Chapter 20 – The Industrial Revolution

The Industrial Revolution in Britain

Began in 1750; by 1850 Britain was the wealthiest country in the world

Origins

Several factors helped it happen

Agricultural Revolution: changes in farming and livestock breeding led to increase in food production

Rapid population growth provided excess laborers for factories

"excess" farmers and rural cottage-industry workers

Supply of Capital

Profits from trade & cottage industry, strong central bank, and flexible credit systems

Paper instruments (currency, stocks, bonds, loans) more widely used for transactions

Early Industrial Entrepreneurs

Historians have said that the English were "fascinated by wealth and commerce"

Their more democratic structure (not absolutist) encouraged progressive behavior, innovation

However, fortunes were both quickly gained *and* lost

Mineral Resources

Coal and iron ore; abundant rivers for power and navigation

Short distances made transportation relatively easy

Plentiful private and public investment in roads, bridges, and (later) canals

No tariffs to hinder trade

Role of Government

Parliament provided a stable government that passed laws protecting private property

A remarkable freedom for private enterprise

Markets

18th-C. wars and conquests developed a vast colonial empire

at the expense of the Dutch and French

Exports quadrupled from 1660 to 1760

to the Americas, Africa, and Asia [not to Europe – with its tariffs]

people wanted inexpensive clothes rather than luxury goods

sold well at home, too, as the wealthier British could buy more

Technological Changes and New Forms of industrial Organization

The Cotton Industry

Britain already had a good system of producing cotton goods

Flying shuttle sped up hand weaving

Caused a "shortage" of yarn until James Hargreaves spinning jenny (1768)

Richard Arkwright's water frame, Samuel Crompton's spinning mule increased yarn production

Edmund Cartwright's power loom (1787) allowed weaving to catch up

Efficiency demanded that workers gather at the machines rather than being spread out (cottage industries)

Located along rivers to use water power

Resulted in new towns springing up near factories to house laborers and their families

The Steam Engine

First revolutionized production of cotton goods; later other industries

1760s: James Watt refined the engine to pump water out of the mine far more efficiently than earlier ones

1782: developed a rotary engine that could turn a shaft and therefore drive other machines

because it was powered by coal, it did not need to be beside a river

Quickly used in textile industry

The cheapest labor in India could not compete; British cotton goods sold everywhere in the world

A tireless source of power (unlike horses) available in apparently limitless quantity

Required more coal output – which led to improvement in iron production

The Iron Industry

Turned to coke (instead of charcoal) and developed cast iron

1780s: Henry Cort developed "puddling" which produced a higher quality iron
became material of choice for machines until the steel of the 1860s

A Revolution in Transportation

"turnpike trusts" built new roads
1760-1830: a network of canals
The Railroad
"invented" in 1500s Germany, using small handcarts on parallel wooden rails
reduced friction allowed for more weight to be pulled (using horses back then)
1804: Richard Trevithick created the first steam-powered locomotive (carried iron ore and people)
1830: George Stephenson's *Rocket* was used on the first public railway line
1840: 2000 miles of track built by private enterprise
1850: trains could travel at 50 mph
created booms in investment and jobs
reduced the prices —> created larger markets —> increased sales —> need for more factories and labor

The Industrial Factory

Workplace moved: artisan's shop —> peasant's cottage —> factory
Factory owners hired workers, who no longer owned the means of production and in turn received wages
Machines couldn't be idle —> workers had regular hours *and* in shifts (no leisurely pace or inactivity)
Efficiency demanded boring, repetitive work
Instituted fines; fired workers for "serious" things like drunkenness (bad example, dangerous)
But for children, beating was common
Coincidentally, some churches (esp. Methodism) reinforced factory values
Follow a disciplined path, discourage laziness and waste; accept hardship in this life, practice thrift
Over time, the society accepted a regular work week

Britain's Great Exhibition of 1851

World's first industrial exposition at the Crystal Palace (19 acres of iron and glass)
Contained 100,000 exhibits, visited by 6 million in 6 months
Displayed British superiority in technology; suggested British superiority in all things
Britain had become the world's first industrial nation – and its wealthiest
Produced half the world's coal and manufactured goods
Cotton industry was the equal of all of Europe's industries *combined*

The Spread of Industrialization

On the continent, it first spread to Belgium, France, and Germany; in North America, it was the United States

