

Fibre of British industry: (above) Platt's self-acting mule spinning machine, 1862. The Cotton industry continued to flourish as one of Britain's manufacturing staples, refusing to forsake quality for quantity in the mass production stakes.

WORKSHOP OF THE WORLD

In recent years Britain has been importing more manufactures than she exported, something unheard of in the past. How have we reached the point at which our manufacturing base, on which so many jobs depend, can no longer hold its own in the world? Financial, insurance and other services have long been important in bridging the gap between total imports – including food and raw materials – and manufactured exports; but when we cannot even pay for the manufactures we import with the manufactures we send abroad, alarm bells should certainly ring. Many historians believe that our manufacturing weaknesses were already revealing themselves before the First World War. Is this true?

New industrial rivals, especially in the United States and Germany, emerged to confront British manufacturers in later Victorian times, not only abroad but also at home because of Britain's unprotected market and the large fall in international transport costs. Between the early 1870s and the mid-1890s prices fell and so did profit margins. The British econo-

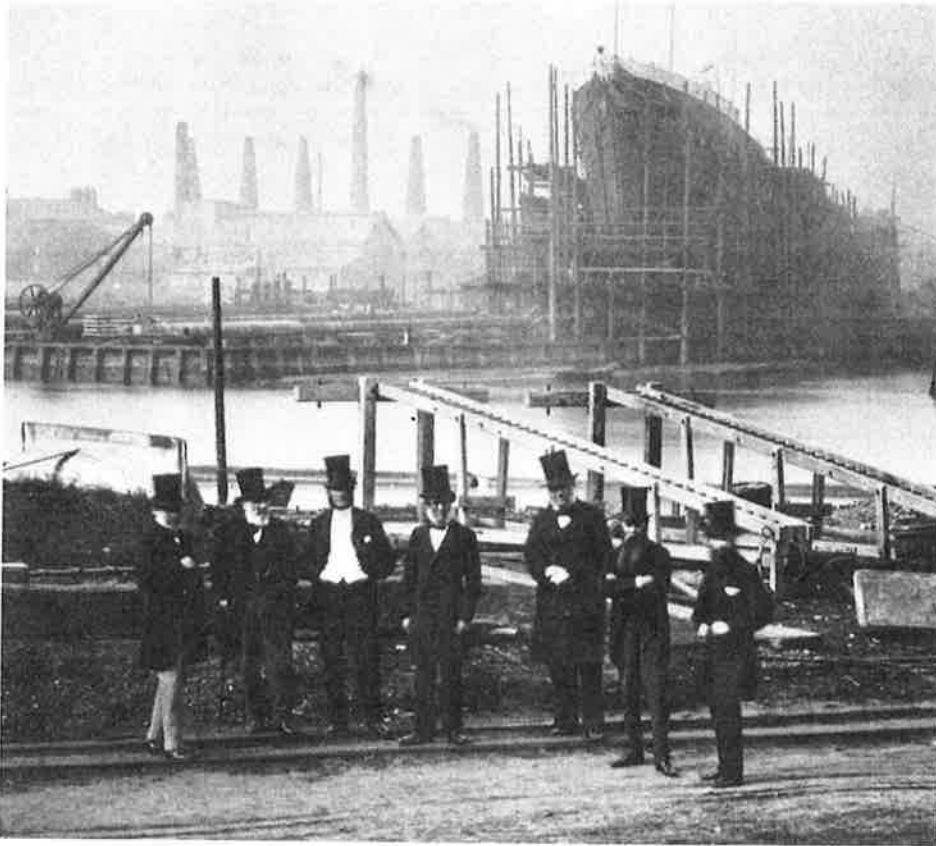
my grew more slowly than previously. Relative – but certainly not absolute – decline set in. Could British manufacturers have competed against their new industrial rivals more assertively either in existing industries, which grew more slowly, or in new ones which, like all young things, grew faster?

