

6. Industrialisation

Most of the people of history have been farmers. This began to change in the 18th century and it began in Britain. In the middle of that century London was already a big city, with 12.5% of Britain's people. Another 2 or 3% lived in the country's other towns and cities. Out of 7½ million people, Britain had a significant and concentrated urban population of about 1.1 million.

By the early 20th century, the population had risen to 45 million and London contained 6½ million. The proportion of the population in London had crept up to about 14.5%, while other towns and cities raced up to take in another 65%. Britain was the first mass urbanised society.

The theme of this essay is work and it will try to explain the processes that radically transformed the working lives of British people. It will also shed some light on how a small, wet island off the European coast became the world's most powerful state. It will cover the period of 1754-1914.

Why did capitalism begin in Britain?

The “industrial revolution” in Britain was the first in the world, or to put it another way, the industrialisation of the whole world began first in Britain. Why here? One very commonly held view is that it was to do with British culture, specifically the religious ideas of “Protestantism”, as they evolved from the 16th to the 19th centuries. The idea, known as the “Protestant work ethic”, has its origin in the work of Max Weber, and is still promoted by modern historians like Niall Ferguson.

To understand it you must understand that the Christianity of medieval Europe (which became known as Catholicism) says that your faith, your actions and your heart determine whether you go to heaven. One way of turning your faith and your heart into actions is to do things for the church. For many Protestants, God determines in advance whether you are going to heaven or not. You can't know and there is nothing you can do about it. This according to Weber, produces anxiety, which can be overcome by hard work.

As an alternative to this, I would suggest that you think of some other historical processes at work. Firstly, in medieval society, feudalism tended to decline as the money system revived. Feudalism depended on a sense of insecurity. Perhaps because of the isolating effect of being an island, real or imagined security was greater. This would make the process of the breakdown of feudalism at least slightly more advanced in Britain than elsewhere.

Secondly, because of the Barons wars, the English aristocracy had established the principle of the rule of law, limiting the power of the monarch. They had also established a Parliament to hold the monarch to the agreement. This kind of thing had occurred elsewhere, in Poland for example, it went much further and created what was called the “Noble Democracy”. The point is only that it was relatively advanced in England.

Thirdly, Britain had established an energetic trade system with Europe. Again being an island might have helped this. Sea transport was relatively fast in medieval times, making coastal people relatively well connected with foreign lands and goods. It is known that British people bred sheep for thick wool, which is useful on the cold and rainy islands. A strong wool exporting industry made a lot of people dependent on European trade in medieval times.

Fourthly, Britain acted as refuge for people escaping persecution in Europe. Its relative political isolation from the 16th century made this possible. Immigrants brought new skills and without land, often had to be entrepreneurs. Immigrants also tend to retain contacts with people they've left behind, from which trade networks can grow.

Fifthly, resources do play a part, at least in the sense that if Britain had been dependent on other nations for its energy it might not have developed so fast. The presence of wind for wind energy, fast rivers for hydraulic energy and accessible coal for the kind of energy needed to power industrialisation, were important. Also, England's relatively navigable rivers and the early development of canals increased the ease of transport and trade.

Finally, it is also worth mentioning that the break with Catholicism and the rise of Protestantism did have some effect. By dissolving the monasteries the state transferred their property to local landowners, and ultimately people made more resources available for the kind of profit-driven commerce associated with capitalism. Also, by reducing the number of church festivals, Protestantism allowed more of people's surplus energy to be used for trade, commerce and industry.

All these factors together put Britain on the crest of a wave. It is important to understand that every process must start somewhere. It doesn't mean that the starting point was qualitatively different, or had some single, magic ingredient. Sometimes, it is just small matters of degree that put some points in a developmental process ahead of others.

From agricultural to industrial revolution

World trade shares ideas and increases productivity. Here is a good example. Sometime before the early 17th century, Dutch merchants in China brought back a kind of plough that was particularly useful for wet, shallow soil, like the kind you get in the rainy hills of Southern China. Some Dutch engineers then brought it to the flat, wet lands of East Anglia.

With some slight modifications this proved more efficient than the traditional ploughs the British had been using for generations. It is probably no coincidence that East Anglia became the centre of innovation after that. In the mid-17th century, they discovered that fields that would normally lay fallow, could grow turnips and clover without losing their fertility. These crops then made excellent animal food and fertiliser. This became known as the "Norfolk system". Soon afterwards, other inventions like the seed drill in 1701, raised food production still further.

