Great Britain, the Industrial Revolution and the world economy, 1780-1914

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The Industrial Revolution had an enormous influence on the international economy, both directly and indirectly. International trade is based on differences in the relative costs of production. These costs are determined by many factors, such as wages, interest rates and land prices, but also by the level of technology. The technological innovations in British textile industry in the second half of the eighteenth century made it possible to produce cheaper, which gave British industry a comparative advantage over manufacturers abroad. As a result exports increased, and in its wake the import of raw materials also rose. The spread of industrialisation thus changed patterns of trade, but the effects were wider. Trade will take place only if transport costs are lower than the difference in production costs. By bringing down the price of transport the exchange of goods between countries will grow. Because the impact of transport costs varies locally, this also leads to shifts in consumption and production.[1] Not only the movement of goods will grow, but also of labour and capital. When labour migrates, this lowers the relative cost of labour, and thus of production at the place of destination in comparison to the land of origin. Also when capital is invested in foreign economies, this will lead to changes in comparative advantage.[2] The greater the differences in comparative advantage and the lower the cost of transport, the more specialised the distribution of production and the higher the interdependency of the world will become.

In this article these processes are looked at in more detail. First, the causes and effects of changes in transportation and conservation of foodstuffs are reviewed. The following section traces the origins and development of the world economy in the nineteenth century. The organisation of trade was greatly affected by the growing volume of trade and changing trade flows, which is the subject of the third section. In the last part the role of government policy and how it interacted with trade is

[1] P.K. O'Brien, 'Transport and economic development in Europe 1789-1914' in: *Railways and the economic development of Western Europe* (London 1983) 21.

[2] K. O'Rourke and J. Williamson, *Globalization and History: The Evolution of the Nineteenth-Century Atlantic Economy* (New York 1999).

discussed. Within this discussion the position of Great Britain in the world economy will receive special attention. As the leading industrial and mercantile nation, Britain was a crucial link in the early world economy that brought together mass production and consumption, shipping services, insurance and credit and played an important political role by maintaining the safety of the seas and working towards trade liberalisation. As this article is meant to provide background information an appendix has been included with statistical indicators. For ease of overview the tables have been grouped together rather than interspersed with the text.

Transport

The development of the infrastructure in Britain was closely related to the growth of its economy. The condition of the road network improved after the maintenance of the main trade routes was privatised in the middle of the eighteenth century. More importantly, the length of the canal network tripled between 1760 and 1830, while its capacity and quality were much improved. The costs of long distance bulk transport for important raw materials like coal were much reduced by the quadrupling of coastal shipping tonnage between 1770 and 1826 (table 1). From 1825 the expansion of the rail network was taken to hand with the same enthusiasm as that of the canals previously. Within twenty years 3.577 kilometres of railway had been laid.[3] For states with less access to water transport the railroads were even more important for bringing mobility across large landmasses. By the start of the First World War most of the inland freight in Europe was indeed carried by rail.[4] However, traditional modes of transport continued to exist alongside the new. Due to the greater requirements of a larger population and increasing mobility there was even a considerable growth in the number of horses employed in transport during the nineteenth century. Most importantly, the competition between different types of transport sustained a dynamic of rationalisation and innovation that drove transport costs down.

World shipping had grown slowly but steadily in the early modern period. After 1820 the speed of growth picked up rapidly; in Great Britain

[3] B. R. Mitchell, and P. Deane, *Abstract of British historical statistics* (Cambridge 1962) 225.
[4] For example, in France and Germany this share was over 80%. S. Pollard, *European economic integration 1815-1970* (London 1974) 51.

