mile in 1780s to about 15 cents per ton mile in 1820s
- But roads were not useful for shipping bulky goods, or over long distances
 - canals brought very large reductions, with the per ton mile rate falling below 1 cent by 1840s
- Canals were more expensive to build, required larger investments than private corporations could provide



Canals



The US transportation system circa 1860

- Together with railroads, rivers and canals made up the US transportation system in 1860

Canals



Steamboat-Navigable Rivers



Railroads



The US transportation system circa 1860

- Together with railroads, rivers and canals made up the US transportation system in 1860
- Railroads had large technical advantages over water-based transportation:
 - built through rugged terrain at lower cost
 - move goods from point of production to market without multiple loadings
 - not as constrained by natural environment, deliver cargo year-round

The US transportation system circa 1860

- Together with railroads, rivers and canals made up the US transportation system in 1860
- Railroads had large technical advantages over water-based transportation:
 - built through rugged terrain at lower cost
 - move goods from point of production to market without multiple loadings
 - not as constrained by natural environment, deliver cargo year-round
- After 1860, railroad-building took-off and with it a debate over the impact of railroads on economic growth in the United States

The market revolution transformed the United States

- The formation of a national market economy based on commercial agriculture
 - reallocation away from colonial staple-exporting economy toward industrial economy

The market revolution transformed the United States

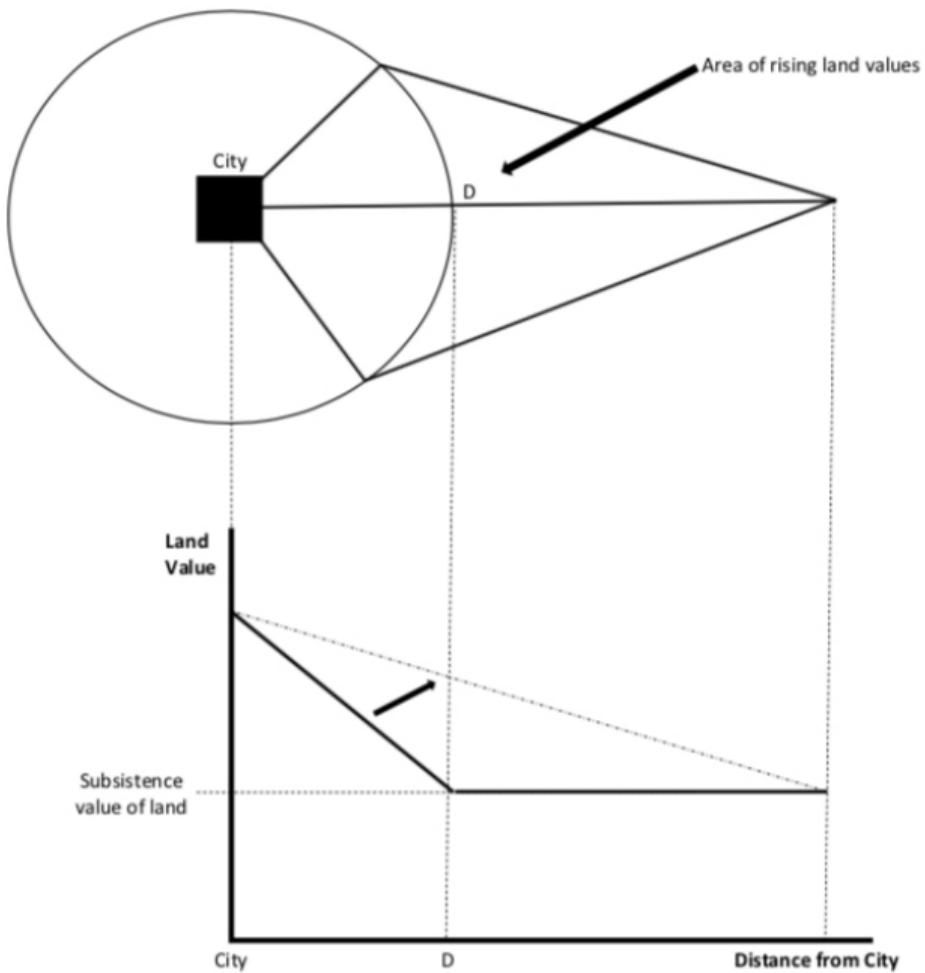
- The formation of a national market economy based on commercial agriculture
 - reallocation away from colonial staple-exporting economy toward industrial economy
- Market revolution led to decrease of social distance through transportation, communication, etc
 - growth of Enlightenment thinking regarding natural rights, church & state, etc

