

Industrial revolution, term which gained currency

[History](#), [Revolution](#)



during the mid-19th century and became widely used by the 1880s. It has traditionally been used to describe dramatic transformations occurring in manufacturing industry between approximately 1750 and 1850 that set the pattern for industrialization. The first Industrial Revolution occurred in Great Britain, and profoundly altered its economy and society. The most immediate changes were in production: what was produced, as well as where and how.

Labour was transferred from provision of primary products to the production of goods and services. Far more manufactured goods were produced than ever before, and technical efficiency rose dramatically. In part, the growth in productivity was achieved by systematic application of scientific and practical knowledge to the manufacturing process. Efficiency was also enhanced when large agglomerations of enterprises were located within limited areas. Thus, the Industrial Revolution involved urbanization, through migration from rural to urban communities.

Perhaps the most important changes occurred in the organization of work. In general, production took place within the firm or the public enterprise instead of the family or manor. Tasks became increasingly routine and specialized. Industrial production became heavily dependent upon the intensive use of equipment produced for the express purpose of increasing efficiency. A reliance on tools and machinery allowed individual workers to produce more goods, and commitment to a particular task or device reinforced the trend towards specialization.

The industrial landscape of mid-19th-century Britain was vastly different to that of the mid-18th century; evidently some sudden change in the British economy did occur in the intervening period. The move from agrarian and primarily rural-based occupations to urban, and subsequent industrial and service, employment rapidly increased. This transformation was accompanied by social and political unrest in the form of rioting, machine-breaking, and political campaigns aimed at reforming hours of labour and other working conditions, as well as Poor Law legislation. Agriculture was sufficiently developed, having undergone its own Agricultural Revolution, to allow the economy to support a growing urban labour force. The growth in population in turn enlarged the domestic demand for goods and services.

Marketing techniques were devised which primarily targeted the wealthy middle and upper strata of society. Trade became increasingly associated with a developing laissez-faire ideology that was gradually absorbed by British institutions. These unprecedented changes were focused in particular sectors and regions of Britain. Furthermore, the organization of manufacturing techniques cannot be separated from changes within Britain's developing commercial infrastructure, marketing, finance, emerging consumerism, established handicraft skills, and the expansion of international trade. All these factors and more played a large and interconnected role in the Industrial Revolution.

Foundations for the Revolution: Capital, Credit, and Empire
The Industrial Revolution was fuelled by the prior accumulation of capital.

The release of capital and labour from the land was faster in Britain than in any other country in Europe. This, together with efficient British agriculture and a growing industrial workforce enabled rapid population growth and urbanization to be sustained. Contemporary observers in Britain and the European continent certainly looked on in awe at the changes sweeping the country.

The formation of capital continued to increase during the Industrial Revolution, as did the manufacture of goods for export. The expansion of foreign markets for British goods was greatly assisted by the establishment of a fiscal-military state, the British Empire and its domestic institutional base, in which overseas markets were carved out during wars often motivated by trade and defended by British military might. The Carnatic Wars in India, for example, were fought between the British East India Company and its French rival (with their Indian allies) for commercial supremacy in India; the War of Jenkins' Ear in 1739 was triggered by British traders' incursions into the Spanish Empire. The doctrine of mercantilism, which inspired the 17th- and 18th-century Navigation Acts, specifically advocated the use of the State's armed might to defend and promote the nation's economic interests.

To finance such wars, the government raised funds through loans underwritten by the State's ability to collect revenue through taxation.

The majority of war revenue was, however, raised on the London capital market. The government thus formed a close alliance with the Bank of England and leading London financiers. The interest payments on the

British national debt by the end of the 18th century amounted to 40-50 per cent of all the revenue raised through tax. The South Sea Bubble was an ill-fated attempt to make merchants shoulder this debt in return for trading privileges; but the incident showed how Britain's military expenditure had helped create a thriving capital market ready to invest in trading and speculative schemes. Much of the tax income came from the collections made by the Excise Department on home-produced goods. The Customs Department was far less efficient at taxing imports and only managed to provide for a fraction of the costs involved in meeting Britain's huge naval needs.

Consequently, it was indirect taxation that propelled Britain to global mercantile leadership during the 18th century—primarily through its role in underpinning wars.

