# 1 The legacy of the early start

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## INTRODUCTION

History is a series of connected pasts; events and choices influence subsequent opportunities and choices. Path dependency appears in many guises. Technological events, like the innovations of the Industrial Revolution, set off processes of continuing technological improvement, firm capacity building and labour force experience that provide first-mover advantages to pioneers. First-mover advantage generates technology-based comparative advantage that fuels export growth with accompanying general equilibrium adjustments. Economic institutions – firms, product and labour markets, supply chains – develop and influence the future in ways that can be both positive and negative. Political economy and government policy develop their own persistence. When these dynamics are reinforced by major historical disruptions such as the Revolutionary and Napoleonic Wars and the World Wars of the twentieth century, legacies are often intensified.

British economic history of the past two and a half centuries falls into three broad eras. The Industrial Revolution saw British industry triumph. At the time of the great Crystal Palace exposition in 1851, Britain was truly the workshop of the world and

the great exporter of manufactured goods. In the half-century to the First World War, manufacturing in the United States and Germany grew faster and Britain lost that dominance. In addition, new technology emerged in lighter engineering, organic chemicals and even in steel but took root slowly in Britain. In the half-century or more after the First World War, Britain's industrial and social history revolved around the decline of industries that had been the basis of historic success, unemployment and regional decline. This history invites speculation that the success of the Industrial Revolution carried with it the seeds of failure.

This chapter explores the legacy of the early start. The material falls into four sections. First, the Industrial Revolution in textiles, engineering and iron created technological advantage and resulted in locally concentrated export industries that had within them dynamics of continued technological change. Second, Britain committed to the international economy and that commitment became broader and deeper in the globalisation of the half-century before the First World War. Third, the First World War had a decisive and disruptive impact. Fourth, institutions – particular types of firms, labour markets and government policy – developed along with industrialisation and international engagement. All four of these features influenced the economy and society in the century beyond 1870 and provide a starting point for this volume. The roots of these connections in the nineteenth century are examined along with their influence in the twentieth century. Much of the historical literature of these connections revolves around a narrative asking why Britain failed. Connections are clear but placing them too firmly in a failure narrative is probably misleading.

## INDUSTRIAL REVOLUTION SUCCESS

The Industrial Revolution transformed Britain. Eighteenth-century Britain was already an advanced economy (Vol. I, Chapter 2) but technological breakthroughs in the last quarter of the century, in a few key industries, precipitated important changes (Vol. I, Chapter 10).

The industries are familiar: textiles, iron, steam power, engineering and coal. At first glance they seem to dominate the modern economy. Research over the past few decades, however, has put the innovations into the context of the totality of the British economy and its long-run performance and concluded that, by themselves, they were insufficient to move the economy into modern economic growth where living standards and population rose together. This conclusion, however, does not relegate the famous industries and their innovations to mere footnotes. Even if their contributions to growth were more limited than previously thought, technological change in these industries sharply influenced the

structure of the Victorian and Edwardian economy and laid the foundation for problems of the twentieth century.

In the middle of the nineteenth century, Britain stood alone in the industries in which new technology had taken hold (Bairoch 1982). In the emblematic cotton industry, Britain accounted for over half all raw material consumed in Europe and America and in per capita terms Britain consumed nearly three times as much as the next most important producer, the highly protected American industry (Bairoch 1965). By the end of the Napoleonic Wars, more of the cotton goods produced in British factories were exported than were consumed at home, even to India, whose cottons had been excluded from seventeenth-century Britain to protect domestic textile production. Even greater global dominance was constrained only by protective tariffs in the United States and continental Europe. In iron, British mills pioneered the use of coal for fuel. When railways greatly expanded demand for iron, British firms provided rails (and pig iron for rails produced abroad) for the railways of America and continental Europe as well as at home. In the global railway building boom of the 1840s and 1850 they provided over half the iron for German railways; railways in the United States were an even better market, buying about four times as much as the Germans (Fremdling 1977).