This debate has provided a field of battle among historians, British and American, as they have looked back over a century or more. Like most such battles, the opposing sides have been well matched. The issues are complex – involving, for instance, problems of statistical and other sources, financial institutions, multilateral trade and the whole spectrum of industries concerned. The aim here is to attempt some simplification: to consider the background against which British manufacturers were meeting greater international competition in two of the newer and some of the older industries before proceeding to look at some more general issues and to draw some conclusions.

International comparisons, though necessary and revealing, can be most

misleading. This is particularly true of comparisons between Britain and the rapidly developing United States before 1914. America was a vast continent in process of settlement and just beginning to enjoy greater industrial prosperity, not a little island already benefiting from many years of industrial ascendancy. America had vast natural resources, huge areas of cultivable land which, when farmed, could grow more than enough food and raw materials for her own needs. Its iron and steel industry and by-products enjoyed the advantage of rich mountains of iron ore which could be easily extracted from the Mesabi Range south of Lake Superior. Little Britain had no such windfalls: the conveniently scattered coalfields were its only great advantage, for her mineral resources were being quickly worked out.

With its vast waves of immigrants and internal movement, America was the continent of change. Its manufacturers were not so bound by tradition and craftsmanship, more likely to seek new ways of making things; and its local authorities, less well established, were less likely to impose



Out of the ark? 'Old' industries, such as shipbuilding, adapted efficiently to new challenges at the turn of the century, showing their role in Britain's economy to be far from played out.

1870-1914 **Theo Barker** looks at how Britain innovated and kept ahead of her international competitors in the years before the Great War.

restrictive regulations. Its home market grew fast, not only in numbers – from 40 million to 100 million between 1870 and 1914 – but also in social depth of demand. This also encouraged larger-scale machine production of standardised goods and mass, often mail-order, marketing. The development of two of the most forward-looking industries, electricity and motors, shows how all these differences encouraged America to race ahead. In the longer run, however, Britain was not slow to take advantage of new opportunities which its different background offered.

Britain had led the world in the study of electricity and magnetism. The statue of Michael Faraday, standing proudly outside the Institution of Electrical Engineers on London's Thames Embankment proclaims his discoveries earlier in the nineteenth century. Britain gained a world lead in cable telegraphy. At the end of the 1870s that resourceful Geordie, Joseph Swan, invented the incandescent electric filament lamp and in 1881 raised £100,000 from others in the area to manufacture his electric lights in quantity. The following year

he registered a far larger concern, Swan United Electric Light Co. Ltd. The American, Thomas Edison, had also been experimenting with electric lighting and had just set up an English subsidiary in competition. When the two joined forces in the Edison and Swan Electric Light Co. (1883), 60 per cent of the joint venture was held by the Swan Company. Edison carried out his first major trials in London between Holborn Circus and the Old Bailey months before he opened his pioneering Pearl Street central station in New York.

At this juncture the prospects for the spread of electricity from central generating stations in British towns looked good, and too for the growth of businesses to manufacture electrical equipment of all sorts. The British had the technical know-how and the advantages of greater urbanisation. Parliament obligingly passed an Electric Lighting Act in 1882 which enabled each intending electric supply company to lay mains under the streets merely by applying for a provisional order without having to go to the time and expense of obtaining a

separate act of parliament. There was a great rush to secure provisional orders for particular places: eighty-three in the first month alone. Pilot schemes, however, soon showed that the new electricity could only be supplied at three times the price of gas, already piped into those urban homes likely to be in the market for electricity. The boom in electricity shares soon burst, giving electricity a bad name among the investing public for some time to come.

Not so in the United States. Customers there found electricity a much more attractive proposition. Gas had not spread so extensively. Coal from which it was produced was dearer and the gas companies were not particularly enterprising. Local authorities allowed the electricity companies to string their cable from poles instead of insisting upon their being laid underground. The central supply of electricity spread quickly.