this already happened from 1780 onwards (table 2). Between 1850 and 1870 and again from 1870 to 1910 the volume of world shipping almost doubled. Throughout the nineteenth century British shipping tonnage constituted about a third of all shipping. Improvements in navigation and shipbuilding had brought down freight costs, and insurance costs were brought down by the eradication of piracy.[5] Early steamships were limited in range by the need to carry their own fuel, and until the 1860s mainly transported high value goods such as mail, passengers and luxuries, while sailing ships continued to dominate the long distance trade. Part of the improvements in shipbuilding technology also benefited sailing ships, but in the late nineteenth century innovations like the screw propeller, compound engine and steel hulls made steam engines much more efficient, thus saving on fuel costs.[6] As steamers were faster, they were able to handle a greater volume of goods in the same time and due to their larger size and the labour intensive nature of sailing, steamships required fewer men on board for each unit of cargo. The opening of the Suez Canal in 1869 shortened routes to Asia, which also benefited steamships. It has been estimated that around 1880 steamships already supplied 60% of all cargo capacity, while by 1914 sailing ships had lost almost all impact on international transport. As a result of these developments international freight costs fell by half between 1820 and 1850 and again up to 1913.[7]

Quite as important as the increased speed and falling costs of transport were the developments in conservation techniques. With the extension of preservation time, distant producers could enter the European market for fresh produce. In the 1860s meat extract was exported from South America and in the late 1870s compressed cooked meat followed. Cold storage was facilitated in the 1860s through improvements in cooling house technology. Cooling compartments in ships appeared in the 1870s, carrying American and later Australian and Argentinean meat to Europe. The first experiments of meat transport by rail were a mixed success, but by

[5] D.C. North 'Ocean freight rates and economic development 1750-1913', *Journal of Economic History* 18 (1958).

[6] S. Ville, *Transport and the development of the European economy, 1750-1918* (London 1990) 49-57.

[7] P. Bairoch, *Commerce extérieur et développement économique de l'Europe au XIXe siècle* (Paris 1976) 34-6. Others use more conservative estimates of the efficiency of steamships. L. R. Fischer and H. W. Nordvik, 'Maritime transport and the integration of the North Atlantic economy, 1850-1914' in: W. Fischer, R.M. McInnis and J. Schneider eds., *The emergence of a world economy, 1500-1914* (Stuttgart 1986) 525.

1879 a practical cooling wagon was patented.[8] However, the public remained suspicious of canned foods and the cost of making cans was high, placing canned food outside the mass market until after the First World War.

International trade

The roots of the world economy extend back several hundred years. World-wide co-ordination in price movements for gold and silver was apparent by the end of the seventeenth century, followed by a number of tropical products for the European market, such as sugar, by the end of the eighteenth century. By then some integrated markets also existed in Asia. However, these markets did not include bulk products and the overall volume was rather small. The integration of European markets for large staples, such as grains, already took place before 1800. This process continued and sped up after the Napoleonic Wars.[9] Between 1830 and 1910 more than 60% of European imports originated from within Europe and around 70% of its exports were destined for other European countries.[10] At the same time the share of traded commodities rose in comparison to production as trade grew faster than production (see table 3 to 6).

By the mid-eighteenth century Great Britain had built up an extensive trade network. There were export surpluses to Europe, West Africa and colonies in the Americas and Asia, which were balanced out by shortfalls with the Baltic, the Far East and the British West Indies.[11] Within this network Great Britain fulfilled an entrepôt function, with the share of re-exports remaining fairly stable at just under a fifth of total export value (table 10). Several triangular flows of goods and capital based on Great Britain came into existence around 1870, which developed into one

[8] Goodwin, B.K., Th.J. Grennes and L.A. Craig, 'Mechanical Refrigeration and the Integration of Perishable Commodity Markets', paper presented before the Fourth World Congress of Cliometrics. Montreal, Canada, July 2000. http://www2.ncsu.edu/unity/lockers/users/g/goodwin/illinois.pdf 5-9; J.T. Critchell, and J. Raymond, *A history of the frozen meat trade* (London 1912) 18-46.

[9] P. Mathias, 'The emergence of a world economy 1500-1914', *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte* 74 (1987) 5-9; K.G. Persson, *Grain markets in Europe, 1500-1900: integration and deregulation* (Cambridge 1999) 91-113.

[10] Bairoch, *Commerce extérieur*, 82-84.