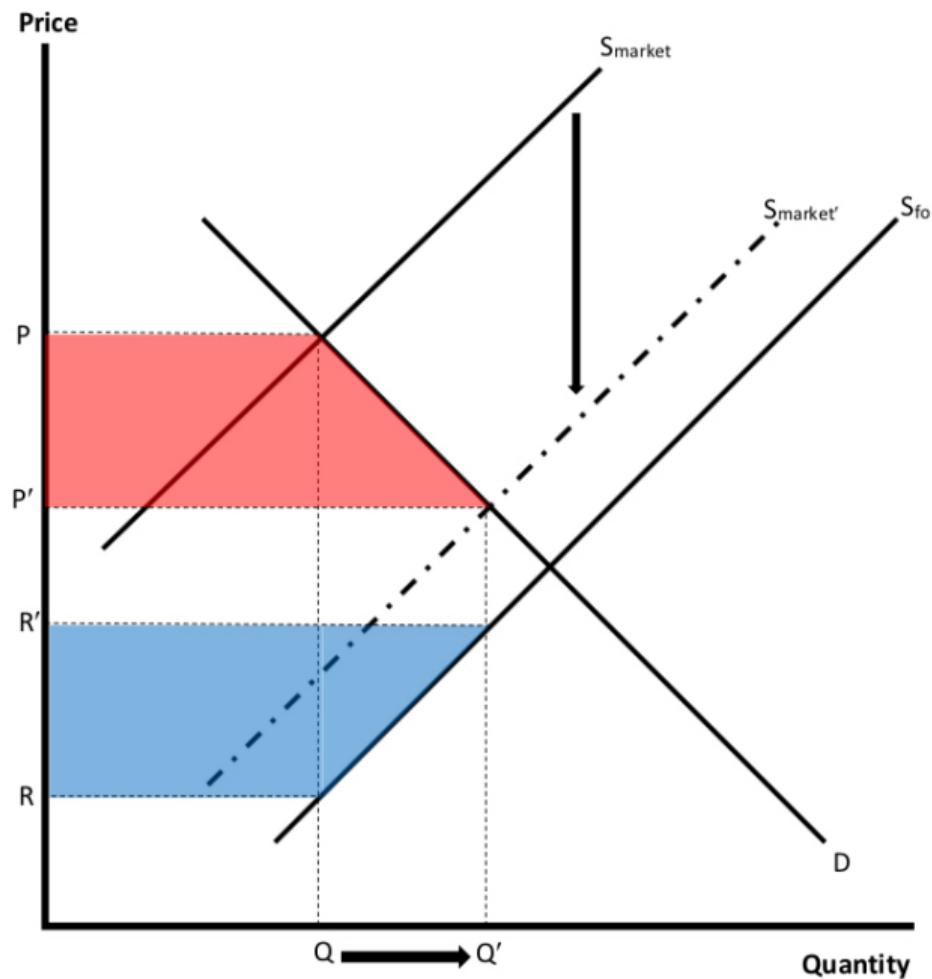
The market revolution transformed the United States

- The formation of a national market economy based on commercial agriculture
 - reallocation away from colonial staple-exporting economy toward industrial economy
- Market revolution led to decrease of social distance through transportation, communication, etc
 - growth of Enlightenment thinking regarding natural rights, church & state, etc
- Expanded scope for voluntary, rather than inherited, imposed, or accidental interactions
 - success of this system built on balance of technology, institutions, beliefs

Economics of transportation with railroads

- Railroads lowered costs of moving goods and people, opened land for cultivation and settlement





Economics of transportation with railroads

- Railroads lowered costs of moving goods and people, opened land for cultivation and settlement
- Were railroads “indispensable” to the economic growth of the United States?

Economics of transportation with railroads

- Railroads lowered costs of moving goods and people, opened land for cultivation and settlement
- Were railroads “indispensable” to the economic growth of the United States?
- WW Rostow argued the answer was “yes”
 - Economic historian and National Security Advisor to Kennedy and Johnson

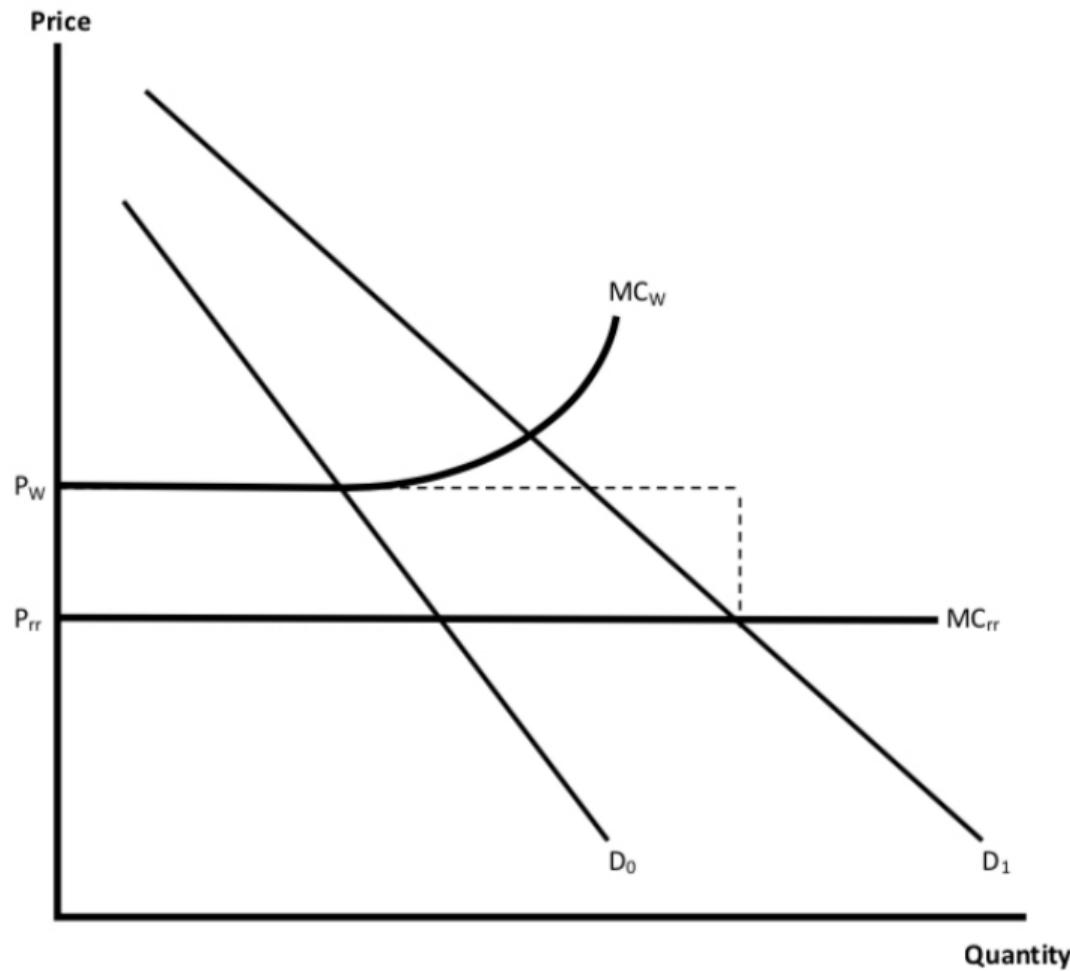
Economics of transportation with railroads