A few years later, when electric traction was added to the lighting load following the successful electrification of a whole tramway system at

Richmond, Virginia, in 1888, two very large electric manufacturers emerged – Westinghouse and General Electric (a merger of Thomson-Houston and Edison General Electric) which produced standardised tramway equipment, soon to be installed in all American towns, even if they could boast little more than a long main street, and then throughout the world. There could be no doubt which nation had been able to push ahead and seize the lead in the exploitation of the new technology.

Britain, however, remained in the race and managed to make longer-run gains from its initial disadvantage. Its manufacturers behaved in a completely rational way, supplying electricity from small individual generating sets to places, outside town centres, where gas pipes did not reach, or to customers in towns who were prepared to pay a premium price for a superior form of lighting. They included theatres, hotels and shops as well as homes. Lighting aboard ship also came into this category. By the early 1890s, after further development, largely thanks to trial and error in America, the cost of sup-

plying electricity from central stations came down to that of gas. British companies were then able to follow the American lead, though in a much more orderly manner using underground cables and with local authorities exercising environmental control. Indeed many of the larger towns municipalised the private ventures or set up their own corporation electricity works and were soon supplying current for traction as well as for lighting and heating.

In Britain, the existing horse tramways had not been encouraged to incur the expense of electrification. Under the tramway legislation of the 1870s, their rights to run in the public streets reverted to the local authorities after twenty-one years. The first stretches of track began to fall due in the early 1890s and extensions to the system some time later. When, from the later 1890s, local authorities acquired rights to all, or the larger part, of entire systems, there was much suburban building taking place as the periodic building cycle moved strongly upwards. It was just the right time to acquire, electrify and extend existing systems. Those local authorities which did this electrified on the most up-to-date methods and ran the most modern sorts of tramcar. If they chose to extend the horse tramways' powers for a further term, those companies, too, set high standards of electrification. Electric traction moved ahead fast. Liverpool got its overhead electric railway running the whole length of the docks. In London, a little later, the steam underground was electrified and new electric tubes were built (all those now in central London apart from the Victoria and Jubilee Lines). There was much electrification on Tyneside, too, by the North Eastern Electricity Supply Co (NESCO) which built up the largest integrated supply system in Europe.

Dr Byatt has shown that that investment in lighting, traction and isolated power plants shot up from about £5 million at the end of the 1890s to between £15 million and £21 million a year (no less than 10 per cent of new domestic fixed capital) between 1900 and 1914. Much of this capital came from America and elsewhere, as did some of the equipment. But most of it was made in Britain. Significantly, the two American giants, Westinghouse and General Electric, chose to manufacture here, the latter as British Thomson Houston (BTH), rather than to import their products duty free, thereby giving employment to British workers and suppliers. There were



Switched on: electric lighting at Chesterfield, 1882 – the year of the Electric Lighting Act. Britain was to benefit from America's ground-breaking (or, rather, over-wiring) experiences with this new commodity.

also many successful British-originated concerns such as Crompton; (British) General Electric; Dick, Kerr; British Electric Traction (BET) and the electrical department of Mather & Platt. In the longer run Britain certainly profited from the delay until techniques had been improved and operation was more efficient. All was set well for the growth of the industry between the wars.

Britain's performance in the other great modern industry – motor manufacture – was equally rational. It, too, gained from later development and by 1913 the British motor industry was preparing to become, by the 1930s, second only to that of the United States.

In motors, as in electricity, Britain started with an initial advantage. It led the world in the manufacture of the first self-propelled road vehicle: the pedal cycle. When it came to choice of motive power, however – steam, electricity or internal combustion – the Americans as well as the British found themselves initially

choosing the form they knew best. The British went for steam which was to have commercial use for heavier vehicles. The Americans preferred electricity, later used for light vehicles in towns where batteries can be frequently re-charged and where quietness is an advantage. Neither was ideal for motor cars and other road vehicles, however, because of the low power to weight ratio.

