16 The industrial revolution in global perspective

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Contents

INTRODUCTION: THE RISE OF BRITAIN AND ITS ECONOMY, 1660–1815

Between 1660 and 1815 Great Britain rose to become the world's leading commercial and military power, surpassing its European rivals, and all other national economies around the world.[1] Although dating the industrial revolution now seems a pointless exercise, it makes sense to begin an account of Britain's long transition to geo-political and economic primacy at the Restoration (1660) and to recognise that its maritime hegemony and economic superiority was widely feared at the Congress of Vienna (1815).

Britain simultaneously achieved both power and plenty, with its relatively rapid rate of growth of per capita income and of international trade, as well as its precocious structural change from agriculture to

[1] We may at this juncture in the process of devolution wish to make more of the relative backwardness of the other kingdoms (Wales, Scotland and above all Ireland). There are data (wage levels, even per capita incomes), and there is a substantial literature on industrialisation in the Celtic periphery, which provide perspective on the English experience and help to deal with the process of integration (see Cullen and Smout 1977, and chapter 14 above).

manufacturing. Although there had been some shift to industry prior to 1660, subsequent changes made Britain the world's richest economy by the start of the nineteenth century. Its dominant navy and powerful army and its fiscal ability to fund armed conflict meant that the British usually emerged victorious from wars with other European powers, a geo-political hegemony that was to persist down to the First World War.

In centralising and strengthening the power of the state, Britain followed the basic outlines of mercantilism, a policy which was also pursued by most other European nations. This meant extensive regulations externally, over foreign trade, shipping and colonial economic activity. British mercantilism existed, however, within a domestic framework of *laissez-faire* and private enterprise that differed from other nations, and also with a strategy for colonisation less dependent on direct governmental investment and administration in settling and building up satellite economies overseas.

During the early modern period European nations were not the only areas to experience economic growth and geo-political expansion. The empires, countries and regions of Africa and Asia were also part of an embryo world economy, and autonomous developments on other continents interacted with those happening in Europe, particularly western Europe. Although the focus in discussing eighteenth- and nineteenth-century economic changes has traditionally been on just one small segment of the world's second-smallest continent, it is important to understand the importance that other parts of an interdependent world played in influencing the pace and pattern of change in the British and other European economies (P. K. O'Brien 1997).

Nevertheless, the timing and the nature of Britain's industrial revolution remain, as other chapters in this volume demonstrate, major topics for debate. Did the industrial revolution occur as a sharp jump during a short period of years of the eighteenth and the first quarter of the nineteenth century, or is it best seen as a gradual process of slowly accelerating growth over the course of a much longer span of time, going back to the middle ages or forward to a more fully industrialised economy later in the nineteenth century? Were the major improvements concentrated in only a few industries, such as cotton textiles and iron, or was economic development the result of a broadly diffused process influencing many sectors of the economy? (See chapters 2 and 5.) Were the structural foundations of the industrial revolution to be found in nationally distinctive economic, political, legal, social or cultural changes? And what was the relative importance of internal compared to external factors in accounting for British development? (See chapter 7.) Continuing debates among scholars demonstrate the controversial nature of the causes and consequences of the changes that we believe represent the industrial revolution. Nevertheless, it is clear that whatever might be argued about the timing and the process of change, the economy of Britain after the

Table 16.1 World population, 1500–1900 (millions)

	Asia	Europe (w/USSR)	Africa	South and Central America	North America	Oceania	Total
1500	245	84	87	39	3	3	461
1600	338	111	113	10	3	3	578
1700	433	125	107	10	2	3	680
1800	631	195	102	19	5	2	954
1900	903	422	138	75	90	6	1,634

Source: Biraben 1979.

Congress of Vienna looked quite different compared to its level at the time of the Treaty of Utrecht (1713), and was by then regarded as economically and politically superior, not only by the British but also by other nations of the world. These changes, whatever their pace and extent, continue to be represented as the outcome of the British industrial revolution.