- Railroads lowered costs of moving goods and people, opened land for cultivation and settlement
- Were railroads “indispensable” to the economic growth of the United States?
- WW Rostow argued the answer was “yes”
 - Economic historian and National Security Advisor to Kennedy and Johnson
- Robert Fogel gave a different and controversial answer
 - Economic historian and Nobel Prize winner in economics

Railroads and American economic growth

One cannot... leap from data that demonstrate the victory of railroads over waterways in the competition for freight to the conclusion that the development of the railroad network... was a prerequisite for the rapid, continuous growth of the internal market.

If the reduction in cost achieved by the railroads was small, and if canals and rivers could have supplied all or most of the service that railroads were providing without increasing unit charges, then the presence of the railroads did not substantially widen the market....



Railroads and American economic growth

- The Fogel's first estimate was that railroads accounted for \$150-175 million in 1860 or 4% of GNP

Railroads and American economic growth

- The Fogel's first estimate was that railroads accounted for \$150-175 million in 1860 or 4% of GNP
- The key to this type of exercise is to be precise about as many of the dimension as possible
 - Sector: agriculture
 - Time period: 1870 to 1890
 - Gains from interregional versus intraregional trade

Railroads and American economic growth

- The Fogel's first estimate was that railroads accounted for \$150-175 million in 1860 or 4% of GNP
- The key to this type of exercise is to be precise about as many of the dimension as possible
 - Sector: agriculture
 - Time period: 1870 to 1890
 - Gains from interregional versus intraregional trade
- To start, define a 40-mile buffer called “feasible region” with access to railroads (and other transportation)

40-Mile Buffers: Waterways (Black) and Railroads (Gray)



40-Mile Buffers: Including Proposed Canals (Dark Gray)



Railroads and American economic growth

- \$73 million due to interregional savings
- \$337 million due to intraregional savings
- Other adjustments bring total to \$248 million
- Additional canals gives \$175 million

Railroads and American economic growth

- \$73 million due to interregional savings
- \$337 million due to intraregional savings
- Other adjustments bring total to \$248 million
- Additional canals gives \$175 million
- Criticisms
 - Adding passenger services and industrial goods
 - Prices versus costs, assumes competition
 - Cost curves for different modes of transport

Railroads and American economic growth

- Take different approach and estimate impact of transportation network on agricultural land values
 - Use general equilibrium to measure connections via transportation network

Railroads and American economic growth

- Take different approach and estimate impact of transportation network on agricultural land values
 - Use general equilibrium to measure connections via transportation network
 - **Theory: gravity equation for trade flows**

$$X_{cd} = f(\text{production costs, productivity, demand, competition, trade costs})$$

where c is an origin county and d is a destination

Railroads and American economic growth

- Take different approach and estimate impact of transportation network on agricultural land values
 - Use general equilibrium to measure connections via transportation network
 - **Theory: gravity equation for trade flows**

$$X_{cd} = f(\text{production costs, productivity, demand, competition, trade costs})$$

where c is an origin county and d is a destination

- **Theory: market access for average connection to all counties**

$$MA_c = \sum_d \frac{N_d}{\tau_{cd}^\theta}$$

where N_d captures market size, τ_{cd} trade costs, θ responsiveness to τ

Railroads and American economic growth

- Take different approach and estimate impact of transportation network on agricultural land values
 - Use general equilibrium to measure connections via transportation network
 - Measure how expansion of railroad network affects counties' market access