[11] S.B. Saul, *Studies in British overseas trade, 1870-1914* (Liverpool 1960) 4-8.

integrated network of trade and capital flows by 1900. This system made it possible to finance bilateral trade deficits with surpluses elsewhere and thus allowed stronger growth of trade in general, as well as facilitating the monetary system by reducing the need for gold flows. The interdependence of trade was especially strong in these multilateral trade relations, because the exports to one area allowed the import from another; while they were also closely linked to capital flows. Restrictions in one area of the system thus had consequences for the system as a whole. In 1914 about 70% of world trade was bilateral, 20 to 25% multilateral and slightly over 5% consisted of foreign investment and non-trade money flows.[12]

Foreign markets were increasingly important for British industry (table 7). Foreign trade grew rapidly at the end of the eighteenth century, but the pace slackened considerably during the Napoleonic Wars. In the decade after the battle of Waterloo foreign trade actually contracted, but after that the rate of growth picked up. The bulk of exports in the late eighteenth century was comprised of manufactures (table 8). More than half of these were textiles, while at the end of the century the emphasis shifted from woollen fabrics to cotton. The share of manufactures initially increased but towards the middle of the century raw materials, such as coal and iron, gained in importance.[13]

As a world economy was taking shape in the middle of the nineteenth century, industrialisation spread to continental Europe and Northern America. There was a fear that this would lead to an increasing overlap in products, but it hardly seems to have affected the expansion of trade. This was because for most countries and for world trade as a whole manufactures never became the dominant product group. By 1913 only in Great Britain, France, Germany and Switzerland were manufactures the main export category. Furthermore, the share of manufactures in world exports declined from 41% in 1853 to 38% in 1911. After 1850 the British lead in manufacturing was rapidly diminished, especially by the growth in Germany and the United States (table 13). The British share of world trade dropped from around 20% to less than 14% by the late 1890s, at which level it stabilised.[14] In 1861 Great Britain had held 66% of all cotton

[12] F. Hilgerdt, 'The case for multilateral trade', *American Economic Review* (March 1943) 397-401; F. Hilgerdt, *The network of world trade* (Genève 1942) 83-87. Saul, *Studies*, 43-64.
[13] R. Davis, *The industrial revolution and British overseas trade* (Leicester 1979) 64-66, 86.
[14] A. Lewis, 'The rate of growth of world trade, 1830-1973' in: S. Grassman and E. Lundberg eds., *The world economic order: past and prospects* (London 1981) 60-8.

spindles in the world, but by 1913 this share had fallen to 39%. It had supplied 63% of all the world's capital goods exports in 1800, but by 1913 this was just 31%. By that time the German market share was nearly as high.[15] British manufacturing exports shifted increasingly to her colonies and southern South America. In these areas, Great Britain remained the dominant trading partner. In 1913 Great Britain received 59% of the exports of its dominions and supplied 38% of their imports. In 1865 Great Britain had exported 20% of its cotton goods to Europe and the USA, but this fell to 7% by 1913, while the share of exports to Asia increased from 43% to 63%.[16] Also worrying was that the share of manufactures in British imports, which had been around 5% for most of the nineteenth century, rose as well (table 8).

The causes and extent of British 'decline' are still hotly debated. An important element can be discerned from the estimates of the share of the 'new technology' industries in the total output (table 12). From these estimates it can be computed that around 1830 and 1860 Great Britain supplied roughly two-thirds of 'new technologies' manufactures in the world, but that this share rapidly declined to somewhere between 15 and 20% by 1913.[17] It has been argued that industrial competitors could benefit from British technology without paying the full price of innovation, but this does not apply to industries such as electronic equipment and chemicals, which only developed after 1860. Neither can this argument explain why some British industries lost their technological advantage. Various authors have pointed at failures in entrepreneurship, the low appreciation of technical education in British society and the obstruction of trade unions to labour saving machinery. It might also be true that the 'old' industries with little scope for technological improvement were too successful and that this reduced incentives to invest in new technologies.[18] However, international competition inevitably increased with the spread of industrialisation, while rising protectionism harmed export industries. British trade was particularly

[15] S. Pollard, *Britain's prime and Britain's decline. The British economy 1870-1914* (London 1989) 14.
[16] D.C. M. Platt, 'Trade competition in the regions of recent settlement' in: D. C. M. Platt, *Decline and recovery in Britain's overseas trade, 1873-1914* (Ipswich 1993) 124-125; Pollard, *Britain's prime*, 36-37.
[17] P. Bairoch, 'International industrial levels from 1750 to 1980', *Journal of European Economic History* 11 (1982) 288.
[18] R. Floud, and D. McCloskey, *The economic history of Britain since 1700, vol. 1: 1700-1860* (Cambridge 1995) 321-333; Pollard, *Britain's prime*, 49-55.

vulnerable as its exports were concentrated on a few products, which were all highly export dependent.