As well as both creating and guarding new markets for British goods, military investment created a demand for military products, and led to innovative engineering developments. For example, the demands of the War of the Austrian Succession led to pioneering improvements in coke-smelting techniques, while the Seven Years' War (with its needs for large numbers of uniforms) corresponded with the introduction of the fly shuttle for looms.

However, the major impact of war was the growth in export demand for British goods. The resulting monopoly on carrying and re-export trades ensured communication with distant and European markets, while

encouraging shipping and shipbuilding. Wars also soaked up many of the unskilled and potentially unemployed sections of the workforce.

Military ventures, however, did crowd out possibilities for the government to invest in the country's own infrastructure. Indeed, it was British businessmen and investors who financed the construction of regional networks of turnpike roads, canals, and ports. Nor did the government invest in education, science, or technology (apart from that involving the maritime and military sectors). These external political policies encouraged private enterprise. Naval power protected the British Isles from invasion, and provided the security for capitalists to invest in the long-term future of the economy.

British currency for much of the 18th century was in a poor state. Fixed unit prices and parities encouraged the export of gold and silver bullion and the melting down of coins. Consequently, a network of financial intermediaries developed to provide paper substitutes (in the form of banknotes, bills of exchange, book credit, and cheques) for coins. Private commercial enterprise thus underpinned the developments needed to supply the nation's money, and consequently produced a financial system which managed to bring the country through eight wars and an Industrial Revolution.

Industry British manufacturing in the Industrial Revolution benefited considerably from new technology. Thomas Newcomen had patented a steam-pumping engine in 1707; in 1769 James Watt dramatically improved the design, and in 1801 Richard Trevithick first used it to power a vehicle. In 1733 John Kay invented the flying shuttle for weavers, while James Hargreaves developed his spinning jenny in 1764, closely followed by Richard

Arkwright, who patented his spinning machine in 1769 and combined it in his factories with systematic industrial organization techniques. Edmund Cartwright patented the first power loom in 1786. Meanwhile, the work of Abraham Darby and his descendants at Coalbrookdale in Shropshire typified the developing British mastery of cast-iron manufacture which gave the world its first major cast-iron structure at Ironbridge in 1777-1779. National emphasis on trade had helped direct these inventors' minds towards production of textiles and iron and steel manufacture, drawing on a scientific tradition epitomized by the foundation of the Royal Society in 1660, and their ideas found fertile soil where they might have withered in other countries.

The expansion of a credit society greatly assisted industry. However, the accumulation of fixed capital during the Industrial Revolution was thwarted, partly because many manufacturers rented their premises, and partly because machinery was often cheap. Further machines and steam engines were frequently hired, while it was quite common to find several concerns sharing manufacturing space and sources of power.

Many customary working practices underwent organizational changes to meet the realities of a harsh, dynamic, and competitive market. The factory system emerged from proto-industrialization, in which part of the labour force had already been organized and disciplined. Numerous manuals on factory organization and management appeared during the early 19th century, including works by James Montgomery on cotton-spinning, and Charles Babbage on the economy of machinery and manufactures. The high profile journalists gave to the factory raised its visibility in the public mind.

However, a far more common feature of the contemporary British industrial landscape was more traditional handicraft forms of manufacture, often organized in competition with factory production. This pattern carried on well into the 19th century. It was typical for 18th- and 19th-century cotton manufacturers to combine a mixture of steam-powered spinning in factories with the large-scale employment of handloom weavers. This spread financial risk, since early machinery was often unreliable, and female labour and child labour were cheap. Consequently, the traditional sector often reinforced the modern.

Nevertheless the age of the machine was certainly imminent, and was becoming a reality on the labour market by the second half of the 18th century. For example, in one of the earliest recorded labour disputes during the 1750s and 1760s, skilled coal-heavers in Newcastle upon Tyne protested for higher rates of pay. Consequently, a new machine was devised to unload the coal. It was also during this period that industrialists started to take into account the relationship between wages and productivity, and natural philosophers started thinking about the measure of labour as a source of power. Thus, in some industrial sectors human labour was beginning to be viewed as simply a competing source of power with alternatives, such as horses and ever-more-efficient machines.