## Export industries

The structure of the British economy reflected the combined influence of major technological change, the adaptability of the economy in reallocating resources – particularly labour – and the effects of specialisation for international trade. These effects were most noticeable in cotton textiles. First, the technological innovations had unusually large impact. Between about 1770 and the end of the Napoleonic Wars, improvements in spinning cotton lowered the cost, in real terms, of a pound of yarn for ordinary sheeting to about a third of its initial price and more in fine yarn for shirting and even more for very fine muslin and thread yarn. The effect of technology on the cost of cloth was similar but somewhat delayed (Harley 1998). Over the following half-century, the price of cotton cloth fell by another 50 %. This extraordinary decline in price drove growth. Cottons displaced traditional textiles and their great cheapening expanded their use.

The cost-lowering technology was initially particularly British. High wages relative to most of the rest of Europe stimulated the search for machinery to save labour and some initial breakthroughs may only have been profitable in British conditions (Allen 2010). Similar falls in price and output expansion followed the British iron masters' successful development of coal-smelted wrought iron. Without cheap coal, foreign competitors could not achieve the same economies, and cheaper British prices attracted foreign buyers so that the industry grew to greatly exceed the size that the domestic market alone would support.

In both textiles and iron, Britain's first-mover advantages sustained technological leadership through the nineteenth century. British firms used the new techniques first and improved the technology as they gained experience. The fruits of the process can be seen in falling prices. The nearly perpetual warfare, which began with the French Revolution and lasted until Napoleon's final defeat in 1815, curtailed the flow of information about British innovations to potential rivals and enhanced Britain's advantage. British exports of textiles continued to dominate world markets until the First World War and iron exports until late in Queen Victoria's reign.

Exports increased the size of the Industrial Revolution industries, with cotton, as in much else, providing the most dramatic case. By the end of the Napoleonic Wars over half of its output was exported and that proportion increased to nearly 80 % by the end of the century. The role of exports in other textiles (wool exports rose from about 20 % of output early in the century to a peak at about 40 % in the 1870s and then fell back to around 30 %), iron, metal goods, engineering (rose from about 20 % to around 40 % from mid-century) and coal (close to 40 % by 1913 when ship coals are included) was less but still contributed substantially to the industries' growth (Deane and Cole 1967: ch. 6).

While exports increased the size of many industries, we must be careful not to attribute too much benefit to the British economy from this 'monopoly' of modern technology. Exports increased because prices of British goods fell. The fall in price reduced the benefits gained from expanding exports. The gains from technology took the form of cheaper products and these benefits accrued to consumers both domestic and foreign. Between 1815 and 1841, for example, cotton production increased about 3.7-fold. About half of the increase was exported, mainly as a result of the fall in the price of cotton cloth to about 30 % of its 1815 level, so that exports in 1841 were about three times as large as in 1815. At the lower price, after the raw cotton inputs were financed from export earnings, the greatly expanded 1841 volume of cotton exports could actually buy about 10 % fewer imported consumption goods than the 1815 exports had financed. There were, of course, incomes earned in the enlarged industries with large export markets but due to the highly competitive nature of the British economy these returns were similar to incomes earned in similar occupations and entrepreneurial pursuits.

## Regional concentration

The Industrial Revolution would not have impressed contemporaries or historians as it did had it not been so geographically concentrated. Historically industries tend to cluster, and, as contemporaries observed and 'the new economic geography' has formalised (Fujita et al. 1999; Venables 2008), agglomeration economies lowered costs and increased productivity. Alfred Marshall observed in 1890 that

> great are the advantages which people following the same skilled trade get from near neighbourhood to one another. The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements [are] . . . promptly discussed: if one man starts a new idea, it is taken up by others . . . and thus it becomes the source of further new ideas. And presently subsidiary trades grow up in the neighbourhood, supplying it with implements and materials, organising its traffic, and in many ways conducing to the economy of its material. (Marshall 1920: 271)

Agglomeration's role in increased productivity has been explored for the steam engine and the iron industry (Nuvolari 2004; Allen 1983).