For generations people had taken sheep's wool door to door. Women would take it in, brush it into threads and spin it on to a "spool", turning it into "yarn". Because women without children would have had more opportunity to do this, in English we still have the word "spinster" to describe an unmarried woman who has passed the usual age of marrying.

People would come door to door to collect and pay for the finished yarn. Some people had "frames" or "looms" in their homes, and then "knitted" or "weaved" the yarn into cloth. Likewise, people would come door to door collecting the finished cloth. This form of production was called "putting out". Because small peasant houses were called "cottages", English also has the phrase "cottage industry" to describe a small scale industrial operation.

Around 1764, James Hargreaves' invented a machine called the "spinning jenny", which simplified and sped up the process. Within 25 years of its invention there are thought to have been 20,000 in use in British homes. Another version called the "spinning mule" was invented in 1779 by Samuel Compton. Workers at first welcomed these machines as labour saving devices, but soon found that the merchants were dropping their price for yarn. The process was increasing and cheapening production. Gradually, the loss of income of the workers caused them to rent machines from merchants, rather than own their own.

Back in 1713 Thomas Newcomen had built a steam engine for pumping water out of mines. In

1781, James Watt designed a more efficient version that was immediately taken up by engineers for use in industry. Edmund Cartwright built the first steam powered loom soon afterwards. At the time, the cottage textile industry of India was the biggest supplier in Britain's world trade network. , but it was a cottage industry of people using hand looms in their homes. "Mechanisation" made the domestic industry dominant.

To begin with, long distance transport in Britain was mostly done by sea or river. Local authorities were responsible for roads, and with no overall responsibility, there was no point in one maintaining a road if the neighbour didn't. This caused a "race to the bottom", with each local authority saving money by spending less on its roads. An alternative system came in the form of "Turnpike trusts", that is to say, private companies building roads and collecting tolls. The first was mentioned in a law of 1709. There were 150 by 1750 and 700 by 1800. They seem to have been concentrated in the South East of England.

Meanwhile, trains and canals were developing. In 1761 the Bridgewater canal was opened, taking coal from the Mersey, near Liverpool, to industrial Manchester. From the 1780s coal became important for factories and from the 1790s canal building exploded. Where most of the canals crossed, in the English West Midlands, the major industrial area of Birmingham and the Black Country developed.

After the 1820s and "Macadamisation" (the use of graded layers of stone to improve drainage) there were more and better roads, and competition was increasing. In 1830, the first modern style passenger train service was opened connecting Liverpool to Manchester. Soon lines spread everywhere. Most of the Turnpike trusts fell into debt. By the 1870s most had been taken over by the government, and in 1888 responsibility for roads was handed back to local authorities.

The first global war and the birth of a nation

In the early 18th century, French and British merchants spread out across the world. Colonies were established. Banks gathered up spare money (which mostly belonged to aristocrats) and invested it in international trade. Profits brought growth and prosperity to both nations, as well as exotic goods from far off lands.

The defence of the merchants and colonies was the job of the state, and when it came to war the same logic of investment was applied. A government could borrow money and spend it on its army and navy. Acquiring new territory speeded up development and raised tax revenue, which could be used to pay off the debt, or more often just the interest. In fact, the best competitive strategy would be for a state to borrow as much as it could, according to whether it could raise enough tax revenue to pay the interest.

At this point in history, we see a change in the meaning of money. It is at this time that the European states and their colonies are experimenting with forms of "fiat" money. This means that people are beginning to exchange pieces of paper, which has no value except the promise it represents. Its value is based on the common agreement that it has value, and ultimately on the power of the state that issued it to collect enough tax to keep its debts under control.

In 1754, British and French soldiers in North America fought over territory in what is now Pennsylvania. This came at a sensitive time. Within the Holy Roman Empire, two states had emerged and were building substantial military forces; Austria in the South and Prussia in the North. The French and British allied to each, respectively. The small war in America raised tensions between these European alliances.

After two years of diplomacy, bigger alliances formed and a global war broke out. What became known as the Seven-Years war (1756-63) had a global spread. There was fighting in Brazil, West Africa and in India. Both sides borrowed heavily. In the end, victory for the British-lead alliance bankrupted France, while Britain, despite gaining a lot of territory, still had a big bill to pay.

The British East India Company had its own private army, mostly of Indians from Bengal. They had successfully beaten the French-backed Mughals, but at great cost. The company had debts it couldn't control without government support, and the government obliged with an ingenious plan. To pay off its own debts the government needed to raise taxes, and by targeting those taxes at the company's competitors, it would also save the East India Company.