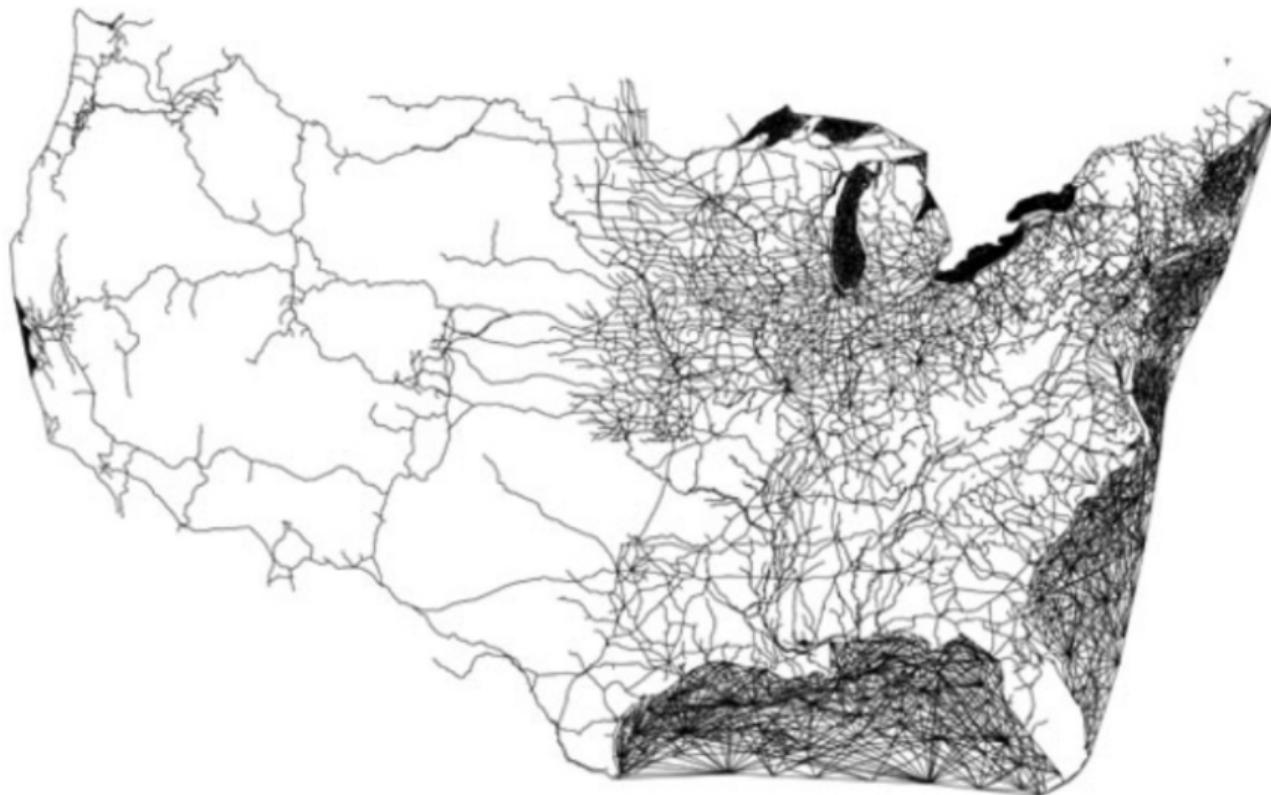
Natural waterways and canals



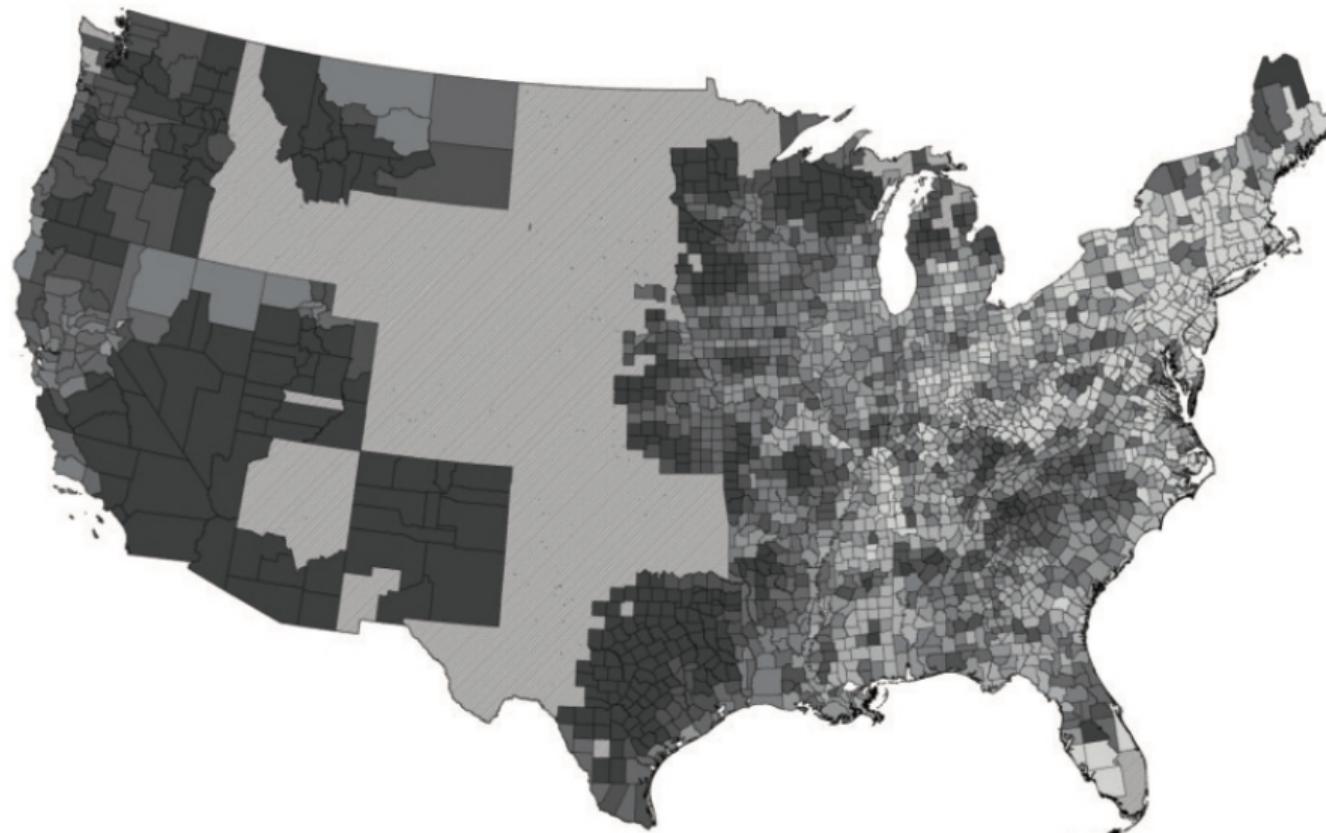
Natural waterways, canals, 1870 railroads