Textiles provide the most striking example of agglomeration (Figure 1.1). At the end of the Napoleonic Wars new industry employed the overwhelming majority of male workers (between half and three quarters) in the Lancashire cotton region and adjacent Yorkshire woollen region. By 1881, textile employment in other parts of England had all but disappeared (Shaw-Taylor et al. 2010)

Mining coal, by its nature, was localised. Even early in the nineteenth century, over half the adult males in the Northeast coal fields were employed in mining, and similar specialised areas appeared in the South Wales coal fields. These trends intensified over the century. Primary iron production concentrated adjacent to the coal fields in the Northeast and South Wales. In Scotland, analogous industrial

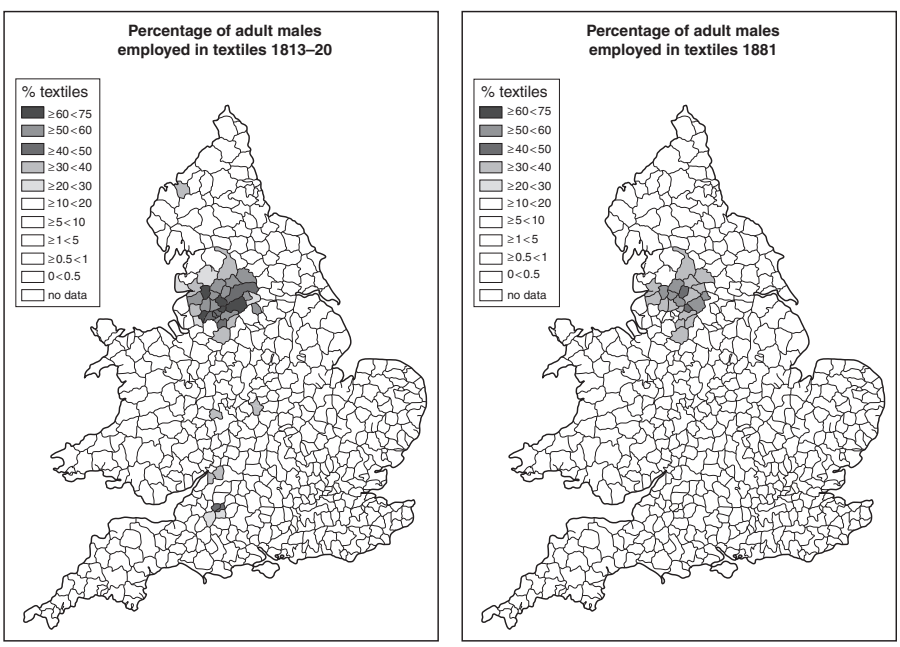


**Figure 1.1** Concentration of textile industries, 1813–20 and 1881.
*Source:* Shaw-Taylor et al. (2010)

concentration resting on textiles, coal and iron appeared around Glasgow. The iron industry in Scotland and on the Northeast coast, in turn, attracted shipbuilding later in the nineteenth century. Pottery and glass was concentrated in the northwest Midlands. Metalworking concentrated around Birmingham. Other industries and other regions were more diversified. Agriculture, although declining as a share of employment everywhere, remained important, particularly in the South and East. The service industries were dispersed as were many manufacturing sectors, particularly those associated with food and drink and with widely available raw materials (Vol. I, Chapter 2).

Remarkably perhaps, the industries of the Industrial Revolution retained their comparative advantage until the First World War. By then, these industries, particularly textiles, were mature with a production technology that was changing only slowly. The formal skill needed to operate the machinery was modest and largely learned on the job. British firms, like Platts of Oldham, made textile machinery for the entire world and also set up the plant for overseas machinery buyers and provided initial training of the workforce. Yet despite wages an order of magnitude higher than in newly industrial regions of Europe, not to mention Asia, British producers remained the world's low-cost producers of all but the most basic fabrics.