The only problem was the American colonists. They had already successfully protested against the Stamp Act of 1765, which imposed a special tax on them for the defence of the colony. Revolutionaries known as Patriots argued first for “no taxation without representation” and later for full independence. Their campaign against the tea tax and the East India Company's monopoly culminated in an act of sabotage in December 1773. Imported tea was dumped in the water of Boston harbour, in what became known as the “Boston Tea Party”.

Desperate for money, the British demanded compensation for the loss. The Americans refused. War broke out within a few months. Decisive in events were two things. One was the role of George Washington, a British born plantation owner from the South. He helped to overcome the divisions between America's northern merchants and southern landowners, enabling them to fight as one nation. The other was Thomas Paine's book “Common Sense”, which made the case for a liberal, national revolution and sold in huge numbers.

Seeing the opportunity to recover its position, the French state made an alliance with the American colonists and joined in the war against the British in 1778. By 1783, thirteen American colonies had declared and successfully defended their independence. A new federal state, the United States, was born.

Revolution

The Seven-Years war bankrupted France. Helping the Americans in their war of independence bankrupted it again. The state faced a deep financial crisis. The King, Louis XVI, realised that the only way out was to get the French aristocracy to pay more taxes. They refused. So he called a Parliament of Commoners known as the “National Assembly”, presumably hoping they would loyally go to the country and get the peasants and merchants to pay more.

The National Assembly however, not only refused to help, but refused to disband. The people of Paris marched in the streets showing their willingness to defend them. They held a series of assemblies discussing a new Constitution. As fear of the King's army grew, the people decided to arm themselves. On 14th July 1789, they stormed the Bastille prison to get hold of some weapons. The event is taken to mark the beginning of the French revolution.

It is likely that the majority of revolutionary leaders in France wanted a Constitutional monarchy, like the one in Britain. This changed however, when the King was caught trying to leave the country for Austria. It was assumed, probably rightly, that he was going to his Austrian allies to lead an invasion. From this point, the revolution became overwhelmingly Republican.

Deposing a King is quite a bold step to take. Executing him is bolder still. The biggest party in the National Assembly, the Girondins, opposed his execution, but then it became clear that not only were the Austrians, but even the Prussians were preparing to invade. They would put the King back

in power if they succeeded, and the King was believed to be secretly conspiring with them. In January 1793, the Assembly bowed to popular demands and the King was executed.

The Girondins led the war to hold back the Austrians and Prussians. They armed the people promising a quick and easy victory. Soon however, there was mutiny, and a growing opposition to Girondins who had served under the King and opposed his execution. A body called the Committee for Public Safety was set up to root out secret Monarchists. It was led by the Jacobins, who began accusing their political opponents of betraying the revolution.

A wave of executions, called the “Reign of Terror” followed. In 1795, its leaders fell victim to a coup that ended in the rule of a new body called the Directory. All the time, people were hoping for a government that could unite the country, give it a stable constitution and secure its borders. The Prussians stopped advancing in 1797, but then the British and Russians joined in.

In Egypt, a General called Napoleon, led a successful campaign against the British. With a heroic reputation, he came back to Paris and led a coup. By 1802, France was secure and strong again. It even held Spain and all its dependent colonies. It was in a position to control continental Europe but was unable to gather the forces to invade Britain. Safe on the island, the British could supply any nation that resisted the French, but it couldn't raise the forces to conquer the continent. It was a stalemate during which both sides borrowed and rearmed furiously.

War broke out again in 1803, and repeatedly, with shifting alliances until 1815. Significantly, the battle of Jena, in 1806, removed what remained of the institutions of state established by Charlemagne one thousand years earlier. The Holy Roman Empire had nominally, but not actually ruled over four hundred small states. When it was finally abolished, they quickly swallowed up each other, until there were thirty nine by the war's end.

One of these states is worth mentioning. In the North East of the old empire, the relatively strong state of Prussia, had acted independently in the wars. It had borrowed, built and established a very large army. Its strategy would pay off only if it could create a large, productive state in Central Europe, which would take several decades. In the meantime, Napoleon was finally defeated at Waterloo in June, 1815. The British leader, the Duke of Wellington, became a national hero.

The world in 1816

The year 1816 became known as the “year without a summer”. Snow is recorded in June in Central Europe. We now know that this climatic event was caused by the eruption of Mount Tambora in Indonesia the previous year. Geological evidence, in particular, sulphur and other deposits in polar ice, show that another event had occurred somewhere in the tropics about several years earlier. Combined, these events account for a whole decade of extremely bad weather in the northern hemisphere.