Natural waterways, canals, 1870 and 1890 railroads



Change in Market Access from 1870 to 1890



Railroads and American economic growth

- Take different approach and estimate impact of transportation network on agricultural land values
 - Use general equilibrium to measure connections via transportation network
 - Measure how expansion of railroad network affects counties' market access
 - Estimate relationship between market access and agricultural land values

$$\Delta \ln Y_{c,1870-90} = \beta \Delta \ln MA_{c,1870-90} + \varepsilon_{c,1870-90}$$

Railroads and American economic growth

- Take different approach and estimate impact of transportation network on agricultural land values
 - Use general equilibrium to measure connections via transportation network
 - Measure how expansion of railroad network affects counties' market access
 - Estimate relationship between market access and agricultural land values

$$\Delta \ln Y_{c,1870-90} = \beta \Delta \ln MA_{c,1870-90} + \varepsilon_{c,1870-90}$$

$$\Delta \ln Y_{c,1870-90} = 0.511 \times \Delta \ln MA_{c,1870-90} + \varepsilon_{c,1870-90}$$

Railroads and American economic growth

- Take different approach and estimate impact of transportation network on agricultural land values
 - Use general equilibrium to measure connections via transportation network
 - Measure how expansion of railroad network affects counties' market access
 - Estimate relationship between market access and agricultural land values
 - Calculate impact on land values from decreases in market access if railroads eliminated, replaced with proposed canals, or other counterfactuals

Railroads and American economic growth

- Take different approach and estimate impact of transportation network on agricultural land values
 - Use general equilibrium to measure connections via transportation network
 - Measure how expansion of railroad network affects counties' market access
 - Estimate relationship between market access and agricultural land values
 - Calculate impact on land values from decreases in market access if railroads eliminated, replaced with proposed canals, or other counterfactuals
- Absence of railroads would have decreased agricultural land values by 60%, largely “indispensable” (e.g., extensions to canals or improvements in

Market Integration

What is economic integration?