The successful winner of the contest, the internal combustion (gas) engine, for long seemed a very outside bet: the ignition of vaporised gasoline, its timing and the transmission of the mechanical motive power via the clutch and gears to the moving wheels posed formidable problems, even though, when solved, they provided the most favourable power to weight ratio. Here the Germans had an initial advantage for they had concentrated upon making stationary gas engines. Daimler and Maybach, who first made them portable in the mid-1880s using vaporised gasoline instead of piped town gas, had been

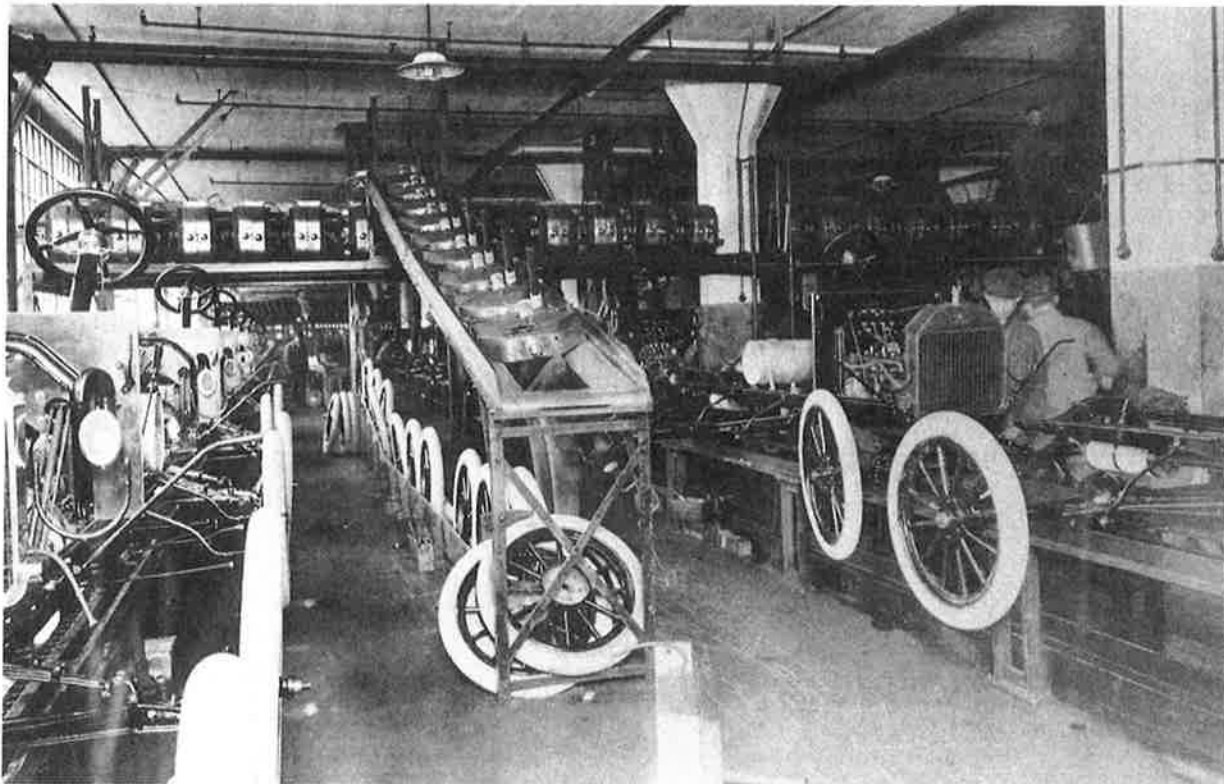


Building bridges: 'Conference of Engineers at the Britannia Bridge, Cheshire' by John Seymour Lucas, and (below) 'Industry on the Tyne: Iron and Coal' by William Scott Bell – two mid-Victorian paintings celebrating Britain's industrial hey-day before her unequivocal 'Workshop of the World' status was threatened by German and American rivals.

leading engineers at Germany's main gas engine works. They both realised the transmission problems involved in using motors in road vehicles and therefore sold them to carriage makers and to builders of small boats. The other German pioneer, Benz, also branched out from stationary gas engines. He was bolder, went the whole hog and tried to drive small, cycle-type vehicles; but, whenever he exhibited them in public, they kept breaking down. Who would exchange a well turned out horse-drawn carriage for such a primitive, undeveloped rattletrap? The British, and the Americans, looked on until the early 1890s without any great concern.