The persistence of these industries as Britain's chief exporters demonstrates the strength of the initial first-mover advantages. Concentration generated a supply of skilled labour and specialised auxiliary trades. It also generated continuing technological advance. One result of this success was higher wages relative even to the rest of Britain. High wages, a specialised and unionised labour force, the general high level of specialisation along with the industrial culture and labour relations of the old industries made these areas unattractive to new alternative industries in the late nineteenth and early twentieth centuries (Heim 1984; Brezis et al. 1993).

In the late nineteenth century, although advances continued in the old industries, the technological breakthroughs occurred, perhaps inevitably, elsewhere. The 'Second Industrial Revolution' transformed, or even created, industries producing lighter engineering goods for consumers – like sewing machines, bicycles and eventually automobiles; those harnessing electricity for lighting, trams and eventually homes and factories; and research-based organic chemicals in dyestuffs and pharmaceuticals. As theoretical arguments of the new economic geography suggest, conditions in Britain's industrial areas, created by first-mover and agglomeration economies, made them unattractive to new industries. Instead, the new industries located elsewhere in Britain, particularly close to London – the great consumption centre – and in industrialising economies abroad (Germany, Switzerland and France in Europe, and the United States). The slow development of these industries in Britain, and particularly in the industrial regions, had repercussions. The workforce in Britain's successful industries possessed skills that required only modest inputs of the formal education that was crucial in new industries. As a result there was only modest demand for improvement in schools

and Britain's public education lagged behind Germany and the United States. At the same time, particularly in America, the new mass-production industries stimulated new managerial structures, while small firms continued to dominate Britain's leading industries. To a large extent, Britain differed because it adapted differently within the globalising international economy.

## THE INTERNATIONAL ECONOMY AND BRITAIN IN THE LATE NINETEENTH CENTURY

Engagement in the international economy was a hallmark of nineteenth-century Britain and showed both continuities and changes (see Chapter 3). At the end of the century, the Industrial Revolution industries remained low-cost producers dominating world trade despite rising British wages. The world economy also shaped the economy in new ways. Eighteenth-century trade had expanded primarily on the basis of tropical commodities –particularly sugar – from new regions. In the Industrial Revolution, British firms had expanded exports because technological superiority resulted in low prices. In the late nineteenth century, improvements and investment in railways and ships lowered transport costs enough to generate a new globalisation. It now paid to transport temperate agricultural and other primary products from the land-abundant New World to Europe (O'Rourke and Williamson 1999; Findlay and O'Rourke 2007).

Lower transportation costs also dramatically expanded the frontier in land-abundant regions, effectively increasing the resource base of the global economy. At the beginning of the century many interior continental regions were effectively empty and outside the global economy. In the Americas and Australia initial contact with Europeans and Eurasian diseases nearly wiped out indigenous populations. Around the Black Sea, the Mongol invasion of the thirteenth century, continued domination by the Golden Horde and the Crimean Khanate, followed by struggles between Russia and the Ottoman Empire, left the fertile regions substantially empty. In the late nineteenth century cheap transportation attracted investment and settlement to these frontiers for export-based grain agriculture.

Transportation and its associated infrastructure in continental interiors drove growth in the late nineteenth century but its construction was highly capital-intensive, requiring funds far beyond those locally available. Entrepreneurs quickly seized the opportunities, borrowing capital from older regions of high savings on developed financial markets. British investors responded enthusiastically. By 1913 they owned foreign and colonial assets worth half as much as assets in Britain itself and about 1.8 times British Gross Domestic Product (Matthews et al. 1982: 128–33). Foreign and colonial railway securities listed on the London Stock Exchange were worth nearly £3 billion in 1913 and made up about 30 % of all listed securities

(including British government debt and the stock and bonds of British railways). Securities of railways located in the United States made up nearly 60 % of these and Canadian issues an additional 10 % (Michie 2001: 88–91).

