

Industrial Revolution

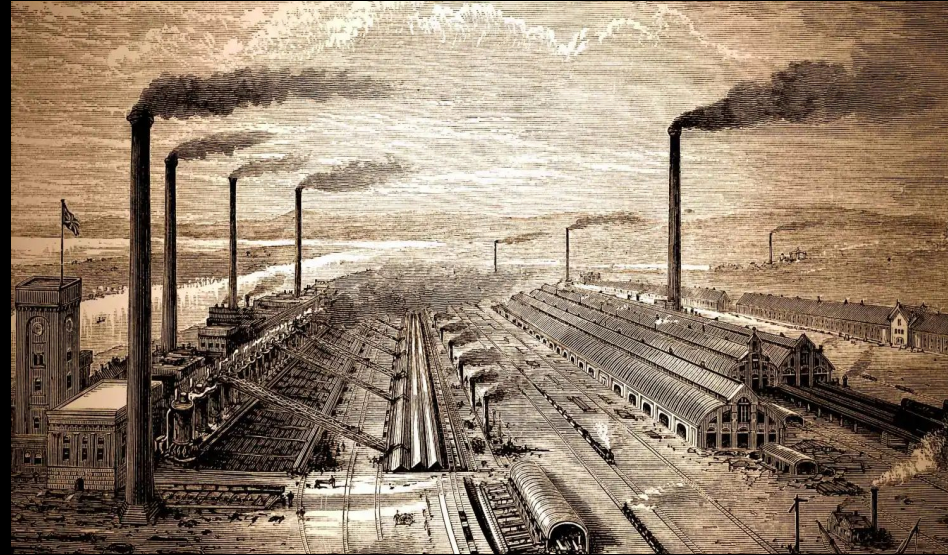
Origins and Evolution

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What was the Industrial Revolution?

- It was a dramatic change in the world in the way that products were manufactured
- It went from “manufacturing” (making by hand) one at a time to the mass production of goods by machines (Age of Machines).



Phases of Industrial Revolution

- The First Industrial Revolution (1750-1850)
 - Man became aware of forms of energy
 - Led to iron, coal and steam technology
 - The mass production of textiles
- The second Industrial Revolution (1850-1914)
 - Also known as **Technological revolution**
 - Replaced steam power with electric power

Beginning of the Revolution

- In 17th century Britain, marked an industrial revolution, changing the country & world forever
- Began in Britain and then spread to other parts of Europe, North America & rest of the world



Changes during Industrial Revolution

From:

- few people making things
- making things at home
- making things by hand
- selling to neighbours



To:

- many people making things
- making things in factories
- using machines to make things
- selling country- or world-wide

Textile Industry

- Prior to the Industrial Revolution, most cloth and clothing was made in homes.
- Women used to make things **by hand** or used very **simple machines**.
- When new machines like **spinning jenny** and **power loom** came, people brought them home, called **Cottage Industry**.



Industrial Revolution 1

- Factories came as Machines became too big to be used at home
- Demand of more power led to invention of **Steam Engine**
- Major changes: Textile Manufacturing, Steam Power, Mining, Factory system, Transportation



Changes in Mining

The use of steam engines and large machines in factories depended on two major things:

- Coal (to power steam engine)
- Iron (to build machines)

Hence there was a major increase in Mining.

Coal Mining in Britain: 1800-1914

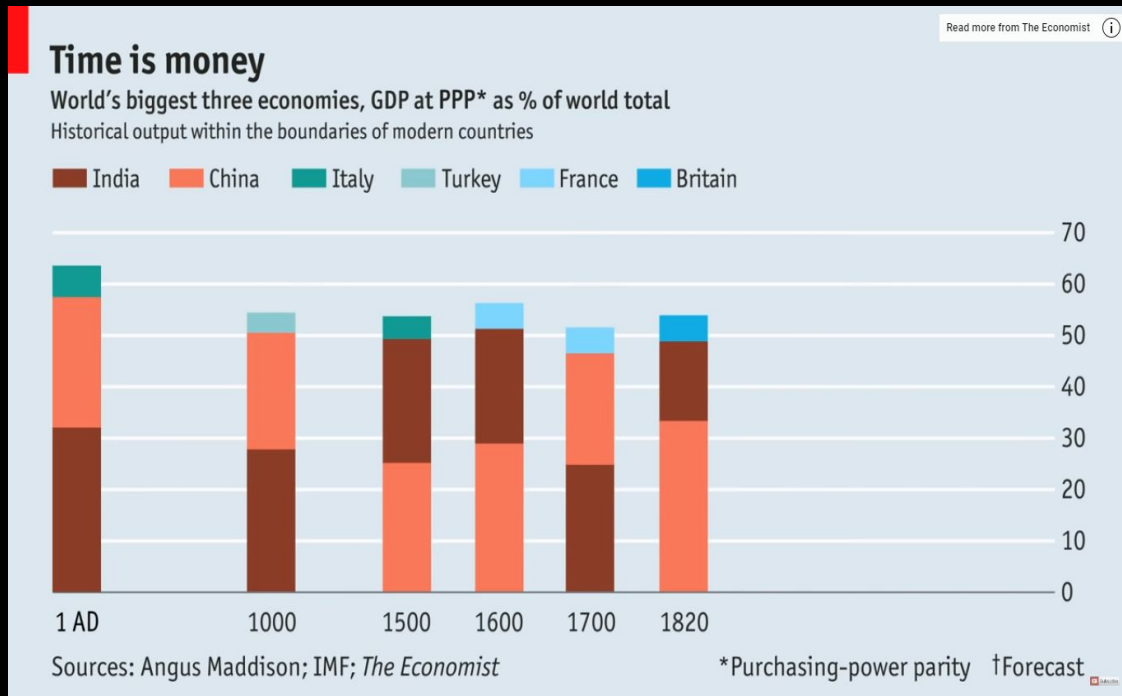
1800	1 ton of coal	50, 000 miners
1850	30 tons	200, 000 miners
1880	300 million tons	500, 000 miners
1914	250 million tons	1, 200, 000 miners

What supported IR-1 in Europe?

- Britain was the birthplace of IR in Europe.
 - Geographic Location
 - Stability and relative peace
 - Free political Institutions.
- It took time for the industrial revolution to spread to other parts of Europe

What supported IR-1 in Europe?

- But some of these reasons apply to India and China as well.
- Infact, India and China were far ahead in terms of growth and population



What gave Britain an edge ?

1) Abundance of NR:- primarily coal.

- Transportation, Communication, Industrial Efficiency, Chemical manufacturing were all facilitated by coal.
- Steam Engine required coal to function.
- Coal mining became extremely cheap.