Among the imports of the main industrial countries raw materials were initially more important than foodstuffs (table 8). During the second half of the nineteenth century, however, some raw materials, like hemp and madder, were replaced by surrogates, while the production of others, like sugar, was moved to industrial countries. Technological improvements also increased the efficiency of raw material use. For example, world cotton consumption grew by 6.0% per year between 1826-1830 and between 1856-1860, but only by 3.3% between the latter date and 1896-1900.[19]

Industrialisation also resulted in a change in consumption. The growth of the urban population led to a higher ratio of consumers to agricultural producers, and rising real incomes led to different expenditure patterns. Foodstuffs for instance fell as a share of the household budget, while manufactures increased. Furthermore, basic foodstuffs became less important to the diet, while the proportion of meat, dairy and fruits increased. Great Britain, and later continental Europe, became more dependent on imports. The import share of gross agricultural product in Europe increased from 3% in the period 1845-1854 to 15% in the decade 1875-1884, at which level it stabilised until the onset of the World War.[20] The average distance travelled by agricultural products imported in Europe also increased (table 14), and European farmers found it much harder to maintain their position. First sheep started to disappear from Europe as wool prices fell, but this could be compensated for by shifting to other products as long as urban and industrial demand grew. However, after 1870 the lowering of transport costs led to a rapid expansion of cultivation of 'virgin lands' in the Americas and Russia.[21] European farmers now found the price of grain driven down by foreign competition and their range of alternatives narrowing. By 1900 improved conservation techniques also allowed butter, meat and fruits to be shipped from the Southern Hemisphere to Europe in significant quantities. Great Britain had become the main market for agricultural products, absorbing almost 30% of world imports in 1876-1880 and a fifth in 1911-1913 (table 15).[22] This caused a

[19] Lewis, 'Rate of growth', 15.
[20] Bairoch, *Commerce extérieur*, 231.
[21] H. Knicks Harley, 'Late 19th century transportation, trade and settlement' in: N.F.R. Crafts ed., *The integration of the world economy 1850-1914* (Cheltenham 1996) 3.
[22] L.C. Bacon, and F.C. Schloemer, *World trade in agricultural products, its growth, its crisis and the new trade politics* (Rome 1940); Taylor and Taylor, *World trade in agriculture.*

high dependency on agricultural imports (table 16). Only in the area of highly perishable goods were British farmers able to maintain their market share.

British terms of trade were falling from 1820 to 1860, which means that exports (mostly manufactures) received lower prices while more was paid for imports (mostly raw materials and food). Great Britain therefore had to export more to buy the same amount of imports. This implies that the worldwide production of manufactures grew faster than foreign demand, while British demand for foodstuffs and raw materials grew faster than could be supplied from overseas. Prices for foodstuffs increased as a result of population growth in Europe, while growing industrialisation drove up demand and prices for raw materials. From 1860 on this trend was reversed, mainly because of falling agricultural prices.[23]

The changes in the world economy were also the result of the growing mobility of production factors. Lower transport costs increased the mobility of labour more than of commodities, and emigration to Australia, South Africa and South America preceded the increase of trade with these countries. The movement of labour from densely populated Europe to sparsely populated areas helped to lower international wage differences, created demand for consumer products but also stimulated production abroad. Between 1820 and 1913 almost twelve million migrants left the United Kingdom.[24] But Europe alone could not satisfy the need for labour in these areas. Slave shipments across the Atlantic continued far into the nineteenth century, and labourers were contracted from India, the Dutch East Indies and China. Opposition to these latter type immigrants mounted in the settler colonies, and they became subject to increasing administrative and legal discrimination.