There is evidence of a westward population shift in the 2nd decade of the 19th century. People from Ireland and Britain went to America, and in America many people went further west in search of better land. At the same time, partly due to the effect of war (population mixing and insanitary conditions) there were outbreaks of disease. In Ireland 44,000 died of typhus. South East Asia droughts ended with huge monsoons in 1817-1818 rains, gestating a new strain of Cholera that reached London by 1831, and New York by 1832.

The droughts and monsoons severely damaged rice crops. From 1816-1818 there was starvation in Yunnan, Southern China. As the climate improved from 1819, some of these areas turned to “cash crops”, that is to say, things grown to sell rather than eat. One of which was Opium.

Nearby, in GuangZhou, the British East India Company was selling woollen and cotton cloth in return for porcelain, silk, and tea. Its problem was that demand for cloth was falling, while British demand for tea was still high. The imbalance was also draining the supply of silver being used for these exchanges, causing other economic problems.

The solution was the new cash crops, Opium, in particular. The plan was to trade elsewhere in the region for Opium, and through intermediaries (because it was illegal in China) exchange it for tea. This is what sparked a confrontation with the local governor of GuangZhou in 1839, and a British invasion.

This first “Opium war” ended with the creation of five “concessions”, that is to say, small British held territories on China's South coast. Unlike what happened in India, Britain didn't attempt to colonise China. This would have been very expensive. Instead, it allied with other European powers and after a second “Opium war”, ending in 1860, established eighty new concessions and a general opening up of trade with Europe.

Meanwhile, in Europe, France experienced repeated revolutions, in 1830 and 1848. The cities of Italy and Germany were also prone to revolution. 1848 saw great demonstrations demanding German unity. The cause was taken up by an aristocrat called Otto Bismarck, who became Prussian Foreign Minister in 1862. He inspired a war and victory over Austria. Then, in 1871, he led the defeat of France that saw Prussian troops reach Paris. Wilhelm of Prussia was crowned Emperor of the 2nd Empire. Prussia had unified Germany.

Thanks to the victory over the French, the new state included the Ruhr, the most coal and iron rich, industrial heart of Europe. With it, Germany set out to build a global empire to match those of France and Britain.

The troubled rise of British industry

During the war with Napoleonic France, the British government did two important things: In the name of the “war effort” it borrowed vast amounts of money and issued huge contracts to British companies. While the GDP (that's the total produced by the British economy) was about £329 million, the National Debt reached £1bn. This is a record high: approximately 200% of GDP.

The contracts helped to create cities. Birmingham became the centre of gun production, Leeds the centre for uniforms. Coal production doubled. Raw cotton imports rose from 13,400 tons in 1790 to 55,000 tons in 1810. To keep production going longer, gas lights were introduced in cotton mills, the first in 1806.

Money also reached down into development. In particular, the use of steam engines made a big leap forward. Richard Trevithick's steam engine was the first to run on rails in 1804. By the end of the war, steam driven processes were widespread in industry. The economy was growing at about 2.9%/year.

The population of Britain as a whole was also climbing:

1801	8 million
1811	10 million
1821	12 million

Most of this growth was urban. For example, Manchester had:

1770 20,000
1790 60,000
1820 300,000

The other important thing the government did was to make sure nothing like what happened in France could happen in Britain. Measures were taken to kill off the revolutionary spirit of the time. In 1794, imprisonment without trial was introduced. In 1799, Trade Unions were made illegal. Old laws (from 1765) making it illegal to express contempt for the King, and to gather in groups of more than 50, were ruthlessly enforced.

Some laws however, were progressive, although their provisions illustrate how bad conditions in the new industries were. The Factory Act of 1802, for example, ordered employers to clean the factory at least twice each year, to provide a suit of clothes for apprentices each year, to limit the working day for children to 12 hours, to allow 1 hour religious instruction on Sundays and to allow physicians to visit to prevent disease.

War tends to damage exporters. In Britain, it badly hit the textile industry. Workers in the cottage industries who “put out” found themselves unable to sell their products, although they still had to pay rent for their looms. Demonstrations of stocking makers had turned into riots in 1811 and 1812. Then, after the war, a campaign of sabotage (or “machine-breaking”) was carried out by secretive gangs in the name of “Ned Ludd”. The word “Luddite” now means someone who resists new ideas.