2) Low population encouraged non-labour intensive techniques

3) Colonization of various countries around the world.

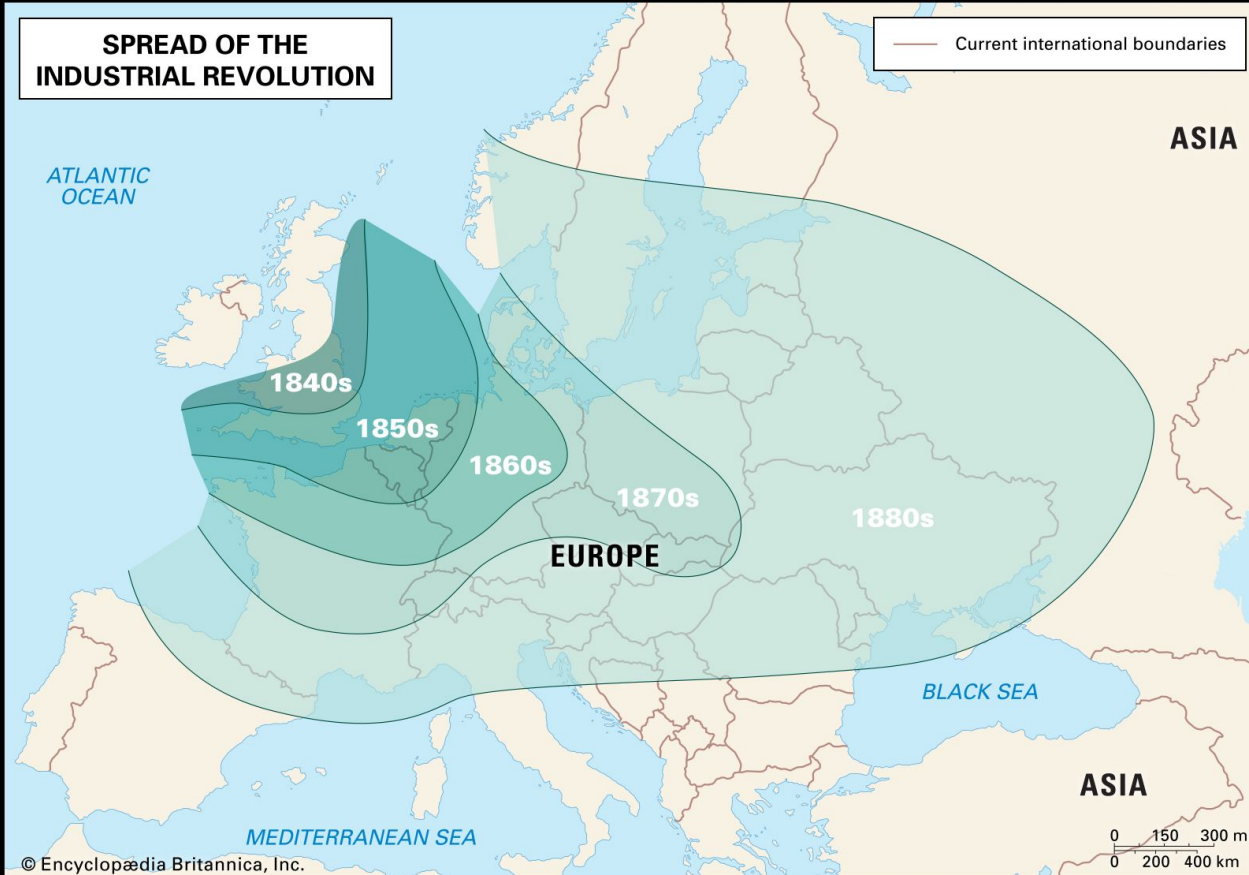
- Played a major role for Europe
- Could exploit NR and HR to their best potential.

British Empire in early 1800s



Why not India and China?

1. Location of **China's coal**
2. **Rapid growth of population** in China
3. Confucian ideals that **valued stability**
4. Lack of Chinese government **support** for maritime explorations
5. China's focus on **defending self** from nomadic attacks from the north and west.