The British balance of trade was negative throughout the whole period, which was made up for by returns on foreign investment and the export of services (table 11). Capital exports on a large scale started around 1870, mainly from Great Britain. In 1914 it held 42% of the gross nominal value of capital invested abroad. Its share in European investments was only 8% but in the 'western offshoots' such as Australia, South Africa and the Americas it was 73%.[25] The fact that British capital was increasingly invested abroad rather than at home may have been another cause for the

[23] Floud and McCloskey, *Economic history*, 304-309.
[24] Maddison, *World economy*, 35.
[25] Ibidem, 99.

loss of its technological lead. On the other hand the causal relation may have been the other way round and investors turned to foreign projects because the expectations of returns in Great Britain were low.

Trade organisation

The interconnection of various producing areas increased the importance of market information. Improved communications made it possible to respond faster to changes in demand and this allowed stocks, and thus costs, to be reduced. Communications were already sped up in the first half of the nineteenth century by the more efficient organisation of 'old' technology. Between 1820 and 1860 despatch times over the world had been reduced by 65%. When the first telegraph link between Great Britain and Paris was established in 1851 long distance communications outpaced the ship for the first time. In the 1860s despatch times were further reduced, so that messages could be sent to any major city around the world in two to four days. The establishment of telegraph communications reduced the travel time of trade information by 80% compared to surface mail in the North Atlantic and by more than 90% from other parts of the world.[26] In 1891 the telephone connected London and Paris and Marconi's first radio experiments succeeded in 1901, so that by 1914 all major ships were equipped with wireless radio.

Efficiency was also increased by standardisation and co-ordination. Especially for perishable goods it was important that there were good connections between the different modes of transport. International train tables were co-ordinated and railway gauge standardised. In 1865 the International Telegraph Union was formed and in 1874 the International Postal Association. Legal standardisation was improved in the 1880s by the international recognition of national patents, trademarks and copyrights, and by the introduction of international rules for private law after 1893. The metric system was gaining acceptance outside the former jurisdiction of the *Code Napoleon* and a rich source of confusion was gradually removed by the

[26] Y. Kaukiainen, 'Shrinking the world: improvements in the speed of information transmission ca. 1820-1870', *European Review of Economic History* 5 (2001) 20; J. Foreman-Peck, *A history of the world economy. International economic relations since 1850* (1995) 68.; J. Ahvenainen, 'Telegraphs, trade and policy. The role of the international telegraphs in the years 1870-1914' in: W. Fischer, R.M. McInnis and J. Schneider eds., *The emergence of a world economy, 1500-1914* (Stuttgart 1986) 507.

introduction of time zones.[27] Faster communications and internationally standardised classification of goods by type and quality also allowed the establishment of futures trades where long term contracts of delivery increased security and reduced price fluctuations.

A similar convergence of practices occurred in monetary policy. Britain had fixed the value of the pound to gold in 1821, which gave it greater security in international transactions and investments. As bills of exchange and paper money were easier to transport than gold, many foreign banks began to hold pounds as reserves. The German conversion to the gold standard in 1873 set off a chain reaction and in the next two decades many countries followed. This of course eased, and reduced the risks of, international transactions by fixing exchange rates. The Bank of England was powerful enough to force foreign banks to adhere to the rules of the gold standard. Recent research suggests that trade increased considerably between countries who adopted the gold standard and within monetary unions.[28] Innovation in credit facilities further contributed to the smooth operation of the world economy as the growth of world trade outpaced the growth of money supply between 1870 and 1892. The gold standard and British investment overseas made London the financial capital of the world. This role was strengthened by a similar position for shipping and insurance, and as the centre for arbitration in grain trade disputes. British trading houses had the widest networks and were dominant in most markets, although in Europe German firms challenged them in the late nineteenth century. The concentration of these services in 'the City' also provided economies of scale and resulted in enormous information flows on prices, supplies and demand from all over the globe. British trade benefited from the close association with the London credit market, which provided capital at low interest rates, based on the trust in well-established markets with large turnovers. Investments often flowed to countries importing British goods, especially the dominions, which stimulated demand. The entrepôt function of London was challenged in the second half of the nineteenth

[27] K. Pomeranz and S. Topik, *The world that trade created. Society, culture and the world economy, 1400-the present* (New York 1999) 179-213.