British investors bought overseas securities in London in anticipation of attractive returns and their expectations were realised. US private bonds (overwhelmingly railways) yielded an average annual rate of return of 6.6 % and private (i.e. railway) stocks 8.1 % between 1866 and 1907. Other non-British corporate stocks did somewhat less well at 5.9 % and 6.9 %. Foreign sovereign bonds yielded 5.7 %. In contrast, British government bonds earned only 2.9 % while British corporate bonds and stocks earned 3.9 % and 4.9 % respectively. Britons who invested abroad not only did well in terms of average return, they also strengthened their portfolios because returns of British and foreign assets were poorly correlated so a portfolio including foreign assets was more stable than one comprised of British securities alone (Chabot and Kurz 2010). Earnings from foreign investments were significant for the British economy as a whole, growing from about 3 % of GNP in the 1870s to around 8 % just before the First World War (see Figure 1.2).

Frontier expansion presented opportunities beyond passive investments in railway stocks and bonds. Export-oriented agriculture in the periphery required new supply chains. Meat provides an interesting example. Local meat was driven to markets, purchased by butchers and sold to consumers. Most of the value of the final product (meat in the consumer's hands) went to the farmer. By the beginning of the twentieth century, however, half of British consumers' meat was imported, as

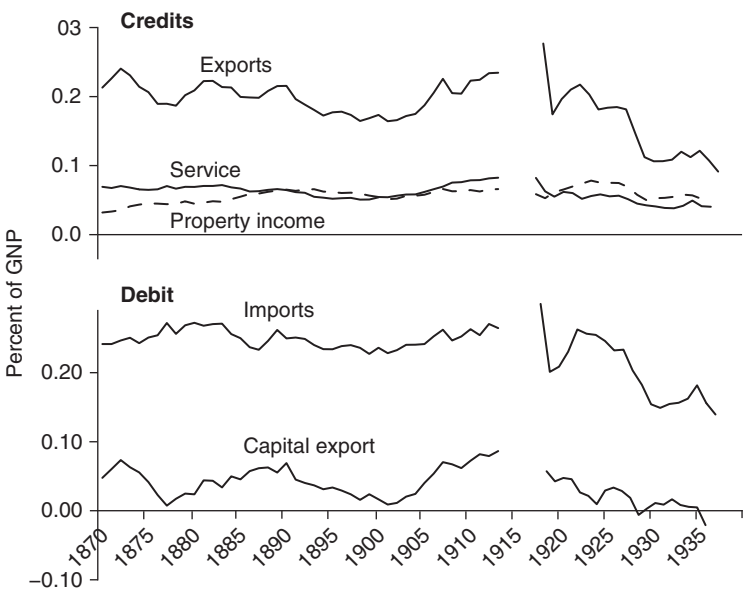


**Figure 1.2** British balance of payments, 1870–1939.
*Source:* Feinstein (1972), Tables 3 and 15

live cattle and chilled beef from the United States and Canada or frozen mutton or beef from Argentina, Australia and New Zealand. American beef sold in London for about £2.20 per 100 lbs., but an American farmer in Iowa received only about £1.40 for the meat equivalent of a live steer. The remainder of the London price paid for the transaction and distribution services needed to get a live steer in the American Corn Belt to the British wholesale market. The steer went by rail to a wholesale market in Chicago, was sold to one of the meat firms and then sent by rail to an east coast port (most likely Boston) and travelled on a steamship to Deptford where it was slaughtered and placed in refrigerated storage. Alternatively it was slaughtered in Chicago, sent to New York in specially built refrigerated railcars and shipped in refrigerated compartments of Atlantic liners (Harley 2008).

Increased long-distance trade required supporting services that were disproportionately provided by British firms, not only in British trade but for world trade generally. British shipowners dominated both liners and tramp shipping. London provided most merchandising and finance for long-distance trades. The merchants in peripheral export economies were frequently British. These British firms earned between 5 and 7 % of Gross National Income (See Figure 1.2). Although these service industries were growing, the way Britain's commodity trade developed has been criticised.