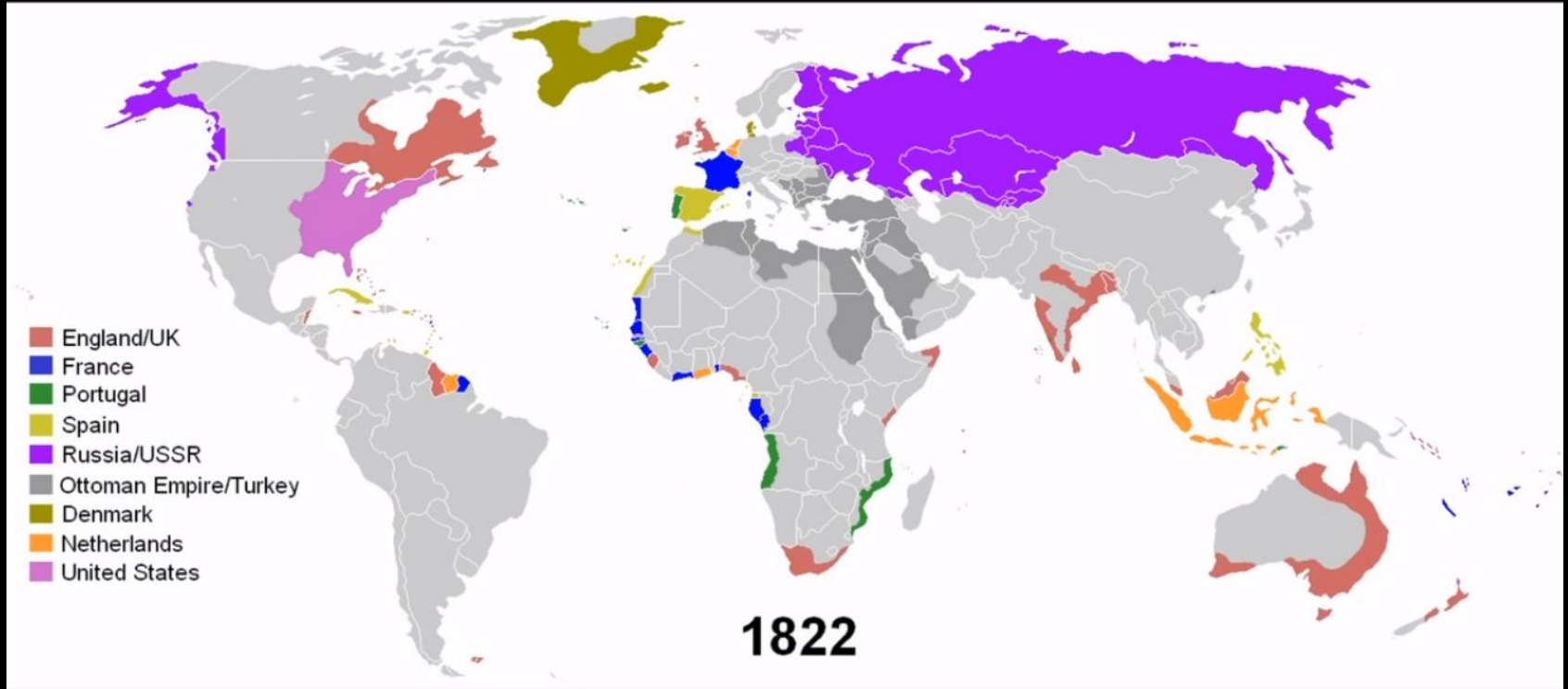


Spread of Industrial Revolution In Europe

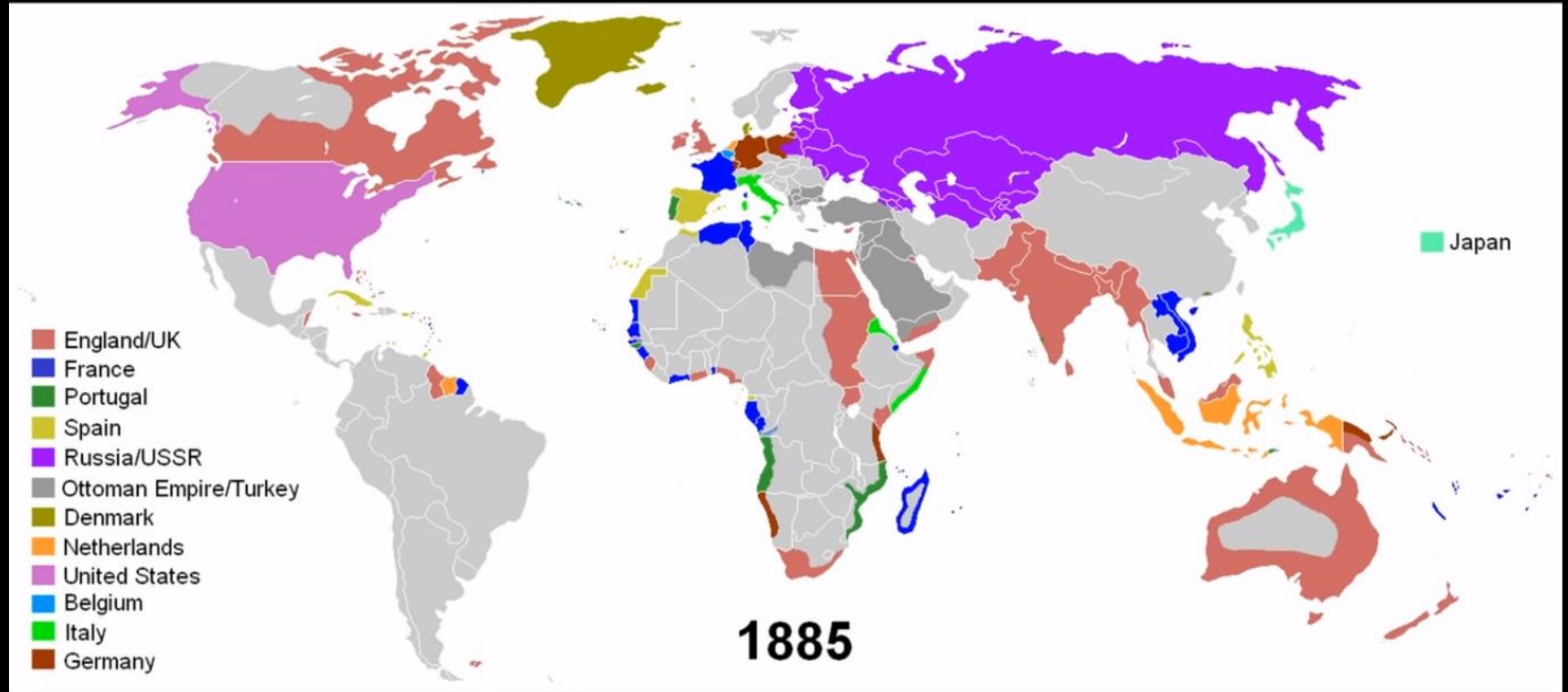
Spread of IR in Europe

- Britain - the birthplace of IR in Europe.
 - ◆ They were aware about this.
 - ◆ Forbade the export of machinery, skilled workers, and manufacturing techniques.
- Belgium
- France
- Germany