BRITAIN AND EUROPEAN POWERS IN THE WORLD ECONOMY, 1492–1713

Estimates of population for earlier times provide contexts for international comparison. Before 1800, Europe accounted for less than 20 per cent of the world's population (see Table 16.1). That ratio had increased somewhat since 1500, owing, in some measure, to a dramatic (nearly three-quarters) decline in Native American populations after they came into sustained contact with European settlers. The European population in 1600 was about the same as that of Africa, each being about one-third of the population of Asia. Both China and India had larger populations than Europe at that time. Asia accounted for almost three-fifths of the world's population. It was, however, Europe that was expanding, via settlement and trade, into other continents. Although this commerce generated reverse flows of ideas, artefacts, raw materials, consumption goods and botanical transfers from Asia, Africa and America to Europe, no sustained movement of ships and peoples from other continents to Europe or to the Americas occurred, except for the involuntary movement of slaves – a movement that took place on European and American vessels.

Within Europe, the British represented less than one-tenth of the overall population (see Table 16.2). In 1600, the total population of Britain and Ireland was equal to about one-third that of France, was below that of German-speaking states, and was roughly equal to that of Spain. Europe and its American offshoots were not among the world's major urbanised areas until about 1850. Europe had just seven of the world's twenty-five largest cities in 1600, and only six in 1700. China, India and Japan were

Table 16.2 Population of selected western European nations, 1500–1870 (000s)

	France	Netherlands	Germany	Spain	Portugal	Great Britain	Ireland
1500	15,000	950	12,000	6,800	1,000	3,142	800
1700	21,471	1,900	15,000	8,770	2,000	6,640	1,925
1820	31,246	2,355	24,905	12,203	3,297	14,142	7,084
1870	38,440	3,615	39,231	16,201	4,353	25,974	5,419

Source: Maddison 2001 183, 232, 247.

more heavily represented among the nations with large cities (Chandler and Fox 1974). Britain's economy did benefit from its island location, which lowered the costs of providing defence from attacks across its borders but also raised the costs of continental action, which operated to restrain military involvement in European power politics. Spin-offs from public investment in the Royal Navy for overseas commerce and a plethora of good natural harbours added to the advantages of a location that was conducive to intra-European and Atlantic trade.

Among the major civilisations of the ancient world, only two had emerged in Europe. Both Greece and Rome had developed external empires around large urban societies on the southern extremities of the Mediterranean Sea. Eventually both declined in wealth and power. No successor empires to Rome developed in that part of the continent for several centuries. Rich nations existed throughout the non-European world before the industrial revolution, combining wealth with learning and innovation, and with organisational and technological developments. Asia, China and India had populous and developed regions, as did Japan, Indonesia and the Ottoman Empire.[2] In the Americas, Mexico (Aztecs) and Peru (Incas) contained politically powerful and sophisticated economic societies. Within Africa, several polities with urban areas flourished. Some of these regions may have had per capita incomes and enjoyed standard of living equal to or above those in Europe before 1500 (Maddison 2001). The Chinese empires were technologically innovative, but, as with other parts of Asia and Africa, contained masses of poor people and great concentrations of wealth. For more than a century after the Black Death (1347–50), when about one-third of its population died, western Europe seemed potentially a less promising region for early industrialisation and technological progress than China, which was also affected by the plague. The widespread declines in population due to the Black Death generated quite different economic and political outcomes in different parts of Europe (Herlihy 1997).

[2] For an interesting discussion of economic change in the early modern and modern eras, with an argument as to the conditions making for ultimate European success, see Jones (1987). For recent discussion of comparative economic development in Europe and elsewhere, particularly Asia, see Landes (1998), Frank (1998), and Pomeranz (2000). For a survey of the debate, see Goldstone (2002).

Table 16.3 GDP per capita in various regions of the world, 1500, 1820 and 1913 (1990 international dollars)

	1500	1820	1913
Western Europe	774	1,232	3,473
Western offshoots	400	1,201	5,257
Eastern Europe and USSR	483	667	1,501
Latin America	416	665	1,511
Asia (exc. Japan)	572	575	640
Japan	500	669	1,387
Africa	400	418	585
World	565	667	1,510

Source: Maddison 2001: 28, 126.