### *Exports, specialisation and performance*

In the half-century before the First World War exports failed to grow as fast as national income, suggesting a loss of competitiveness. The composition of commodity trade reinforced this suspicion. Exports remained dominated by the old industries that increasingly sold to primary producers in the periphery – often British colonies or areas of British influence – while sales to advanced industrial economies lagged. At the same time, Britain imported increasing quantities of manufactured goods from industrial rivals – particularly advanced goods that embodied recent technology. The export of capital was also seen as a weakness; surely if it had been invested in British industry, Britain would have held onto more of its industrial lead and been in the forefront of new industries. Capital exports also increased the influence of financiers in the City of London who forged a political alliance with the old ruling class and whose political agenda differed from that of industrialists (Best and Humphries 1986; Cain and Hopkins 1987; Daunton 1989; Rubinstein 1993).

A disturbing feature of British industry was its failure to lead in the 'Second Industrial Revolution' despite clear leadership in the first. In the second half of the nineteenth century, new industrial technology moved away from textiles and heavy industry to lighter engineering products, the application of electricity, and the development of new organic chemical products, all industries foreshadowing twentieth-century trends. Electricity became the dominant source of industrial energy and its use spread to homes. Light engineering developed mass-produced consumer durables – most strikingly the automobile but also a whole range of

electrically powered household appliances. Organic chemicals grew into a spectrum of industries from dyestuffs to pharmaceuticals. Britain's revealed comparative advantage (i.e. the relative importance of exports) in 1913 lay in ships and rails, textiles, iron and steel (all Industrial Revolution industries) and spirits and tobacco. In contrast, Germany's comparative advantage occurred in electricals, cameras and books, leather and wood, industrial equipment and chemicals; that of the United States was in non-ferrous metals, agricultural equipment, industrial equipment, automobiles and electricals (predominantly Second Industrial Revolution industries). 'British comparative advantage lay in unskilled-labour-intensive, capital-neutral, and human-capital-scarce commodities' while 'US comparative advantage was seen to lie in human-capital-intensive, unskilled-labour-scarce commodities' (Crafts and Thomas 1986: 643; Crafts 1989).

Although the lag in new industries appears to be a sign of failure, another explanation emerges from examining Britain's trade at the end of the nineteenth century. In particular, three elements need to be considered: Britain's involvement in the expanding global economy as a major provider of capital and international services; the strength of Britain's old industries; and the multilateral international economy.

Earnings from capital to finance expanding frontiers and services to global supply chains affected commodity trade. The goods and services that a country sells to the rest of the world, earnings on overseas capital and what it borrows finance what it buys and what it lends. A surplus may be temporarily financed by gold inflows but balance will eventually prevail. A gold inflow would increase Bank of England reserves, causing a fall in bank rate and expansion of the economy that would raise prices and increase imports relative to exports, bringing external balance. By the first decade of the twentieth century, Britain was earning around 7 % of national income from its previous overseas investments and about 6 % from the international sales of services. The British bought some services from foreigners (holidays, etc.) that amounted to about 2 % of GDP and invested abroad between 1 and 7 % of national income annually. This left invisible earnings worth between 4 and 9 % of national income to finance commodity imports. Free-trade Britain drew on foreign sources for half its food and many of its industrial raw materials and also imported increasing amounts of manufactured goods. Imports amounted to about a quarter of national income. Because of invisible international earnings, however, exports were inevitably less than imports, and with imports remaining a more or less constant proportion of income and invisible earnings growing, exports declined as a portion of national product.

Multilateral features of the globalised economy also affected British trade. The periphery exported land-intensive primary products that the core financed by sale of manufactured goods. After 1870, continental Europe expanded imports of primary products, despite protective agricultural tariffs (O'Rourke 1997). The trade was still fundamentally the exchange of core manufactured goods for peripheral food and raw materials but had a multilateral character (Saul 1960). Figure 3.10 illustrates