It was the French manufacturers, using Daimler and Benz patents, who first produced the modern car layout and a few sales were reported at last in 1892 and 1893. When develop-





(Left) Driving force: Model T assembly lines at Ford's Highland Park Michigan Plant, 1914.

America, with its rapidly expanding home market and vast natural resources, set the pace in the new motor industry.

(Right) Motor cycle show at Olympia, 1910: Britain's cautious and 'rational' response to foreign competition led to positive longer-term results, as in the field of motor cycles, which by 1911 produced a better growth rate than cars.

ment had reached the stage at which a French-built Panhard, equipped with the latest Daimler engine, managed to get to Bordeaux and back from Paris (730 miles) in fifty-two hours (under forty-nine excluding stops) well-to-do customers were queuing up for expensive, purpose-built replicas even though they had no hope at all of repeating anything like the Bordeaux performance. (It had taken place in ideal June weather with Panhard's partner, Levassor, at the wheel and a trained mechanic at his side.)

In 1895 the motor car was still a far from reliable piece of engineering. It nevertheless fell victim to premature company promotion in Britain based on over-sanguine expectations, as had electricity before it. With motors the chief promoter was Harry Lawson who had already learned from the cycle business how to extract honest money from a gullible public. He bought the British rights to the Daimler and other patents and promoted several confusingly interrelated companies which were to produce, so he said, British-made autocars (his trade name for them) in quantity at a factory in Coventry. *The Autocar*, published from late in 1895, became his mouthpiece as he agitated, with others not in the conspiracy, for the repeal of the so-called 'Red Flag' legislation which had up to then very properly protected people and horses from the hissing, fiery steam traction engines, thousands of which were then to be encountered on Britain's

narrow lanes and roads.

Repeal followed soon. In 1896 Lawson chose the very day on which motor cars were first allowed to run on British roads at over 4 miles per hour, a wet November Saturday, to organise a run out of central London as far as Brighton to publicise the new vehicles. This first Brighton Run was far from being a great success – many of the participants gave up and took the train instead – but Lawson got the publicity he sought. Money rolled in. Instead of making cars in Coventry, however, he and his friends imported models from the continent, pocketing the royalties and proceeds from their sale. Even at the end of 1897, shareholders were told, 'very few' vehicles had been made. The value of his companies' shares tumbled. A good opportunity had been lost, even though the nature of the home market in Britain precluded production on the scale which the Americans were able to achieve at last after 1900, and especially after 1904. In the event, the British motor industry grew at a slow rate for ten years before being able to make greater headway.

Herbert Austin, the Birmingham manager of the (Australian) Wolseley Sheep Shearing Machine Company, persuaded his employers to advance £2,000 so that he could 'take up the manufacture of motor carriages' as a sideline. He exhibited a three-wheeler a month after Repeal and, during the Boer War, Vickers, the arms firm, bought the motor car part of Wolseley

– with Austin as manager – for £40,000 to manufacture and market Wolseley cars. Austin left to found his own company at Longbridge in 1906.

F.W. Lanchester, a most talented engineer, also made his first car in 1896 and set up a company in 1900, though he lacked the business acumen to sustain it. More fortunate were the cycle makers who went into motors at that time: Singer, Riley, Rover, BSA, Swift and Sunbeam. The Daimler company, reconstituted after the Lawson débâcle, also started to produce reliable vehicles. Henry Royce, the Manchester crane manufacturer, turned to cars after 1900 and was joined by Rolls in 1904. William Morris, the Oxford cycle maker, started making them in 1909. All these British manufacturers were able to sell their products against imported competition; and Ford decided, in 1910, to invest in an assembly plant at Trafford Park, Manchester, rather than to import them duty-free from the United States.