Thus, at the start of the fifteenth century, other parts of the world besides Europe had levels of wealth and knowledge that seemed to promise long-run expansion. That situation changed once Europeans (led by the Portuguese) began to expand geographically, down the west coast of Africa, across the Atlantic, and into the Indian and Pacific Oceans. Transcontinental commerce increased during the sixteenth century, under western Europe's political, military and economic dominance. This occurred in the Americas, where the Spanish, Portuguese, Dutch, French and British invested in colonies and maritime bases and attracted inflows of settlers from Europe.[3] Only a few European settlers went to South-East Asia and the Ottoman Empire, and within these areas long-distance trade represented only a minor share of total production. Commerce multiplied, not only in those regions where European contact and violence had led to profound changes in the economies and cultures of indigenous populations, but also in places like India where (as Marx complained) the British, the merchants and the colonial rulers did little to transform the culture and social arrangements, or to change traditional techniques and modes of production. Nevertheless, at first relatively and later absolutely, the non-European world began to lose ground economically, politically and militarily to Europe (see Table 16.3).[4]

EUROPEAN ECONOMIC DEVELOPMENT, 1500–1800

Even prior to the British industrial revolution, there were significant shifts in economic and political power within Europe. It took nearly three centuries after Columbus's voyages before British success was secured. In the time of Columbus and for some two centuries thereafter, the rich countries of early modern Europe were in the southern part of the continent, along the Mediterranean. From the middle ages onward, the city-states of the Italian peninsula expanded, on the basis of trade, finance and industrial production, and they achieved artistic, literary, scientific and architectural grandeur, even during political and social turmoil. With the discovery and colonisation of the Americas, and the development of

[3] For estimates and examinations of the flows of people from Europe and Africa across the Atlantic, broken down by European nations, see Eltis (2000).

[4] Income estimates dealing with these patterns of change are presented most recently in Maddison (2001). For earlier estimates, see Bairoch (1981).

Table 16.4 Relative per capita incomes, the Netherlands and Britain, 1500–1913

	A	B
1500	~	99.0
1650	~	
1700	145.0	150.2
1750	120.0	~
1800	82.9	~
1820	74.2	85.9
1850	75.6	~
1913	~	78.6

Source: Column A, de Vries and van der Woude 1997: 707 (midpoint of two estimates for the Netherlands). Column B, Maddison 2001: 90.

sea routes around the Cape of Good Hope and across the Indian Ocean to South and East Asia, the locus of Europe's economic and political power shifted to Spain and Portugal. Spain, for a time, was not only politically dominant on the European continent, but also the most successful power in the Americas. Spain (along with Portugal) had a lead of about one century over other European nations in the settling and exploitation of the Americas, and was able to colonise and trade with areas that were previously wealthy. Before the arrival of Cortes in Mexico and Pizzaro in Peru, both had sophisticated societies with great wealth and complex political organisations. Mexico and Peru together contained about three-fifths of the total Native American population of the Americas (Denevan 1976). Their size, commercial sophistication and considerable mineral wealth (particularly silver and gold) provided Spain and Portugal with immense and immediate riches and two centuries of economic growth, even if they did not provide the basis for long-term sustained economic development (K. O'Brien 1997). Over the centuries, the costs of European and Atlantic warfare weakened Spanish power. The Spanish Habsburgs attempted to dominate the European continent as well as the Americas. Spanish decline was due in part to their engagement in more wars in the sixteenth, seventeenth and eighteenth centuries than other European nations, but perhaps more important was the frequency with which they lost.

In the early years of the seventeenth century, when the British overseas expansion both across the Atlantic and around the Cape of Good Hope really began, Britain confronted yet another rival for the dominance of global commerce – the Netherlands. The Dutch possessed well-developed commercial and shipping networks, political stability, and surplus capital to invest at home and abroad (Israel 1995). They controlled much of Europe's transatlantic shipping until challenged after 1651 by the British Navigation Acts. The Dutch attempts to create large colonies on mainland North America and in Brazil failed, owing to military weakness attributable to a relatively small domestic population (about one-third the size of British population in 1750). Nevertheless, it seems certain that the per capita income of the Netherlands continued to exceed British levels until the end of the eighteenth century (see Table 16.4). The Dutch decline was due to various political and military events, particularly the occupation by the French from 1795 to 1815. During this period of decline there was also some loss of interest in science and mechanical arts, an interest regained only in the second quarter of the nineteenth century.