Europe and the colonized societies



Europe and the colonized societies



Second Industrial Revolution

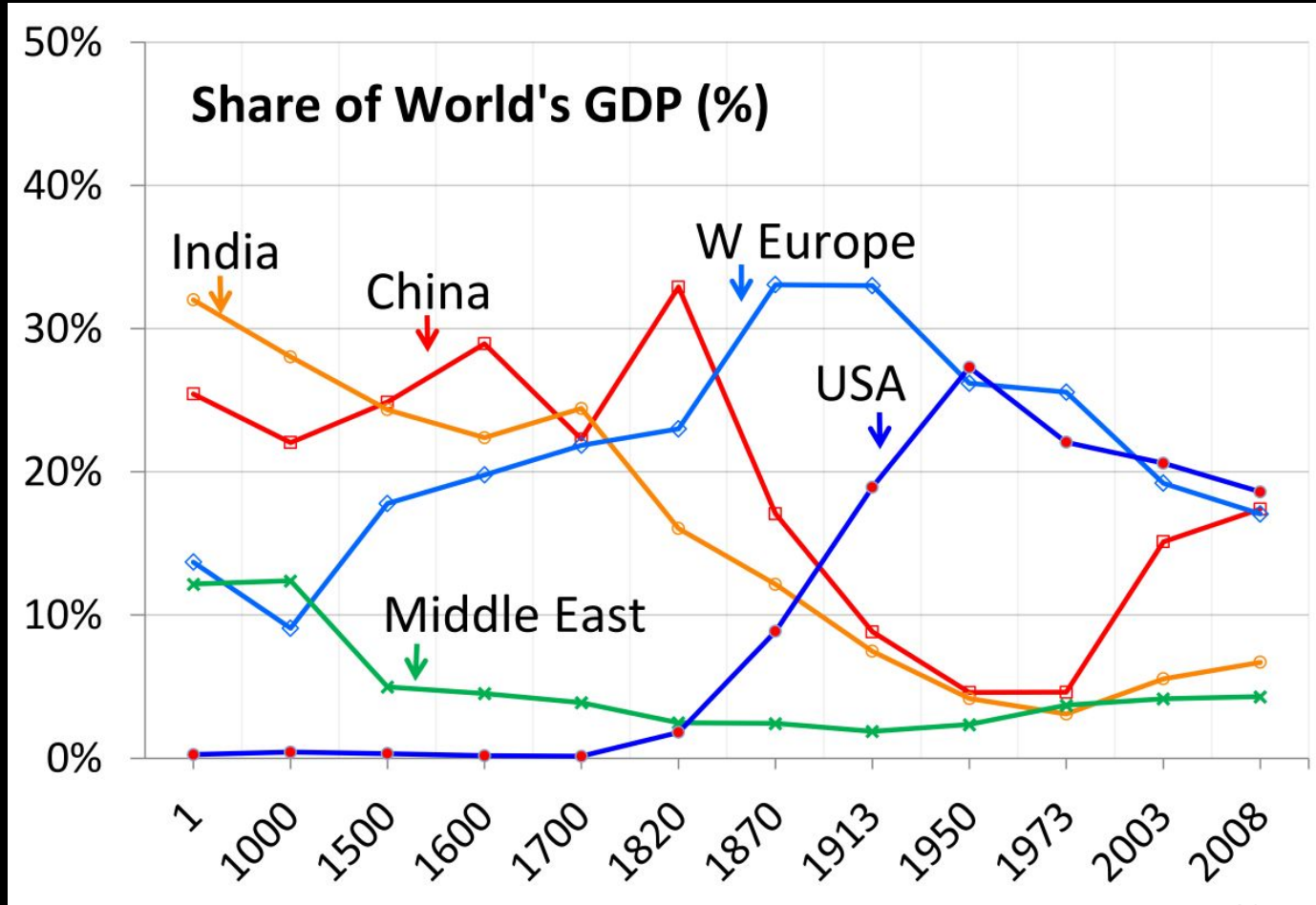
Origins

- Started during the late 19th century and continued into the early 20th century
- Began in USA and slowly spread to other parts of the world

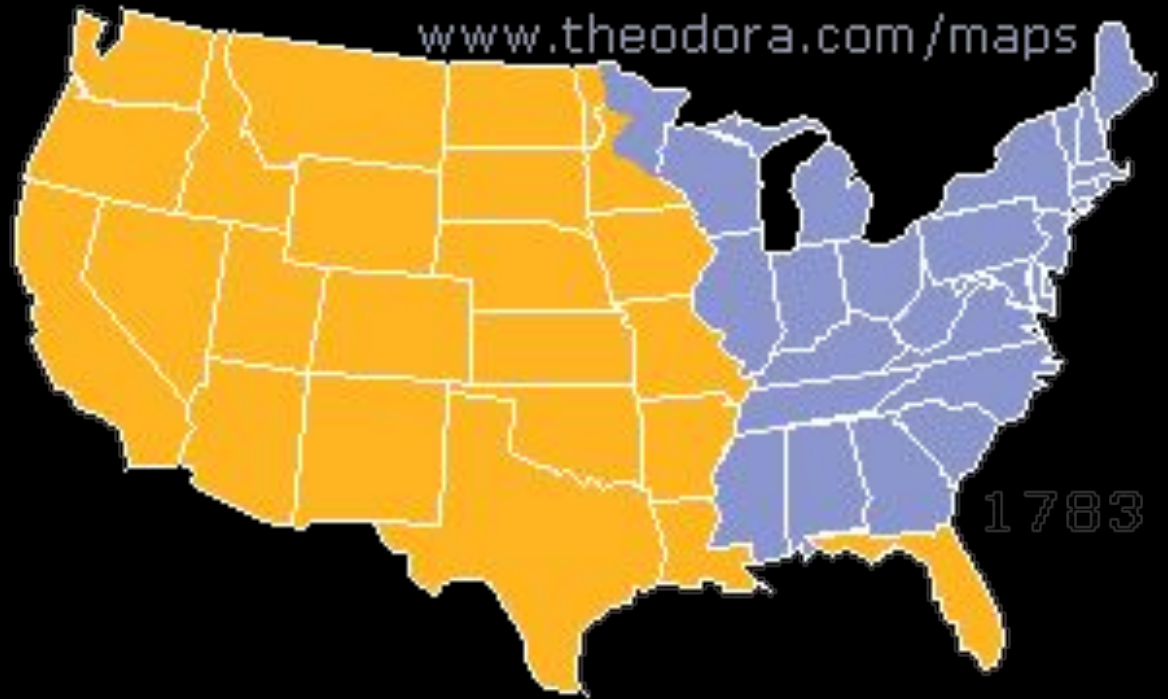
Reasons

- Rapid urbanisation
- Addition of new territories
- Drastic increase in population (fueled by people from new territories) increased market for goods
- Fueled by immigrants and advances in technology

Share of
world's GDP
based on data
from **Angus
Maddison**



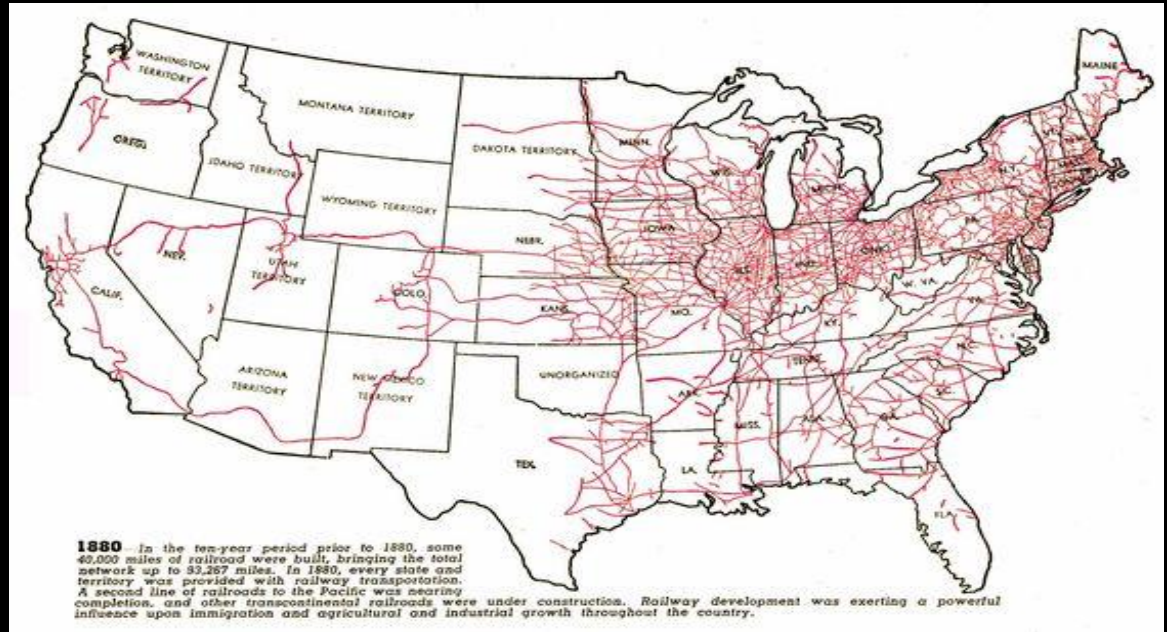
Expansion of US Territories (1800 to 1890)