Foreign trade figures, as *The Economist* pointed out at the time, showed that Britain's position was growing stronger. The value of net car imports grew relatively slowly, from £1.23 million in 1908 to £1.41 million in 1911. British car exports, on the other hand, grew from a lower total, £801,000, to £1.8 million in the same period. By 1911, too, British manufacturers were making headway with commercial vehicles and buses as can be seen from progress at Leyland Motors and the great success of



the London General's bus-making subsidiary, the Associated Equipment Co (AEC) in making the B-type bus. By the outbreak of the First World War, nearly 3,000 buses were running on London's roads alone, almost all of them British made.

Britain was also doing well in making motor cycles which sold at prices, £40 to £60 rather than upwards of £150, which British customers could afford. Names like Ariel, Norton, Matchless and Excelsior became familiar before the war and were already being shown off at the Tourist Trophy (TT) races in the Isle of Man in 1907. The comparable trade figures for motor bikes in 1908 and 1911 show even more impressive growth than for cars: net imports from £34,000 to £38,000; exports from £37,000 to £279,000. By 1913 British industry was making more cars and commercial vehicles than Germany, the pioneer. Although Britain had not yet caught up with France, it was well on the way to doing so for it was growing many times as fast. The leaders of the British motor – as of its electricity – industry, reaped the benefit of having taken rational decisions in the interest of longer-term growth.

The denigrators' other major criticism of our carefully calculating ancestors is that they showed an unwillingness to countenance change, continuing to send old staples to traditional markets rather than newer products to new and more

rapidly developing countries. The whole concept of old and new industries, however, is most misleading. The old staples were often producing new products. Take, for example shipbuilding, an industry even older than the ark. In the mid- and later nineteenth century, as wood gave place to iron and steel, sail to steam and vessels of a few hundred tons to those of many thousands, Britain seized the world lead. By 1913 it produced half the world's tonnage, nearly 2 million tons in that year alone. British shipping lines bought the latest from British yards, parting with older, less up-to-date vessels to less efficient foreign rivals. Shipbuilding on the Clyde, the Tyne, the Mersey and elsewhere flourished as never before. Here was no old industry.

Cotton was the basic staple *par excellence* and textiles as a whole accounted for half Britain's manufactured exports in 1913. Yet within the cotton industry considerable changes were taking place. In 1902 the secretary of the Manchester Chamber of Commerce went out of his way to compare the higher qualities produced in Britain with those of the USA and Continental Europe:

The yarn produced in English mills is by many degrees finer and of higher value per pound than that spun in the mills of the other two regions. For many years English cotton yarn has been growing finer and finer. The change has been brought about by two or three causes, but mainly in conse-

quence of the increase of machinery in countries to which our coarser yarns and piece goods were formerly sent. These they now produce much more extensively for their own production leaving to us the production of the finer descriptions.

Britain, responding to changing world conditions, was sending higher qualities to more advanced countries as well as goods of traditional sorts to underdeveloped markets *which were still expanding*. The industry as a whole was very profitable. The building of the ninety-five new cotton mills between 1905 and 1907 was a sensible, rational investment.

Other branches of textiles also did well. Woollens, England's oldest staple, continued to be much sought after. And the further growth of these older branches did not prevent the extraordinary development of artificial silk. Courtaulds managed to develop a tricky chemical process much more successfully than their German rivals. In heavy chemicals Britain could not match the Germans but were not left by the wayside. The old Leblanc soda manufacturers merged to form United Alkali and the Brunner Mond concern forged ahead with ammonia soda. UA was one of the largest British manufacturing companies in 1905, one of fifty or so large concerns by then. Big business had already arrived in British industry.

Some branches of British manufacturing were undoubtedly unsuccessful; but in a world of international specialisation and (for Britain) free trade, the aim was to export what we made best and to import from others, duty free, the products in which they excelled. That we failed with dyestuffs, for instance, was not a sign of weakness for we were able to import dyestuffs made on a large scale and more cheaply in Germany to the great advantage of our thriving textile industry. In any case, our willingness, as the world's leading trader, to import not only food and raw materials but also many manufactures, encouraged the continued development of world trade. (Present-day Japanese trade policy shows the braking effect of attempted self-sufficiency).