Nevertheless, the successful Dutch fiscal and financial measures were emulated by Britain. Unlike other European nations, the Dutch invested more heavily in South-East Asia and investments in their East Indian colonies continued to yield benefits to the metropolis for a prolonged period.

Yet it was France that emerged as the greatest threat to British hegemony in world commerce in the seventeenth and eighteenth centuries (Crouzet 1990). France was nearly three times larger than Britain in terms of area and population. French mercantilism competed with British, economically and geo-politically. While the outcome of this rivalry, as seen after the Seven Years War (1756–63), seemed easy in retrospect to predict, during the eighteenth century the writings of British and French economic pamphleteers and statesmen had expressed considerable uncertainty as to the eventual resolution. Indeed the outcome of the competition seemed in doubt right up to the start of the French Revolution (1789) and the Haitian Revolution (1791). These conflicts, and the ensuing Napoleonic Wars, led to a thirty-year hiatus in French economic growth. The slave rebellion in Haiti meant the loss of the richest region in the Americas, and Haiti's subsequent economic collapse meant that a major trading partner had shrunk to insignificance (Engerman 2000).

Estimates of French economic output and foreign trade suggest that they may well have grown at rates comparable to those of Britain from 1700 to 1790, and then again from 1820 to 1900 (See O'Brien and Keyder 1978; Crouzet 1990). The British, unlike the French, experienced very rapid growth and trade expansion between 1780 and 1820, even during the American Revolution and the Napoleonic Wars. Despite their relatively favourable eighteenth-century economic performance, by the end of the century the French had fallen behind the British, economically and militarily. Although the loss of Canada to the British after the Seven Years War indicated the differences in military prowess, its loss was of limited significance economically. Voltaire dismissed it as a conflict 'about a few acres of snow', and the discussion at the post-war settlement centred on whether the British should take Canada or the small Caribbean island of Guadeloupe. It was the outcome of the Revolutionary and Napoleonic Wars (1793–1815) that provided a clear demonstration to contemporaries of Britain's preponderant naval, military and economic power.

The other nations of western Europe, such as Belgium, Switzerland and the German states, generally had some increase in economic growth in the eighteenth century, but their increases and structural changes were not as dramatic as those of Britain, despite similarities in politics and culture. None had early colonial empires, but this could be as much an effect as a cause of their slower economic growth. The German states were not unified until the middle of the nineteenth century, which limited their economic and political development. Within the British Isles, Ireland experienced relatively rapid growth of population and income, with a basically unchanged economic structure, until the onset of the collapse in the Irish Famine of the late 1840s. This led to a decline in population, because of both increased mortality and extensive migration, although per capita incomes for those surviving and remaining did increase (O'Gráda 1993).

EXOGENOUS AND ENDOGENOUS FORCES BEHIND THE RISE OF THE BRITISH ECONOMY, 1713–1815

The rapid demographic and economic growth of the Spanish, Portuguese, British and French Americas was due both to the migration of Europeans, as free and as indentured labourers, and the transportation of black African slaves. The slave trade accounted for over three-quarters of the movement of men, women and children to the New World in the years before 1800, and this established important political and trading relations between several European nations and various states within Africa. Europeans generally traded with Africans on the Atlantic coast, because the disease environment and the military power of African states located in the interior limited the possibility of inland capture and control by Europeans. The slave trade grew rapidly until about 1808, when constraints on that infamous commerce were introduced, by both Britain and the United States, and it was subsequently ended by other states in the nineteenth century. While the transatlantic slave trade continued into the 1860s, the major post-1820 recipients of slaves were Brazil and the Spanish Caribbean colonies, particularly Cuba. The ending of the slave trade and then emancipation in the 1880s had a significant impact on the economy and society of many New World colonies. The effects were less on Africa, where an internal slave trade persisted and where a trade in palm oil and other commodities replaced the Atlantic Ocean trade in slaves.

The American colonies turned out to be highly productive, in terms both of agricultural staples, at first mainly sugar and tobacco and later grains, cotton and coffee, and of minerals (particularly precious metals). All European nations with colonial empires followed their own variant of mercantilism, and imposed controls on trade and production designed to benefit the home country. Political if not economic conditions changed, however, when many colonies achieved political independence from Europe. The American Revolution created the first newly independent nation in the New World, and the Haitian Revolution the second. In the first quarter of the nineteenth century most, but not all, of the Spanish colonies of Latin America won their independence, while Brazil freed itself from Portugal in 1822.