Railroads

- The most visible effect of the revolution
- Helped transport goods across the country, **increased demand**
- **Steel replaced iron** in tracks, allowing for larger tracks and more powerful locomotives
- Brought down cost of transportation

Expansion of Railways in the United States (1880)



Electrification

- Made possible by advances in electromagnetic theory by Michael Faraday
- Led to the increased use of electricity to power machinery
- Almost all inventions during this period were powered by electricity
- Replaced steam power in factories
- First power station built in Britain in 1890

Innovations

- Light bulb (improved design by Edison)
- The Bessemer process -United States Steel
- Combustion tractor (Agriculture)
- Telephone
- Telegraph
- Assembly Line - Facilitated Mass production and lowering of production costs

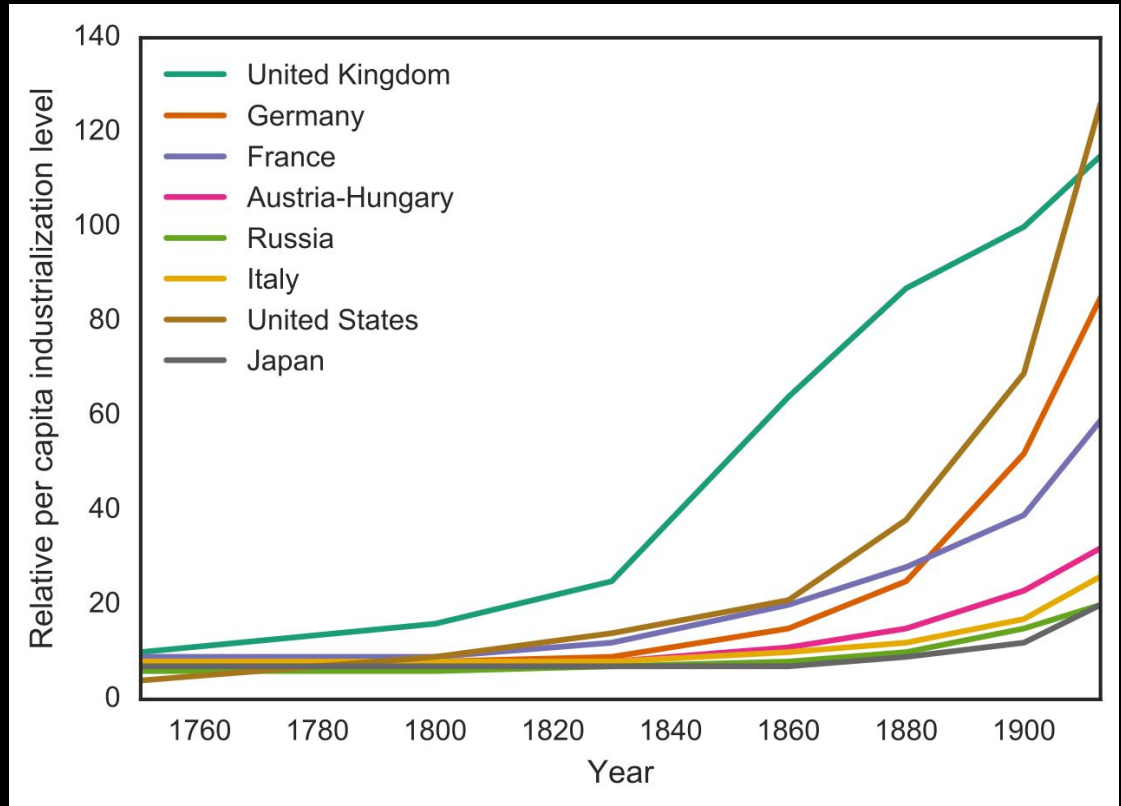
Advancements in communication

- Invention of **telephone** and **telegraph** sped up communication
- Use electricity to send instantaneous messages
- Enabled businesses to communicate with other businesses situated far away as if they were in the same marketplace
- Allowed trains to communicate with each other, increased efficiency and reduced accidents

An early map showing the telegraph lines in United States.