Rioting and machine-breaking gradually increased and punishment got harsher. Seventeen people were sentenced to death at York, after machine-breaking in Leeds. Twenty three were sentenced to death after food riots in Lancashire and Cheshire. In 1819, a demonstration at St Peter's Field in Manchester was attacked by the army, killing fifteen people. This is remembered in British history as the “Peterloo massacre”. The government did not show remorse but blamed dangerous radicals. It introduced six more laws to stop opposition, including extending the crime of “slander” to include criticising the government.

During the war, the government had helped country mill owners buy threshing machines to increase food production. After the war, because of competition, more flour mill owners felt the need to get them. As unemployment in the countryside got worse, a sharp increase in food prices set off a wave of threshing-machine breaking in 1830-31. The gangs acted in the name of “Captain Swing”.

The following year, in the small Dorset town of Tolpuddle, a group of farm workers responded to the crisis, not by smashing machines but by forming a Union. All members had to swear an oath to refuse to work for less than a fixed pay level. Although Unions were now legal, they were prosecuted under a law forbidding secret oaths, and six were sentenced to transportation to Australia.

The Tory governments of this time were probably the most unpopular in British history. Even the late arrival of the war hero, the Duke of Wellington, couldn't save them. The Liberal Party eventually won power, and in 1832 reformed the voting system. The vote was extended from about 3% to about 5½% of the population. Responding to the mass campaign for the “Tolpuddle martyrs”, it issued a pardon in 1836 and they returned from Australia, to great celebrations.

It was also in this year that Britain got a new monarch. Queen Victoria was a bright, strong, attractive character, and the mainstream newspapers sold her image to the country on a new wave of optimism. Perhaps that's why the Chartist campaign for further reform failed to reach the heights it deserved. Despite big events and huge petitions, too few of the new voters supported it, so it failed

to break the government's resolve.

In the absence of reasonable, constitutional means of protest, desperate workers found other ways. In 1842 for example, workers realised that they could stop production at factories that used steam engines by removing safety plugs. Attempted arrests and fighting led to what became known as the “plug plot riots”.

The decade became known as the “hungry 40s”, because of a general stagnation of the economy and the high price of bread. The latter was caused in part by the Corn Laws, which were import controls introduced at the end of the war to reduce dependency on grain imports. They were increasingly regarded as favouring the gentry and inhibiting the growth of cities. Their repeal in 1846 may have been a factor in the economic upturn that followed.

Prosperity, Reform and Empire

The great turning point was 1851. It was coincidentally, the year that London hosted the great exhibition, showing how the developing empire was bringing back exotic goods from around the world, as well as promoting scientific and technological innovation.

It was also the year that the Amalgamated Society of Engineers was formed. This was the first of the “New Model Trade Unions” that required a long apprenticeship and protected skilled workers from competition. The timing couldn't be better. In the 1840s famine in Ireland brought in millions of refugees. As the economy began to improve, cheap, Irish unskilled labour allowed the salaries of skilled workers to creep up.

One event, in 1858, directly affected the politicians and helped to affect the thinking of governments. It was called the Great Stink. In the preceding period, flush toilets had become popular in London's wealthy homes. Previously, human excrement had been collected for fertiliser, but now it was simply washed down into the river. A heat wave in the summer of 1858 caused a powerful and sickening smell to rise from the river. It could be smelt in the inner rooms of the Houses of Parliament.

This is what prompted the employment of the famous civil engineer Joseph Bazalgette to build 1100 miles of sewage drains. The scheme redirected many of London's small rivers underground and allowed for the massive expansion of the city. It also helped to inspire the idea of “civic pride”. Many impressive buildings, typically in a classical style, were built in the late Victorian period, reflecting a greater concern amongst local authorities for the quality of city life.

Globally, Britain had been gradually expanding its influence, even during the difficult times. In 1877, the Government took over responsibility for the East India Company's military operations. Queen Victoria was officially declared Empress of India, and what would be called the British Empire officially began. It would last for 81 years, and at its peak cover ¼ of the world's land surface area.

To begin with the Empire's currency dominated the world and sustained its commercial dominance. Britain's banks lent the money to help the industrial world expand, and its financiers collected the interest that paid for the expanding service industries at home. Gradually, however, this expanding industrial world allowed other states to build their own empires: the Americans, Germans and Japanese, in particular.

The United States concentrated on building alliances in the former Spanish and Portuguese colonies of the Americas. They built a large navy to control the Pacific Ocean trade via the countless islands

to the far east of Asia, while the Japanese made plans to counteract them. Newly united Germany had a massive industrial population, yet much of its economic surplus was being skimmed off by the financiers of London. These imbalances meant that British dominance could not survive the 20th century.

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