Limitations to Industrialization

In the late 1700s, continental countries did not share Britain's advantages
Lack of roads, poor river transportation,
Tariffs, guild restrictions, dislike for business competition, excessive worship of thriftiness, aversion to risk
1790-1812: **Warfare**: Revolutionary and Napoleonic Wars from
interrupted trade, caused much physical destruction and loss of manpower
weakened currency, led to political and social instability
Napoleon's Continental System/blockade
1815: British flooded Europe with cheap cotton textiles, British machinery was too modern, expensive
continental investing more likely to be family enterprises (and consequently less affluent)

Borrowing Techniques and Practices

Lack of technical knowledge led to borrowing/stealing British knowledge
British had tried outlawing technology from being exported (until 1842)
But skilled British mechanics were in demand on the continent
1817: John Cockerill, a businessman, set up an industrial plant in Belgium
by 1840, skilled mechanics were being developed/schooled in Belgium and France

Role of Government

Continental governments had been used to playing a large role in economic affairs
Established pro-business policies
Paid for technical education, exempted some businesses from import tariffs, even financed factories

Invested in public works: roads and canals, deepening/widening river channels, constructed railroads
Railroads were built well before public acceptance (BTW, it helped ironworking and engineering)
Protected new businesses by setting high tariffs on British businesses
Tried to offset huge British advantages

Joint-Stock Investment Banks

British had had the advantage: early, less costly machines could be largely financed through private funds
Pooled large number of small- and medium savers to create a large supply of capital for investment
1830s: the Belgians were the best
as shareholders, their liability was limited to their investment (no personal property)
France: Crédit Mobilier; Germany: Darmstadt Bank

Centers of Continental Industrialization

Belgium, France, and Germany
Example: Cotton industry
France's machines were old, les efficient (a generation behind Britain)
Belgium: more coal and less water meant jumping in to steam power
Steam power moved over to mining and metallurgy

Industrialization in the United States

1800: the U.S. was an agrarian society
1860: population was 6x greater (5 —> 30 million); half *weren't* farmers
at first borrowed/stole British technology
later grew on superior innovation (e.g., interchangeable parts)

The Need for Transportation

As a much larger country, US needed a large-scale transportation system
Later acquisition of technology coincided with road- and canal-building, railroads, steamboats

The Labor Force

Short on craftsmen, but long on farmers – actually an excess
Whereas many men west of the Appalachians moved West, women tended to go back East
1830s & 1840s: Decline in rural births was made up for by immigration of. English, Irish, Scottish, Welsh
in all, US had mostly unskilled workers, so it invested in machinery
the North was more advanced: better diets, higher income, more machine-made clothing
income inequality, but even though the rich got richer, the poor did not get poorer

Limiting the Spread of Industrialization in the Nonindustrial World

Russia lagged far behind: largely rural, little middle class, autocratic regime fearful of change

The Example of India

Britain *worked* to deprive India of industrialization, thanks to the British East Asia Company
Encouraged export of cotton to Britain, where it was turned into goods to be sold back to India
Putting spinners and weavers out of work
Little local capital to invest hampered any real industrialization

The Social Impact of Industrial Revolution

Population Growth

Great increase – in part because record-keeping improved
Britain began a census in 1801
1750: 140M —> 1800: 187M —> 266M
not just more births – also fewer deaths
decrease in famine, epidemics, and war
decrease in plague and smallpox
increase in food supply
Urban: city sizes increased (but they were "islands" in an agricultural sea"
Rural: overpopulation in the countryside brought famine, exodus

The Great Hunger

Ireland was a country of peasants renting from absentee English landlords
Married earlier than other Europeans, and they had children

They were highly dependent on the potato for survival
1845-1861: Potato blight destroyed Ireland: 1M died, 2M emigrated to the US and Britain

Emigration

1821-1850: 110,000 a year emigrated to the US
1847-1854: emigration exploded
more often, the rural poor moved to the cities

The Growth of Cities

1850: in Britain and Belgium, cities were where to find factories (land, labor, and capital)
British cities:
1800: London had 1M, six cities had 50-100,000
1850: London: 2.36M, 9 cities over 100,000 and 18 cities of 50-100,000
urban populations on the continent grew also, but not nearly as rapidly

Urban Living Conditions in the early Industrial Revolution

Population growth in the cities made for miserable living
Had always been that way, but the expansion made it more obvious
Poor were stuck in the city while the rich could afford to move "away"
Sanitary conditions were appalling
Streets were sewers and open drains: refuse, dirty water, food waste were left to rot
Food was adulterated – merchants added alum, water, and lead to food
Government wouldn't intervene
1875: Britain finally passed a food and drug act
investigators believed that conditions were the cause of moral shortcomings (e.g., crime, prostitution)