The British colonies on the mainland of North America, settled one century after those of Spain, had not been European settlements of first choice because their climates and resource bases looked less desirable than those colonies in the Caribbean and Latin America. The initial

British New World settlements were in the West Indies, but this shifted after the start of the eighteenth century. Over time, as crops and settlement patterns evolved, temperate North America became the richest area not only in the Americas but in the world (McCusker and Menard 1985). With new agricultural and industrial technology, the success of the United States reflected its favourable demography and endowment.

The traditional attention paid to a first British industrial revolution has underplayed some important aspects of developments in other areas of the world and their relations with Britain. Foreign connections gave rise to a number of different roles in economic development. They were markets for exports and sources of imports of raw materials for use in production as well as for consumption, sources of capital and labour and of ideas and beliefs, and were of considerable importance in providing more land ('ghost acreage') to offset the Malthusian problem of high population density (Jones 1987). There will be, however, no need to argue whether the basic cause of British economic growth is to be found in external, rather than internal, factors. The magnitude of foreign relations may not have been very large, but clearly some factors from outside the British Isles influenced the rate and pattern of growth and, conversely, British growth affected all nations and regions.[5]

In the early stages of its economic development Britain, as did the Netherlands and other European nations, received factors of production, goods and ideas from elsewhere on the European mainland as well as from other parts of the world. Small inflows of labour, primarily of skilled workers from elsewhere in Europe, certainly played a part in the emergence of several English industries, particularly textiles. In the middle ages funds had been supplied by Italian bankers to the monarchs. In the seventeenth and eighteenth centuries Dutch capital flowed into the realm. Ideas and consumer novelties, including tropical groceries, were brought back to Britain by travellers from other countries as well as by Englishmen and Scots. New luxuries as well as more standard consumer goods were imported, meeting basic needs and inspiring greater industriousness among workers (chapter 13 above). The shares of foreign trade to domestic production and of factor movements to total factor inputs remained relatively low, compared with many of the later developers, and with the higher magnitudes Britain displayed in the nineteenth century. Clearly Britain, an economy already rich in some important natural

[5] There have been scholarly debates both on the magnitude of the contribution of overall foreign trade to British economic growth, and on the developmental importance of specific trades, such as the slave trade and the export of cotton textiles. The attention to foreign trade is based upon the argument of limited prospects for the British economy without external developments, a counter to the argument that it was the efficiency of the internal economy that permitted Britain to succeed in international markets, but as yet there appears to be no clean-cut resolution of this issue. The seminal work on the impact of the slave trade on the British industrial revolution is *Capitalism and Slavery* by Eric Williams (1944), See also O'Brien and Engerman (1991) and Inikori (2002).

endowments, especially coal, mineral ores and fertile soils, was also an economy and society benefiting from external influences.

In its economic development, Britain drew upon scientific and technical knowledge from other nations. While developments in science, both as a method of inquiry and as a cosmology, were important, the particular uses to which Britain was able to put this knowledge were a key factor in its economic growth. The role played by technology, and by empirical applications by engineers and artisans, led to more successful commercial improvements and a broader diffusion among economic sectors than did the greater attention given to advances in scientific knowledge elsewhere (Jacob 1997).

BRITAIN'S INTERNATIONAL RELATIONS

During its long transition to a successful industrial economy, connections between Britain and the world, politically and economically, were numerous and significant. Britain became a source of labour to various parts of the world, as part of the process of settling new areas on different continents. Major outflows of migrants from the seventeenth to the nineteenth century went to the West Indies, to the North American mainland colonies that became the United States and Canada, and to Australia, New Zealand and South Africa. This outflow consisted of free migrant labour (some of whom were subsidised), as well as indentured servants. There were also shipments of convict labour, first to the United States and then, after American independence, to Australia. In the eighteenth and nineteenth centuries, Britain received some immigrants, mainly skilled and professional labour, but the outflow from the British Isles (especially the Celtic fringes) was significant. Britain received capital from the Dutch in the eighteenth century, and these funds may have played some indirect role in the early financing of the industrial revolution. By the nineteenth century, however, Britain had become the major source of capital internationally, providing loans and credits to private individuals, corporations, states and nations throughout the world, including its colonial empire.