Per Capita Industrialisation Levels

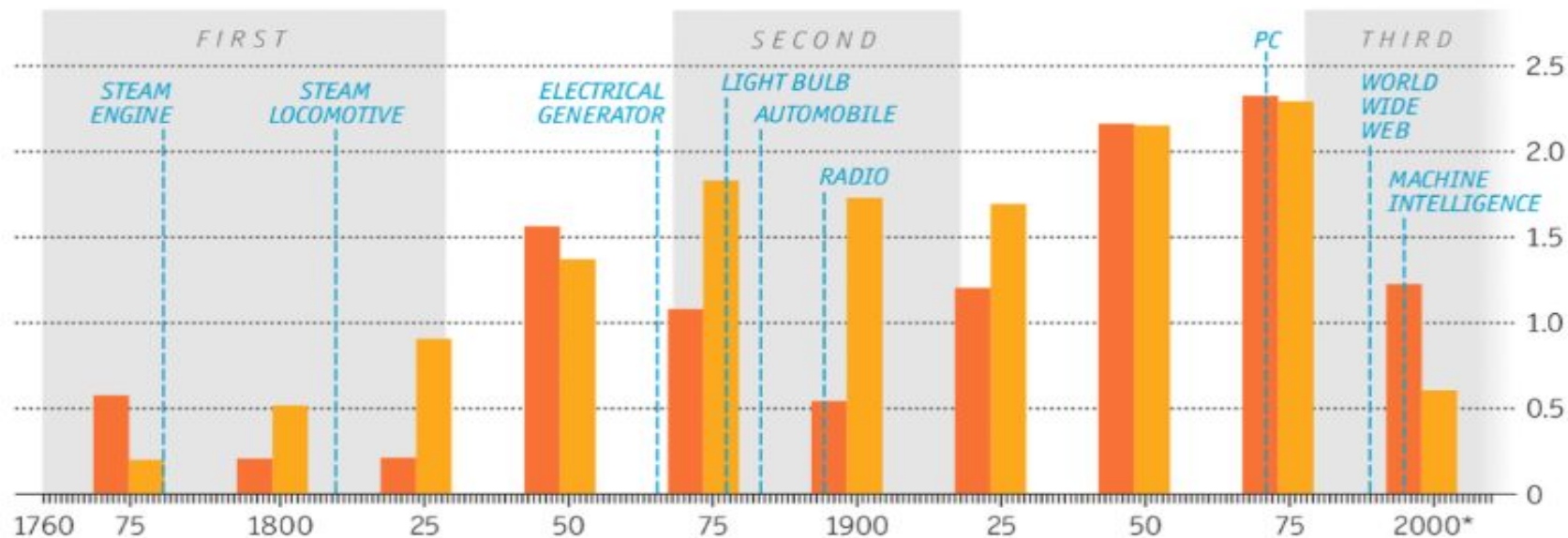


Impact on GDP

For richer, for poorer

GDP per person, average annual % change over 25-year periods

Britain United States
Industrial revolutions



Sources: Maddison Project; *The Economist*

*To 2010

Impact on Society

- Engineering colleges were established
- Emergence of new middle class.
- Prices fell
- Life expectancy reduces
- Pollution
- Child labor

Why not Britain?

- US and Germany outdid UK
- High Taxations by Britain
- Welfare schemes
- Large geographical area

Pendulum Shift

- Marked a shift of industrial development from Europe to North America
- Followed by the Third Industrial Revolution in Japan, Korea and Taiwan
- Shifts happen because of “If it ain’t broke, don’t fix it” mentality.

Third Industrial Revolution

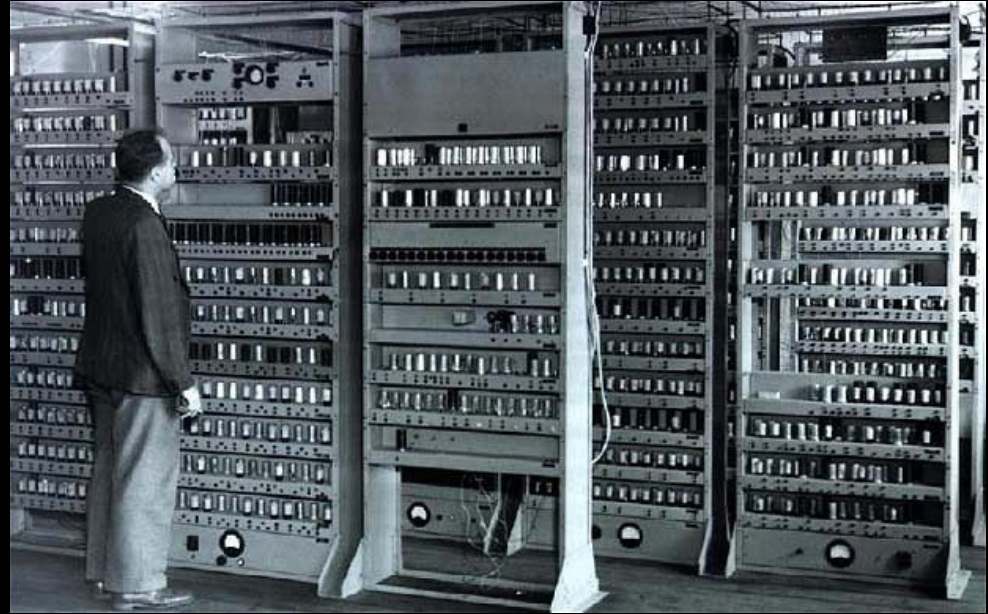
- This revolution witnessed the **rise of electronics**
- Electronics and Information Technology were used to automate production



INDUSTRY 3.0

Automation, computers
and electronics

The start of Industrial Revolution 3 comprised of inventions of electronics such as transistors, integrated circuits, calculators, personal computers, etc...



Transistors

- Revolutionized the field of electronics and paved the way for smaller and cheaper electronic items
- Computer systems now were capable of doing huge mathematical calculations

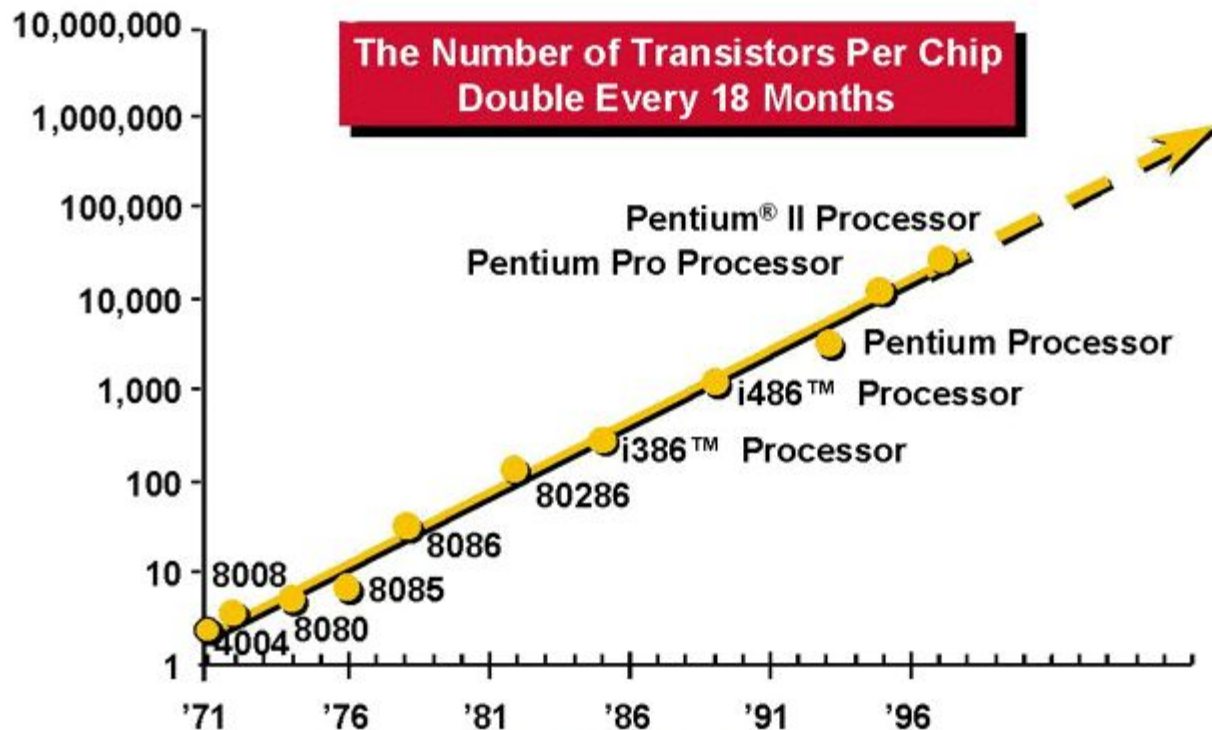
Integrated Circuit

- ICs were the next major milestone, invented by Jack Kilby at Texas Instruments
- With the technological advancements the size of ICs reduced and speed increased
- They roughly follow the **Moore's Law**