Urban Reformers

Edwin Chadwick became obsessed with eliminating poverty and squalor
Secretary of the Poor Law Commission, released a report
Disease was caused by rotting substances and overcrowded dwellings
Recommendations: drainage, removal of refuse, improve the water supply
Middle class was willing to support reform because of the outbreak of ***cholera***

New Social Class: The Industrial Middle Class

The *bourgeoisie* had been around since the middle ages; originally meant "burgher (town dweller)"
Now it came to include people involved in commerce, industry, banking, professionals, bureaucrats
At the lower end were master craftsmen and shopkeepers

The New Industrial Entrepreneurs

Raised capital, built factories, organized labor, purchased machines, figured out markets, trained supervisors
Risks were high, competition was fierce, and failure was commonplace
Half of the industries were small, employing under 100 people
Religious dissenters were prominent in the Industrial Revolution
Had been shut out of government, university posts, turned to education and investment
Relied upon each other for financial backing

Significance of Industrial Entrepreneurs

Over time, businesses were passed on to sons, who had a different perspective
Created a business aristocracy
Eventually merged with the traditional aristocracy

New Social Classes: Workers in the Industrial Age

As middle class was trying to *associate* with the landed elite, they were trying to *distance* from the laboring classes
Largest group of working class in the beginning was the hand craftsman (e.g., shoes, gloves, printing)
Still there was an attempt at an "aristocracy" of laborers (who worked 12-16 hour days, 6 days a week)
Crafted luxury items for the rich (e.g., coaches, carriages) and earned higher wages
Fearful of mass-produced, machine-made goods
Industrialists looked forward to the end of guilds, craftsmen
Servants were a large portion of the lower class

Working Conditions for the Industrial Working Class

Dreadful. 12-16 hours a day, 6 days a week (1/2 hour each for lunch and dinner)

No minimum wage, no job security
Often dirty, dusty, or hazardous
Women and children often employed in factories and mines
Children had been used on farms and in cottage industry, but they were exploited in factories, mines
Smaller size helped, more easily accepted harsh conditions, worked for lower wages
Orphans were often sent to work by the church parishes responsible for their care
Parliament acted slowly, only protected children in mines and mills (not in small workshops)
1830: women and children were 2/3 of cotton industry labor
1833: factory Act removed children – who were replaced by women
women were unskilled and paid ½ of men
Families didn't necessarily object to employment of women and children
Women's work was actually fairly traditional: mostly single, working as servants and in agriculture
Children weren't necessarily treated better at home

Standards of Living

While there may have been some financial justification in the beginning for staggeringly low wages, there was certainly a widening of the gap between the rich and poor
tea, coffee, and sugar were still semi-luxuries consumed by the rich and middle classes
meat consumption actually declined from 1780-1840
long cycles of "boom and bust" were common
middle class definitely benefitted but working class would have to wait

Efforts at Change: The Workers

In Britain, the government (in reaction to the French Revolution) outlawed worker associations
Nevertheless, ***trade unions*** formed to protect workers, limit entry into their respective trades

The Trade Union Movement

1810s: strikes in cotton spinners, hand-loom weavers, and miners
1824: repeal of the Combination Acts (unions were tolerated
1820s and 1830s: attempts to create national trade unions
Robert Owen: a social reformer who urged cooperation over competition
1834: Grand National Consolidated Trade Union (national federation of trade unions)
purposed to coordinate general strike

Luddites

1812: skilled craftsmen, they organized to attack the machines that threatened their jobs

Chartism

Derived from the People's Charter of 1838; national petitions presented to Parliament in 1839, 1842
demanded universal male suffrage, payment for members of Parliament, eliminating property qualification for Parliament, annual sessions of Parliament
1842: a largely unsuccessful general strike; played out by 1848

Efforts at Change: Reformers and Government

Government in Action

As the number of poor increased, pressure to enact reforms increased
From 1802 to 1819: factory acts that limited labor for children 9-16 to 16 hours a day, and none under 9
But only applied to mills and mines
Factory Act of 1833: children 9-13 could only work 8 hours a day; children 13-18: 12 hours a day
Calls for childhood education
1847: Ten Hours Act limited children 9-13 to 10 hours a day
1842: Coal Mines Act eliminated women, boys under 10 from work in the mines