Numerous changes also took place in more traditional industries.

For example, there were new industrial uses for coal which affected brewing, brick-making, malting, sugar-making and soap-boiling. Transformations in materials changed certain luxury industries, such as hat-making

and jewellery production. Product changes in textile industries greatly reduced the finishing time for certain products. The success of the calico-printing industry in the late 18th century was due to a reorganization and disciplining of intensive labour. The Staffordshire Potteries were transformed from 1759 by the entrepreneurial genius of Josiah Wedgwood, whose talents were as much for early marketing and manipulation of contemporary Neo-Classical taste as for technical innovation, and later by Spode and Minton.

Any account of industrial change has to take into consideration regional differences and variations between patterns of development for different products, so one grand picture cannot be applied to the whole of Britain.

Some areas flourished while others stagnated or declined. For example, the wool textiles of the West Riding district of Yorkshire overtook the south-west and the East Anglia region. South Lancashire dominated cotton textiles, and the Midlands created a successful manufacturing complex of small metalwares and hardware. Worcester porcelain was probably inspired by Oriental wares entering the country from Bristol, and used transfer-printing methods to speed production. Coalfields increasingly dictated where iron-processing, steel manufacture, and later shipbuilding developed.

Before there was a national system of transport and communications, the local district was the most important geographical unit for establishing its own transport, commercial, and credit networks. The developments in transport facilities, such as improved turnpike roads and canals,

were primarily regionally based, while district banks and commercial ties formed, by which most capital rarely left its area of origin. The growth of provincial towns led to local lobby groups, often in opposition to the interests of powerful economic groups in London. Indeed, the metropolitan economy of London and the south-east was of a different structure to those of industrializing areas of the north. However, even though capital markets were primarily regional, London was crucial in underpinning and expanding the role of credit involved in both domestic and international trade.

Certain historians have pointed to Britain's industrial fresh water sources, mineral ores, and rich coal supplies as the key factors in its industrialization. However, although coal was obviously important, many proto-industrial areas had already become well established before it became a major factor of development or source of energy. More important in defining original industrial locations were social and institutional factors peculiar to particular regions. For example, resistance to innovation and mechanization tended to occur in areas characterized by well-established structures in trade and the organization of labour. Counties such as Yorkshire were far more accommodating to innovations than rival wool districts such as the West Country. The latter, for example, had a tradition of solidarity and collective action, while the domestic system prevailing in the West Riding was characterized by a lack of specialization and was consequently more amenable to technological and organizational change. Furthermore, local merchants in this area monitored changing tastes and fashions in Europe, and bought for cash or short-term bills of exchange, thereby enabling

manufacturers to quickly acquire funds. Regions such as Lancashire, and to a certain extent the Midlands, experienced changes similar to those in the West Riding. In the coal areas of the north-east a diversified economy had been forming since at least the 16th century. Other areas, such as the Weald and perhaps even Cumbria, underwent manufacturing decline during this period.

Social Upheaval and Protest The Industrial Revolution was accompanied by rapid population growth and urbanization. It was also attended by a huge increase in the wage-earning portion of the population, as well as a bourgeoisie whose income came primarily from the profits made in industry, in addition to the traditional landed aristocracy whose wealth stemmed mainly from rents. Market conditions were beginning to dictate the social structure. The paternalistic agrarian world of the 18th century was being transformed, and with this came social unrest. Protest at the changing moral economy manifested itself in riots over agricultural enclosure and supplies of grain, as well as incensed gangs of machine-breakers. More than ever, the poor and low-paid were seen as a real threat to social stability. It is therefore not surprising that a heightened sensitivity to crime emerged, accompanied by a rapid increase in recorded crime rates. The pillar of 18th-century criminal law—the so-called “Bloody Code” (periodical public hangings as a deterrent)—was no longer seen to be working. New ways of dealing with criminals were established, mainly through a large programme of prison-building. The early 19th century also saw the emergence of regional police forces. For many contemporary commentators, crime became directly associated with industrialization.