Moore's Law

- Observation that the number of transistors in an integrated circuit doubles about every two years
- This law is given by Gordon Moore, one of the co-founders of Intel Corporation

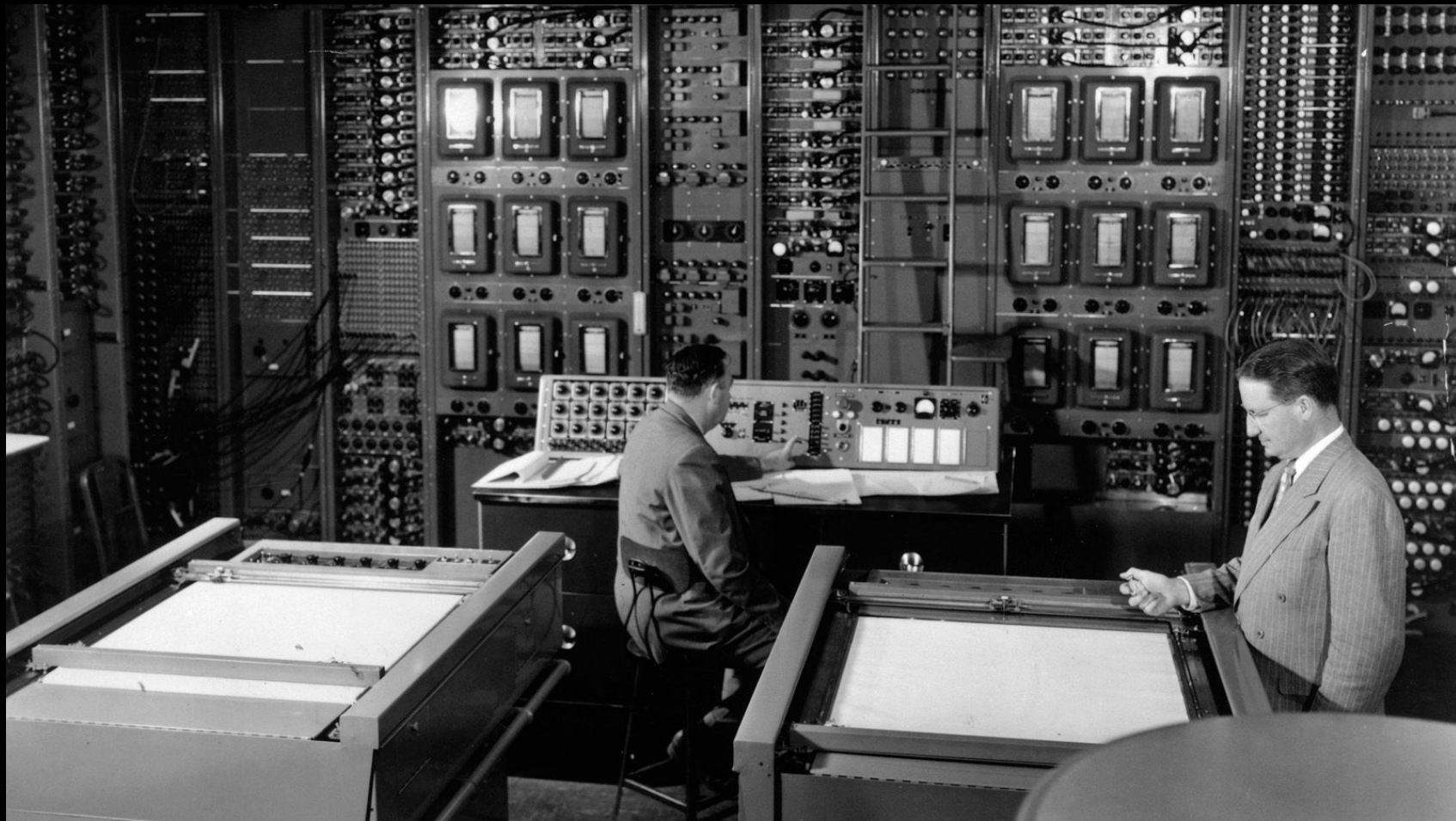
Transistor Count 1,000



Source: Intel Corporation

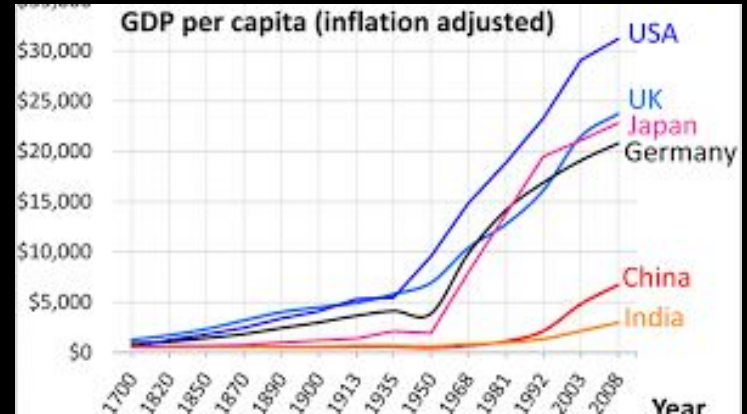
Personal Computers

- In 1970s, computers were room sized big machines requiring thousands of separate transistors
- With the advent of the microprocessors, personal computers came into existence, which were smaller in size and faster in processing



Revolution in South Asia

- The advantage of this revolution was best taken by Japan, followed by other South Asian countries, such as Taiwan and South Korea
- Japan is regarded as proving ground for a wide variety of new products and technologies



Revolution in Korea

- Korea utilized its most significant advantage, **lower labor costs**, to develop its industrial base and attract foreign investment
- Foreign-owned, labor intensive assembly operations were typical of early electronics production
- The export orientation of this industry was of paramount significance