By 1860 the United Kingdom accounted for about 30 per cent of Europe's exports, because of both its economic size (representing about 20 per cent of Europe's 1870 income) and its policy of relatively low tariffs. The basic pattern of exporting manufactures, particularly textiles, and importing agricultural commodities persisted throughout the classic era of free trade, 1846–1914. The United Kingdom's share of world industrial production rose from an estimated 4.3 per cent in 1800 to 19.9 per cent in 1860, when its share of exports in its national income rose to a peak of about 20 per cent (chapter 6 above).

Britain was at war, at sea and on land, for many years between 1660 and 1815, mainly with other European nations (see Table 16.5). These

Table 16.5 Number of years per nation at war, 1450–1900				
	Great Britain	France	Netherlands*	Spain
1600–50	17.5	24.0	36.0	48.0
1650–1700	26.0	22.5	26.5	34.0
1700–50	29.0	25.0	18.0	29.5
1750–1800	26.5	25.5	11.5	19.0
1800–50	26.0	18.0	14.5	30.0

Note: *For the period 1560–1600, the Netherlands were at war for 48.5 years.

Source: *Wright* 1965: 653.

wars, although critical in seizing power from the Dutch and the French, did, however, involve considerable drains of labour, capital, and natural resources from the private economy. Under certain conditions (including the long-term presence of under- or unemployed factors of production, and given favourable outcomes flowing from peace settlements), wars could be considered (as they were at the time) to be profitable undertakings. In addition, it has been argued that mobilisation for and fighting of wars promoted British state-building, by centralising power in the monarchy and parliament, which led to the development of an effective governmental tax and expenditure system (Winch and O'Brien 2002).

Wars are generally not like zero-sum games. Wars, even those that are won, involve costs to all participants in terms of resource use foregone and the destruction of capital (physical and human). For example, the expansion of the British merchant marine (the world's largest by the late eighteenth century) was costly to build up, but it has been frequently argued that, in the absence of investment in the navy, Britain could have remained a second-rate political and economic power. Before the Seven Years War Britain engaged in war mainly with European powers, although these wars quite often spread to include battles outside Europe over colonial possessions. In the nineteenth century, Britain became involved in numerous colonial wars in remoter parts of its empire, as well as with the nations of Asia and Africa. This required the continued presence of maritime bases and military capacity in these areas, at some cost to British tax payers, which reduced the net benefits from imperialism.

By the start of the nineteenth century Britain was unique in the size of its world-wide empire (Canny 1998; Marshall 1998). Even after the loss of the United States in 1783, a loss whose costs were mitigated by the continuing high level of trade and commercial relations between the two independent countries, the British maintained the world's largest empire, with a population many times that of the metropole. Colonies served as sources of agricultural commodities, based on the pool of cheap manpower, but expenditures on imperial defence and the protection of trade limited the overall profitability of the Empire. Although debate on the profits of imperialism goes back to the classic works of Smith, Hobson, Lenin and others,[6] it was only after the end of World War II that

[6] For more recent discussions see Davis and Huttenback (1986), Ferguson (2001), and O'Brien and Leando Prados de la Escosura (1998). And for the contemporary views of the economists, see Wood (1983).

the Empire was drastically reduced. This was primarily due not to any major change in, or concern with, economic profitability to the British, but rather to a shift in moral sentiments and political beliefs and realities influencing the willingness to bear the direct and indirect costs of ruling foreign territories.

CONVERGENCE AND RELATIVE DECLINE

The nineteenth century was clearly when Britain became the world's major power, economically and politically. Britain's economy was growing rapidly, its Empire was expanding, British naval power was the key to a world-wide 'Pax Britannica', and the British economy was regarded as the one that rivals believed needed to be overtaken. Although the Dutch possibly had a higher per capita income at the start of the nineteenth century, and the United States probably surpassed Britain by its end, Britain was recognised as the world's economic leader throughout the long nineteenth century (1815–1914).[7] Although there was a decline in per capita income relative to the United States towards the end of the century, it was the impact of World War I on British capital investments overseas, on manpower and on budgetary conditions that meant that the relative decline was not to be reversed. Nevertheless, throughout the twentieth century, the British economy still experienced absolute growth in per capita income, and an improving standard of living for most of its population.