Workplaces were often built to house a greater number of workers, to improve the efficiency of production. This required greater regulation and centralization of the labour process. To achieve this often required the restructuring of traditional skills and working rhythms. The emergence of a centralized factory system generally met with equal resistance in all regions. Such a system challenged traditional apprenticeship and the regulation of production methods. These changes also came at a price for the owners of production, since they enabled workers to build up a collective alliance through common interests, which in turn led to the formation of organized and more effective protest against their employers.

However, the reorganization of skills and the labour process did not follow some determined re-skilling path. For example, many areas of industry remained distinctly fragmented, and sweatshops, workshops, and putting-out existed alongside centralization and the emerging factory system. Any view of the Industrial Revolution has to appreciate the diverse and innovative alternatives to the factory system. Nonetheless, by the mid-19th century industrial management had become far more involved in the organization of work.

Although the factory system never dominated production, it was certainly very apparent in certain regions, and had undoubtedly become embedded within 19th-century culture. During this period, labourers in all spheres of production, from factories and workshops to cottage industries, did lose some control over the rhythm and nature of their work. They also became increasingly subject to the demands of larger industrialists or

merchants for either credit or work. More often than not, there was no security against unemployment, and social unrest was the only means of protest available. Certain regions became identified with protest movements—for example, factory reform became associated with Yorkshire and Poor Law reform with Lancashire.

The most exploited members of the working population were women and children. The woollen and cotton industries primarily employed these groups because their labour was plentiful and therefore cheap. Subsequently, many new work regimes were first tried out on this section of the working population, and indeed some machines were developed with children in mind—for example the original spinning jenny was designed for children between the ages of 9 and 12. Women's work was generally seen as less skilled, and of a low status. This was partly legitimated via biological notions that women were not as robust and intelligent as men. Consequently, by increasing and intensifying this cheap source of labour, the substitution of capital for labour was often discouraged.

Population As early as 1700 nearly half of Britain's population was employed outside of direct agricultural labour. Britain had an agricultural capacity ready to support its rising population. It also had accumulated stocks of skilled labour necessary for the construction of an urban and industrial society.

The distinctive tenurial system of land ownership was characterized by great estates and enclosed, consolidated, and relatively large farms, which encouraged agriculture to adjust to the growing pressure of an

expanding population. This also released capital and labour for rapidly expanding urban areas. By the 1840s Britain was more urban than any other European country.

The rapid growth in population during the Industrial Revolution was also dependent on region, occupation, and social rank. For example, fertility and migration patterns were very different for textile and mining districts. Obviously, mortality rates were higher for the unemployed and low-paid, and greatly increased in urban areas. Consequently, the spread of urbanization required the immigration of labour from rural areas, since urban mortality far exceeded its birth rates. In many ways the high urban death rate acted as a check on the spiralling rural birth rate.

Furthermore, rapid bursts of population growth often followed a major war, famine, or outbreak of disease. Clearly one of the most important factors to affect the population was an improved diet, and to a certain extent developments in medicine.

Trade Demand for goods within the domestic economy was primarily restricted to those with large incomes. The vast majority of the population could probably not afford to consume fashionable products. However, the expansion of the proletariat did increase the demand for certain basic products, such as clothes, candles, beer, butter, and crockery. It was the wealthier members of the increasing middle class who provided the market for mass manufacturers. Ironically, upper- and middle-class consumerism may have negatively affected the production of domestic products in the search for individual and fashionable items.

Britain's external trade was crucial, since exported goods consisted primarily of home manufactures. Many of these products had the potential to be mass-produced, such as textiles, iron, and metalwares. During the Industrial Revolution, imports and exports rapidly grew, while re-exports increased ninefold. Because of European protectionism, the main market for Britain was British colonies-mainly the West Indies and North America.

Britain's excellent coastal and internal waterways provided an ideal platform to exploit an expanding Atlantic economy. With the loss of North America the situation altered during the 1780s. Invariably, during economic depressions Britain would use its military might to expand its trading conquests. One of the most important commodities of British trade during the 18th century was slaves. These underpinned the dynamic growth of the Atlantic economy, and also built up elaborate trade routes for other goods.

Africa was the second-largest destination after the United States for British iron in the mid-18th century, and took almost a quarter of British cotton by the 1790s. The most important domain for British trade from the 1830s was India, which made up for the decline in trade with the West Indies.