[28] J.E. López-Córdova and C. Meissner, 'Exchange-Rate regimes and international trade: evidence from the classical gold standard era', Center for International and Development Economics Research. Working Paper C00-118. http://repositories.cdlib.org/iber/cider/C00-118 (2001) 38.

century, for example in sugar, but it assumed this function for several 'new' products.[29]

The large investments required by advancing technology and increasing complexity of operations stimulated a process of concentration. Economies of scale could be achieved through the optimal use of machinery and distribution of labour, but also by horizontal and vertical integration. Trusts integrated several stages of the production process and distribution, while companies extended their hold over several factories. Overseas investments in new plants were made to produce closer to the markets and to evade rising foreign tariffs. Savings could also be made in research and development and marketing as well as in the concentration of capital at a higher level. In this way the fixed costs could be spread over a larger volume of output. Because of the large volume of their business, these companies also preferred to deal with large suppliers, which again stimulated the concentration in those sectors. By the end of the nineteenth century European shipping was dominated by a few large companies.[30] North and South American trusts combined the purchase, slaughter, packaging and exports of meat and sometimes even the retailing on British markets. There was also a movement towards large chains of multiple stores in the retail trade from the 1870s. These businesses could achieve economies of scale in distribution, credit, purchases and organisation through mass turnover. Chain stores started in a limited range of mass consumption products, but over time diversified. In 1885 their share of turnover in Great Britain was negligible, but by 1914 it was 12-14% in groceries and provisions, and 9-11% in meat.[31] The multiple store chains were an important driving force behind standardisation and quality control.

Nevertheless, small-scale production remained important, especially in crafts and agriculture where the opportunities to benefit from economies of scale were fewer. In their relations with the concentrated industries and trade, individual craftsmen, farmers and consumers were at a distinct disadvantage. Because of their small orders and limited financial credibility they obtained less favourable conditions than their larger competitors. In response to this they combined into co-operatives for production, the

[29] R. Michie, 'The City of London and international trade 1850-1914' in: D.C.M. Platt ed., *Decline and recovery in Britain's overseas trade, 1873-1914* (Ipswich 1993).

[30] Ville, *Transport*, 68-88; K. Wiedenfeld, *Die nordwesteuropäischen Welthäfen* (Berlin 1903) 238.

[31] W.H. Fraser, *The coming of the mass market 1850-1914* (London 1981) 121; P. Mathias, *Retailing revolution: a history of multiple retailing in the food trades based upon the Allied-Suppliers Group of Companies* (London 1967) 132-137.

purchase of inputs and consumption goods. In this way they gained market power without giving up their small-scale production. Sometimes these co-operations developed national organisations that achieved such a large turnover that they could establish their own factories, like the Co-operative Wholesale Society in Great Britain.

Trade policy

Classical trade theorists since the early nineteenth century have held that free trade benefits all participants. Under free trade the market should induce each country to produce those goods in which it has a comparative advantage towards others and this should result in the optimum pattern of production and trade. European trade in the eighteenth century was anything but free. Even the Dutch Republic had limitations on particular import and export products. Great Britain had import tariffs, but also taxed exports and even forbade the emigration of persons in certain industrial occupations. The Navigation Acts restricted the access of foreigners to trade and shipping with Great Britain and its colonies, and forced the colonies to trade with the mother country. Part of the grievances of the North American settlers in 1775 lay in these Navigation Acts. British trade and manufacturing in its 'infant' stage thus benefited from protected markets and resources in the colonies. As seen above, re-exports made up an important part of British foreign trade. The independence of the American colonies and the continental blockade during the Napoleonic Wars thus threatened to stop British industrialisation in its tracks. This forced British manufacturers to look for new markets and increased their dependence on India for sales, which in turn greatly damaged India's large indigenous textile industry. The desire to open the South American markets for their exports was an important argument for British attacks upon Spanish and Brazilian colonies and later support for their independence struggle.