Copyrighted Material

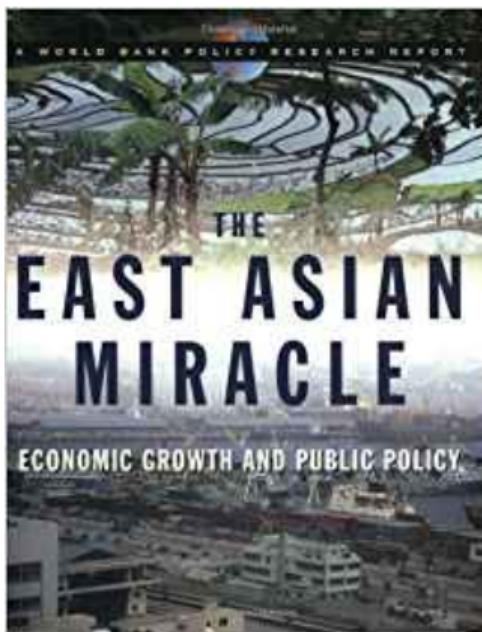
NATIONAL BESTSELLER



The World Is Flat

A BRIEF HISTORY OF
THE TWENTY-FIRST CENTURY

Thomas L. Friedman



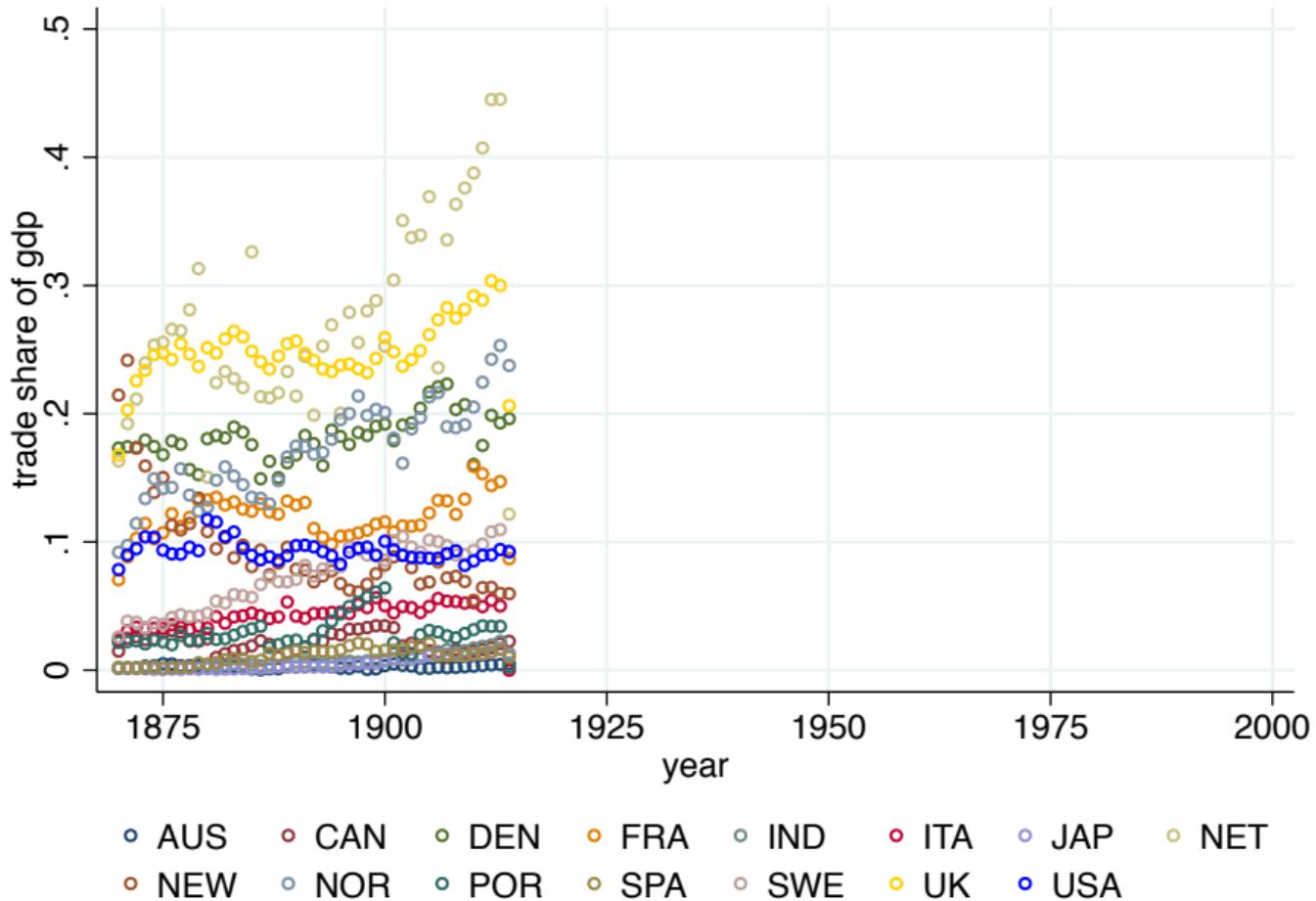
JEREMY RIFKIN