During the first half of the nineteenth century, Britain was at its zenith as a world economic power. The United States and the western European nations had per capita incomes of roughly three-quarters of the British level (see Table 16.6). There was a great concern on the part of other nations to catch up with Britain, for both economic and political reasons, and convergence (of income levels, trade volumes, levels of industrialisation and technology) was seen as an important policy goal by many European nations. The measures to be pursued were often based on the implementation of what were felt to have been British techniques, although some sought to adopt different methods. Several of the follower nations imposed high tariffs on manufactured imports, unlike the increasingly free-trade British. Important in Britain and elsewhere in Europe were policies introduced for increased education and public health. The growth of heavy industries was seen as central to convergence. In addition to economic goals, nations undertook military build-ups, as the growth of armies and navies were seen as a necessary aspect of the catching-up process. Although there were wars among other continental

[7] Leandro Prados de la Escosura's recent estimates (2000) suggest a United States lead earlier in the nineteenth century.

Table 16.6 GDP per capita, selected countries, 1820–1913 (1990 international dollars; Great Britain equals 100)

	France	Germany	Netherlands	United States	Switzerland	Belgium
1820	58.0	49.9	85.9	59.3	60.3	62.2
1870	53.8	52.2	79.0	70.1	63.1	77.3
1913	67.7	70.8	78.6	102.9	82.8	81.9

Source: Maddison 2001: 185, 247.

European and Asian powers, between the end of the Napoleonic Wars and the First World War no wars occurred between Britain and any other western European nation apart from during the Crimean War.

Prior to the American Revolution, the per capita income of the thirteen continental colonies was probably close to or perhaps slightly below that of the British metropolis. With American independence, however, there was a period of about two decades over which the United States per capita income declined, at a time when British growth rates remained high. The United States followed the basic British policies of mercantilism. Even with high tariffs on manufactures, the American economy remained heavily concentrated upon the production and export of agricultural commodities with the continued import of manufactured goods, mainly from Britain. After the War of 1812, the United States, while still predominantly an agricultural economy, began to grow rapidly, with westward expansion of both the northern agricultural and the southern cotton economies, as well as developments within manufacturing. Raw cotton exports went mainly to England, and cotton accounted for about half of all US exports in the first half of the nineteenth century. As the size of the manufacturing sector increased, and agricultural productivity continued to improve, the American economy began to grow more rapidly than did the British. Even with the slowdown associated with the American Civil War, it seems certain that sometime between 1880 and 1900 the United States surpassed the British in per capita income and became the world's leader. By this time, the exports of manufactures exceeded those of agricultural commodities, and the United States became the world's leading industrial power. The American lead, starting at the end of the nineteenth century, persisted throughout the twentieth century, a period when Britain's relative position continued its decline, although the absolute level of income continued to rise.

On the European continent several nations sought to offset British commercial and political hegemony and to surpass the British economically. Her most serious competitors were the two largest nations of western Europe: France and Germany. Rivalry with France went back to before 1688 and, although the French did well after 1820, they were unable to grow sufficiently rapidly to close the gap with Britain until quite recently. Alone in western Europe, France had little out-migration, to the United

States and elsewhere, and (unlike Britain) its external capital flows went mainly to nations of continental Europe.

Germany, after unification, undertook both geo-political and economic actions necessary to become a great power. It is often believed to have been the most successful of the national economies on the mainland, although its achievements were probably more impressive in the military than the economic sphere. Germany's policies of high tariffs and of technical education helped to spur the growth of heavy industries, and its expenditures on armaments and warships provided credible military threats to Britain by the end of the century. In Prussia and other parts of eastern Europe, the abolition of serfdom in the first half of the nineteenth century provided for a greater degree of labour mobility internally, as well as leading to extensive external emigration, mainly to the United States. Serf emancipation probably helped to increase the growth rate of several economies, at least in the long run, although they have continued to lag well behind Britain. The nations of western Europe and the British dominions overseas were gaining on the British, economically. Britain no longer seemed unique in the world. Nevertheless, Britain maintained economic and political leadership within Europe, and its position as a major world power continued into the twentieth century.