Accompanying overseas expansion came much more sophisticated forms of commercial and financial organization, including joint-stock insurance companies and private banks. Investments were made in internal transport systems such as canals and roads, in dockyards, and in mining industries.

By the late 18th century Britain dominated the seas, supported by an effective internal financial complex. External trade was a fundamental determinant of the shape British industrialization took. Without international markets, the cotton trade would not have existed, both the woollen and iron industries would have been much smaller, and agriculture would have evolved much more slowly.

Changing Views of the Industrial Revolution Over the past three decades the idea of an Industrial Revolution has undergone serious revision. Indeed, the very notion of a revolution has become a highly contested issue. Broadly, there are two competing perspectives. Those who maintain there were momentous changes point to developments in technology, the organization of work, and economic growth.

They claim that these encouraged a rapid increase in population, urbanization, the transference of labour from agriculture to manufacturing industry, social class formation, and the restructuring of the family.

However, this account has been challenged by recent economic historians who, primarily through an examination of contemporary statistics, claim that Great Britain, far from experiencing a dramatic surge in economic expansion, actually only experienced slight growth.

This revisionist account claims that many of the so-called revolutionary developments associated with this period were in fact

evolutionary transformations which retained traditional economic and social patterns.

Evidence cited includes slow growth, limited saving and investment, static standards of living, a predominance of liquid capital as opposed to fixed assets, and limited personal consumption. Consequently, the idea of an Industrial Revolution is put in doubt and replaced by a continuity thesis, which emphasizes developments stemming from an earlier period. The British economy is described, instead, by traditional sectors and familiar production methods.

Critics of this gradualist view argue that the Industrial Revolution should not be equated with macroeconomic growth, and that there really were dramatic social and institutional transformations in economic organization, as well as new products and processes. Technological change under this banner includes changes in skills and tools, as well as simply machinery and capital-intensive plant and equipment. Furthermore, certain sections of the economy which seemed to have been growing only slowly were in fact experiencing transitional changes in mechanization and restructuring towards a factory system, examples being the wool industry, and chemical industries such as soap and candle-making. Change did not always result in economic growth. Equally, rapid growth did not always mean a revolution in the production process. Furthermore, the statistical data used in producing the economic figures of the gradualist approach have been questioned, making the conclusions potentially unreliable.

Assessment The Industrial Revolution is no longer perceived as a straightforward juncture in British history. Traditional accounts of sudden and rapid economic growth, or a mass exodus of capital from land to industry, are no longer viewed as sound. Nor can we say with confidence that there was a universal evacuation of agricultural labour to the manufacturing sector, or a defiant rise to dominance of the machine and the factory system. Rather, there was a mixture of established and innovative systems of production, either competing or working together.

Nevertheless, the changes were such that the period was one of social turmoil in the shape of protest movements and rioting, coupled with rapid population growth sustained by agricultural capacity, and increasing urbanization. Of particular importance was the development throughout the 18th century of a fiscal-military state. This carved out new trading routes and expanded the demand for British-made goods, while simultaneously creating a robust and sophisticated credit network. We can conclude by saying that the Industrial Revolution was concentrated in certain industries and fuelled by foreign trade.

During the 1960s it became fashionable to look at the British Industrial Revolution as a model which all proto-industrial countries had to copy in order to become industrialized. However, it is now generally recognized that those countries that caught up with Britain displayed more contrasts and varieties than similarities with the British experience. The first Industrial Revolution was unique, and economists no longer see it as a necessary stage which proto-industrializing countries have to go through.

By the time of the Great Exhibition of 1851, the eyes of Europe and North America were firmly set on British industrialization. The jewels of British industry were displayed for all the world to see, within the impressive surrounds of the glass Crystal Palace. In many ways, however, Victorian Britain was already beginning the slow descent of industrial decline. As other nations flocked to the exhibition to view British industrial power, it also became apparent from the products displayed by other nations that Britain's industrial lead was being quickly eroded. Indeed, the second half of the 19th century saw the rapid acceleration of German, French, and North American industrialization at the expense of Britain. 1—————
1 "Industrial Revolution," Microsoft Encarta 97 Encyclopedia. 1993-1996
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