BESTSELLING AUTHOR OF THE END OF WORK

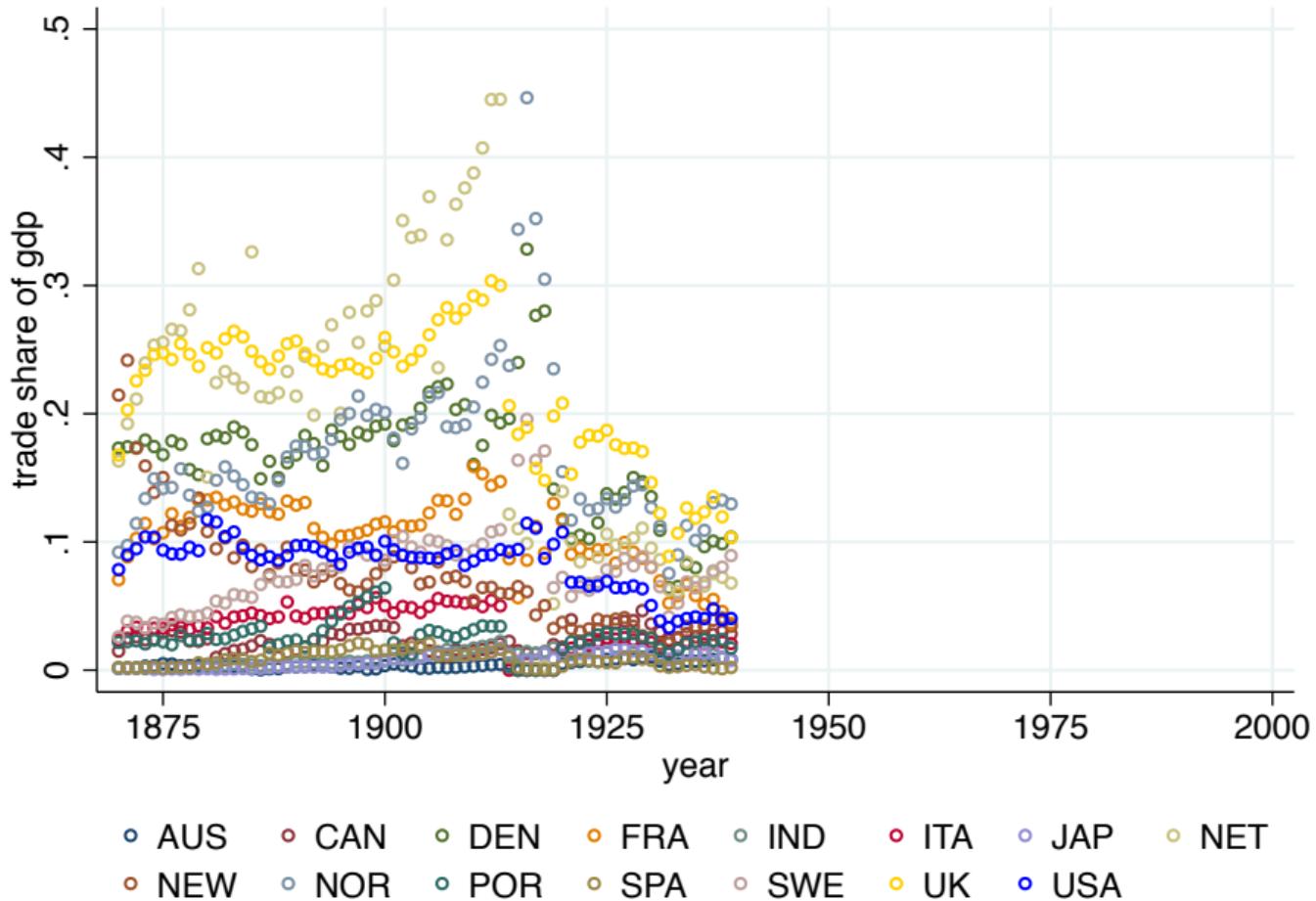
THE EUROPEAN DREAM

HOW EUROPE'S VISION OF
THE FUTURE IS QUIETLY ECLIPSING
THE AMERICAN DREAM

When were periods of increasing economic integration in US history?