British manufacturers, capable of grappling successfully with these changed and more competitive circumstances, could not have been in any way less competent than their predecessors. The argument that family firms by then lacked the drive and ability shown by their founders does not fit the facts. If later generations *did* prove incompetent, the business



Local technical schools – such as this one showing a brickwork class at the Newcross Institute c.1900 – mushroomed during this period in an attempt to create and harness the skills and innovation requisite for industrial progress.

changed hands or went west, to be replaced by an abler successor. Or a capable manager took over. The cultural argument advanced by Martin Wiener in *English Culture and the Decline of the Industrial Spirit* may seem plausible in view of the present-day social scene; but it does not fit the earlier facts either. As families grew, many more eligible candidates, often from the distaff side, became available to run the family business. Those who wished to pursue non-industrial pursuits were free to do so: indeed *had* to do so. There was not enough room for them all in the business.

It has been asserted that Britain's educational system aided the quest for gentility. Rubinstein's recent investigation into the family background and subsequent careers of a large number of public school boys has shown that most came from professional families and themselves went into the professions. Of the rest, those from business were usually drawn from banking and finance and went back into those services. 'Too few sons of entrepreneurs attended a public school to make any real difference', Rubinstein concludes. Nor was there any lack of opportunity to study science and technology in the years before 1914 either at grammar schools, local technical schools/colleges which were springing up in most towns or at the expanding redbrick universities, supported by local industrialists who expected to see returns on their investment. Cambridge was making great strides; but most notable of all were the developments in London both at existing colleges and at the new City & Guilds Central Technical College which from 1907 formed

part of the world-class Imperial College. In technical education, as in manufacturing industry, Britain made great strides before 1914.

British manufacturing's success in the years before 1914 does not suggest that it suffered in any way from lack of capital. Indeed the evidence of electricity and motors indicates that at the outset too much capital did those industries positive harm. Capital exports, often from the rest of the world via London and not British capital, benefited Britain by making available cheaper and more varied supplies of imported food and raw materials, whether tea from Ceylon or palm oil from West Africa. British manufacturers were able to finance growth from internal savings or, bearing in mind wealth already accumulated and its unequal distribution, from local borrowing often at rates which would make present-day business men green with envy. It needs to be borne in mind, too, that only a small amount of capital invested in manufacturing went into the sharp end of the business, the machinery itself, which was the key to increased productivity. Much went into buildings. Investment in machinery, as Sir Alec Cairncross pointed out in his classic *Home and Foreign Investment, 1870-1914*, rose in the 1890s and remained at this higher level until 1914.

All history is to some extent present-minded. With today's gloomy opinions on the state of Britain's manufacturing base, we must inevitably look with greater favour on the performance of our pre-1914 forbears. So did some commentators at

the time. In 1911, for instance, a US commercial agent wrote home about 'the wonderful organisation of the cotton industry in Lancashire', adding: 'It is doubtful whether its presence and influence in the world markets can be seriously affected at least for many years to come'. He was quite wrong. But neither he nor any of our carefully calculating business ancestors could in 1911 be expected to take

account of the First World War in which Britain, the greatest trading nation, was inevitably the greatest loser after the armies dug in and 'business as usual' was abandoned. Our foreign markets could no longer be supplied as before. The Americans moved into South America, the Japanese gained advantages in the East, and Indian manufacturers seized more of their home market. The war accelerated trends with which, given the slower pace of peace, British manufacturers could have coped as they had been doing before 1914. Does anyone believe that Lancashire cotton in the 1920s would have been suffering as it did if there had been no war? Or British shipbuilding? Yet it has been after looking back from this side of the 1914-1918 war that historians have reached their gloomy conclusions about Britain's industrial performance on the other side of that disastrous conflict.

FOR FURTHER READING:

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