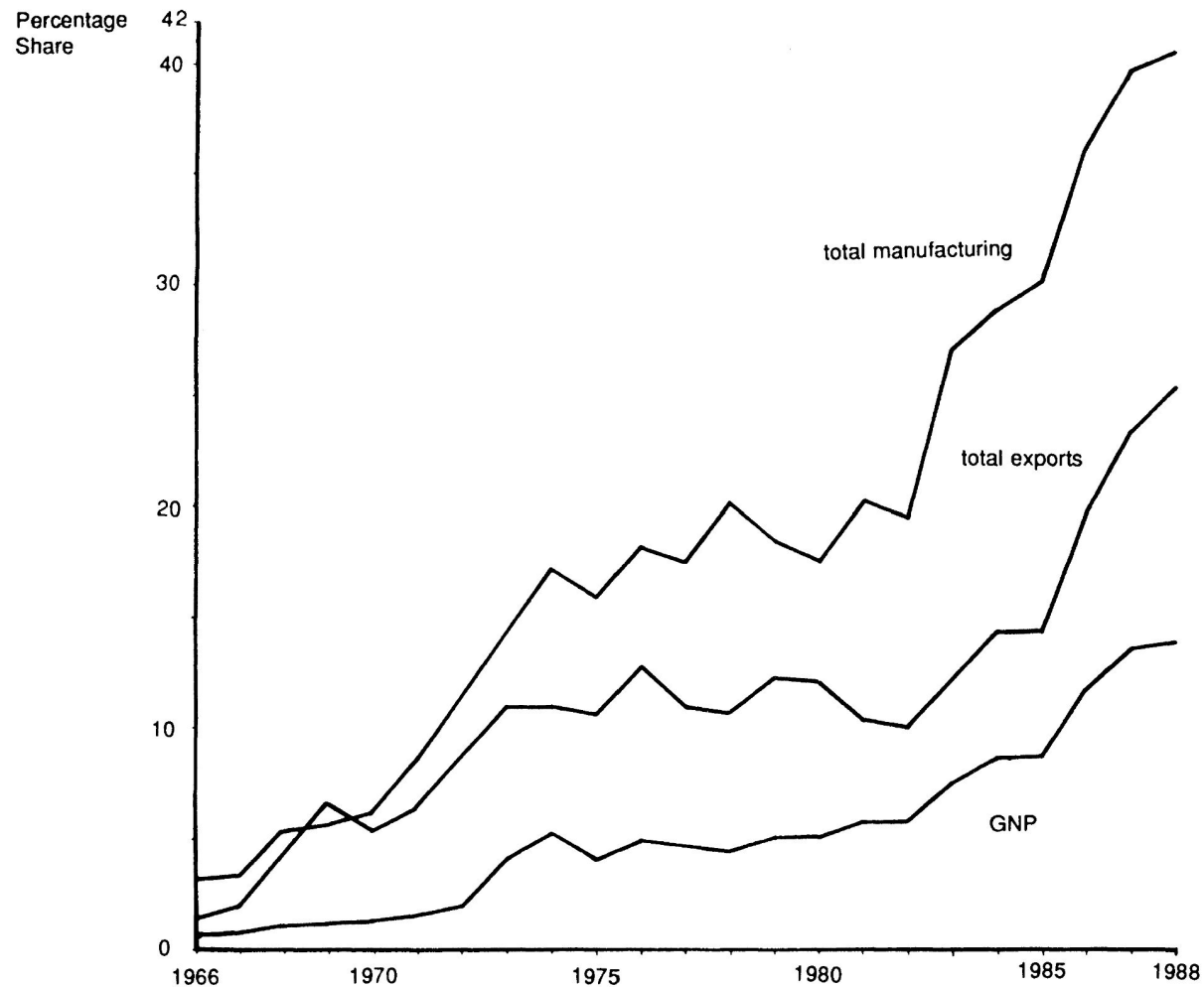
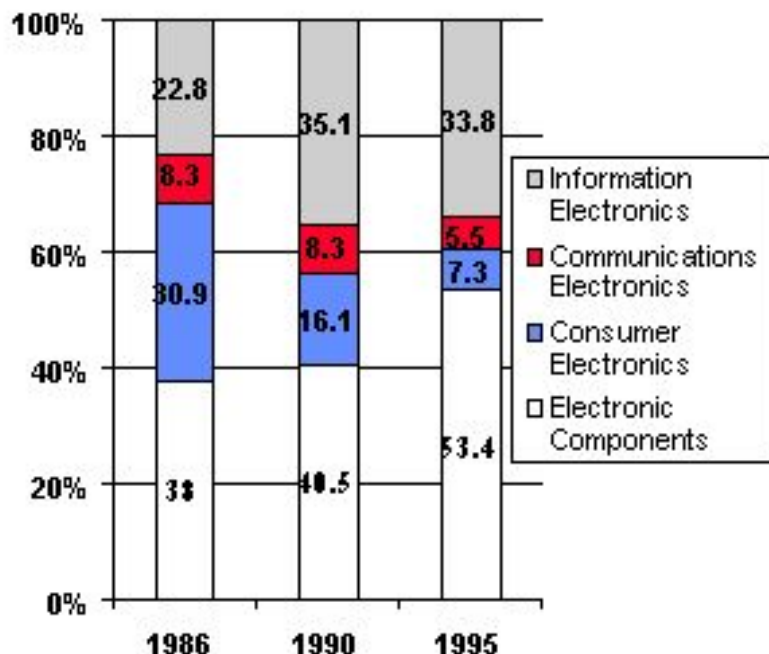


Fig. 1. Korea's electronics industry: growth trends. Data sources: [39; 41; 43; 44].

Revolution in Taiwan

- Taiwan's information technology (IT) and electronics sector has been responsible for a vast supply of products since the 1980s
- Taiwanese companies are known to provide services for manufacturing customised computer chips for other companies

The changing structure of Taiwan's electronics industry



- Electronics Industry growth ('90-'95) = 12.4%
 - Information = 11.7%
 - Communication = 3.4%
 - Consumer Electronics = -4.1%
 - Electronic Components = 18.9%
- Information & Electronic Components Products are mainly in PC and IC businesses.
- Product integration is growing.
- Value added comes from enabling components and software.

RESOURCES:

Sites to visit:

<https://historyofmassachusetts.org/where-industrial-revolution-take-place/>

<https://www.jstor.org/stable/pdf/143401.pdf?refregid=excelsior%3A2ff08b31c92d47d86c8036aa50e99638>

<https://www.euromoney.com/article/b13209y01r88c9/taiwans-electronic-revolution>

<https://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-and-maps/second-phase-industrial-revolution-1850-1940>

<https://www.history.com/topics/industrial-revolution/industrial-revolution>

Sites not to visit

<https://en.wikipedia.org/>

<https://industrialdevelopment.weebly.com/>

Dedicated to:

The inventors who provided us with
crucial tools to remake the world.

Thank You!