- International:
 - The late 19thC until World War I

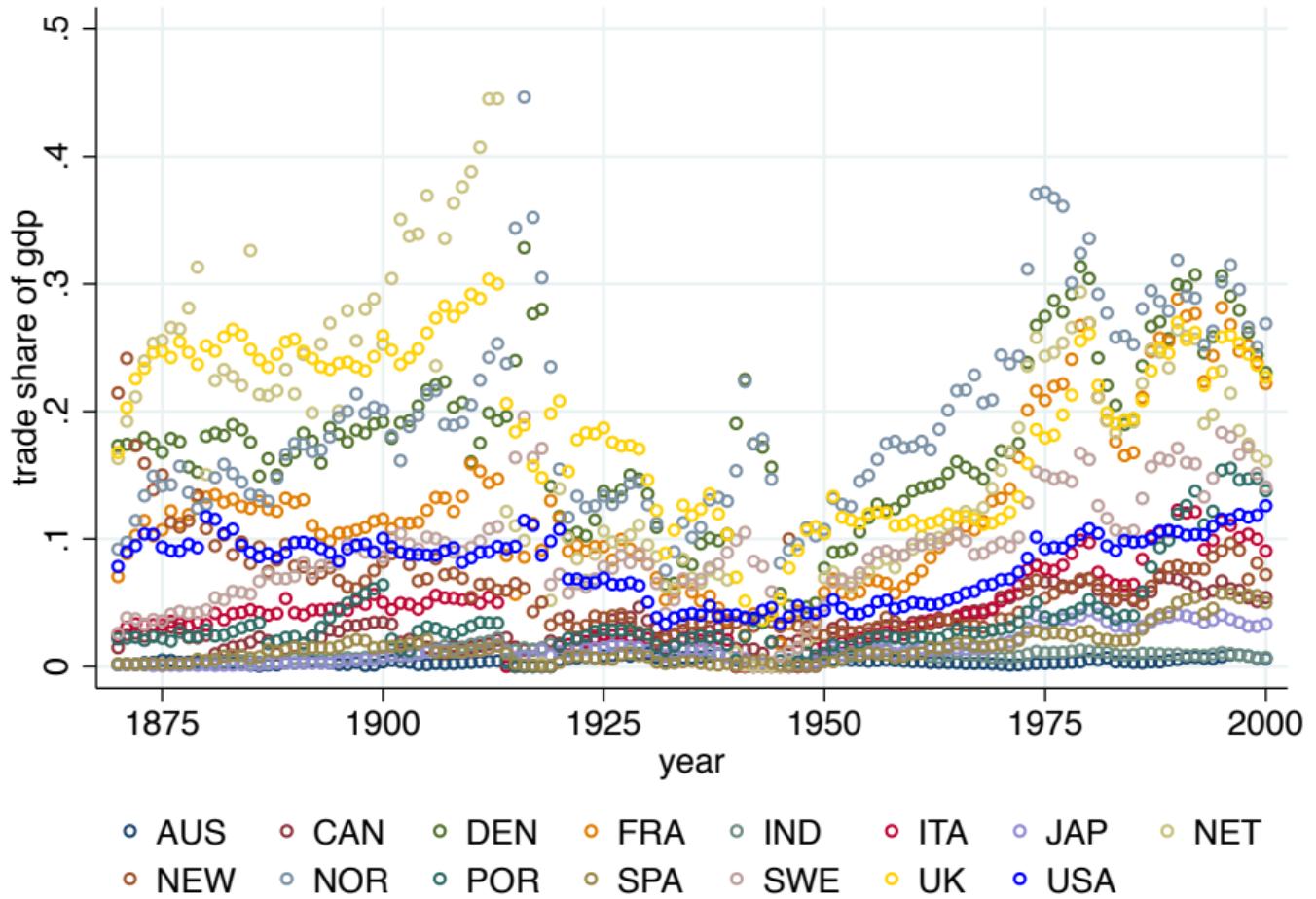


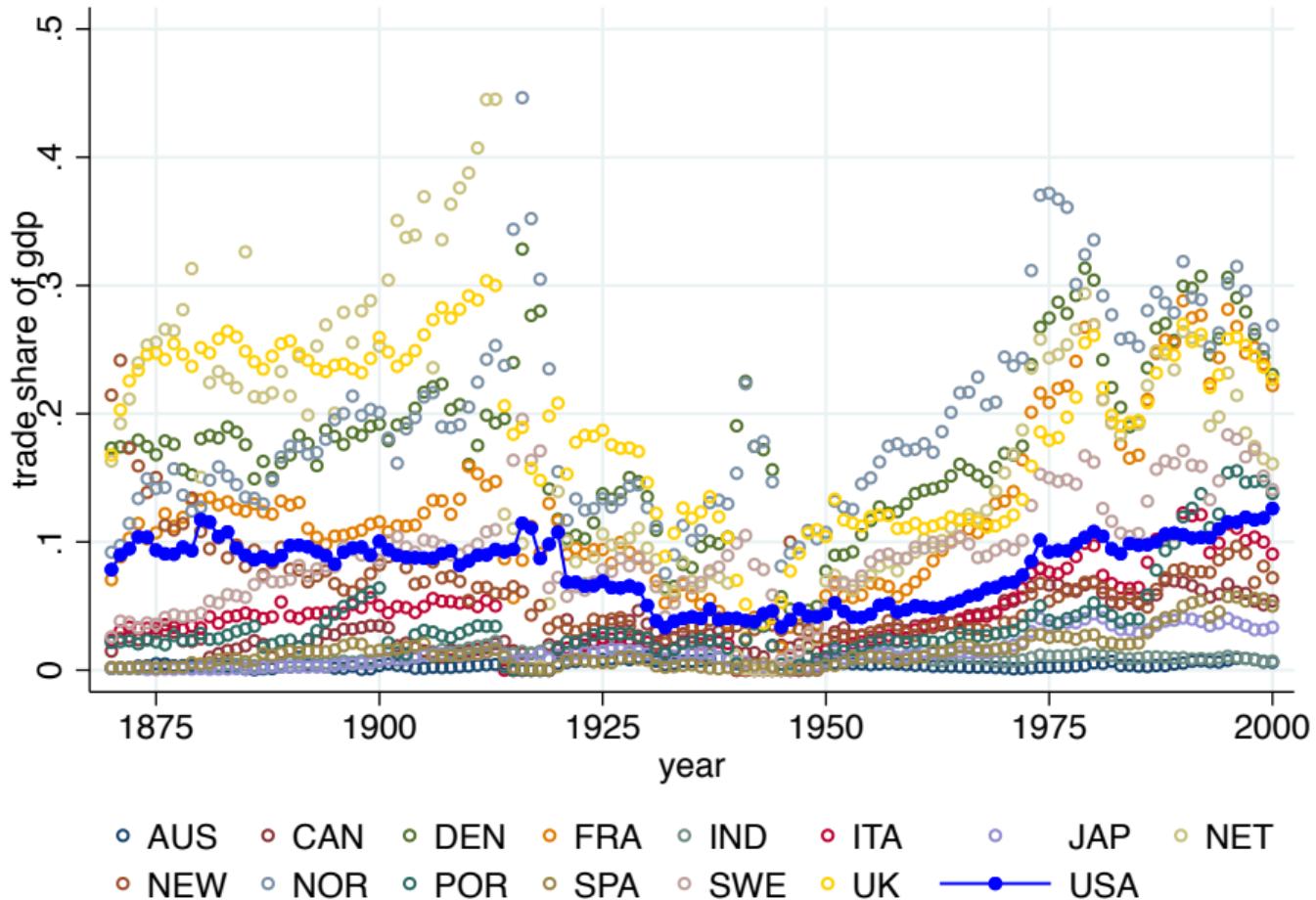


When were periods of increasing economic integration in US history?

- International:

- The late 19thC until World War I
- After the end of World War II





When were periods of increasing economic integration in US history?

- International:
 - The late 19thC until World War I
 - After the end of World War II
- Domestic:
 - Waterways, canals, and railroads in the 19thC

When were periods of increasing economic integration in US history?

- International:
 - The late 19thC until World War I
 - After the end of World War II
- Domestic:
 - Waterways, canals, and railroads in the 19thC
 - Highways and containerization in the 20thC