After 1815 protectionism continued in Europe. Great Britain also retained considerable tariffs. However, as trade patterns started to change, so did economic interests. In the eighteenth century the British Isles had exported grain, but that surplus was turning into a deficit. With the rapid growth of industry the political power had started to shift from the landed gentry to the industrialists. Armed with the theory of comparative advantage, the free trade movement began to demand change. Negotiations

with other countries to bring about bilateral free trade agreements came to nothing. The eventual change to free trade was determined by the wish of the British administration to simplify the collection of tariffs and thus bring down its costs. In 1842 and 1846 the number of tariff groups was much reduced and most items were exempted entirely. The Navigation Acts were repealed in 1849. Although the Netherlands and Belgium also reduced their tariffs in its wake, the liberalisation of European trade only took place after 1860 when Britain and France agreed on a liberal trade treaty. France then took the initiative to extend the conditions to other countries through the most-favoured-nation clause, which effectively offered the lowest tariff level in any trade agreement to all other countries with that status. Within a decade the system had spread throughout Europe and tariff levels had come down considerably. Nevertheless absolute free trade was never achieved, not even in England.[32]

The economic depression after 1870 cooled enthusiasm for free trade. First the farmers were hit by the influx of cheap grain, and later of meat and dairy, which limited the possibilities for adjustment in these directions. However, due to its decreasing economic importance agriculture had lost much of its influence on politics. Industrialist from sectors threatened by overseas competition soon added their weight to demands for protection. The political weight of these alliances, coupled with concerns for home industries and employment drove most countries to increase their tariff levels for agricultural and industrial products. Nevertheless tariffs in Europe remained at a moderate level, and world trade continued to grow at a rapid pace. In Great Britain the Conservative Party adopted protection, together with a system of imperial trade preference, as a main campaigning item for the elections of 1906. However, free trade sentiments ran deep and the Conservatives lost the election. As a result the introduction of protectionism and imperial preference was postponed until the 1930s.

The highest levels of protection were found in the white settler colonies in the Americas and Australia, which tried to foster their own industry by reducing the imports of manufactures. Low tariffs were forced upon China, Japan, Persia, the Ottoman Empire and Siam (present day Thailand) by aggressive British and American diplomacy.[33] The colonies of most European powers were also subject to restrictions on foreign imports

[32] P.T. Marsh, *Bargaining on Europe. Britain and the first common market, 1860-1892* (New Haven 1999).
[33] P. Bairoch, *Economics and world history* (London 1993) 37.

in order to retain privileged access to their markets. Officially the British colonies adopted free trade but products from Great Britain were favoured informally and sometimes even formally. Cultural links through migration ensured that differences in language and taste were small, while there was a strong 'imperial' sentiment that directed consumers towards British products.[34] In this way the colonies could provide cheap labour, unencumbered by social legislation, and valuable natural resources to be developed by entrepreneurs from the mother country. Some colonial industries were at the forefront of technological and organisational development and often proved a dynamic element in the industrialisation process in their home countries.

Conclusions

The Industrial Revolution changed the volume, pattern and organisation of world trade. Little more than a hundred years after its start, the 'revolution' had led to intimate connections between producers and consumers all over the world. Mathias even speaks of a 'quantum leap' in communications, transport and capital flows after 1850.[35] Cotton from the American south was converted into cloth in Lancashire and then sold in one of the British colonies. British capital sponsored railway lines that carried Australian sheep to harbours where they were slaughtered and packed to be sent off to London. Ships carried guano from Chile to Denmark, where it was used to fertilise crops that were fed to cows whose milk was used to produce the butter for Manchester workmen. Great Britain was the centre of all that trade. Its leading position was attained before the arrival of the world economy in the mid-nineteenth century. The high point of industrial growth in England actually lies around 1830 when steam transport was still in its infancy and trade liberalisation had not yet taken place.[36] The dominance of British exports was thus mainly achieved by optimising and expanding the use of 'old' communication technology and in an unfriendly economic environment.

[34] Platt, 'Trade competition', 100-105
[35] Mathias, 'Emergence', 10-13.
[36] N.F.R. Crafts and C. Knick Harley, 'Output growth and the British industrial revolution: a restatement of the Crafts-Harley view', *Economic History Review* 45 (1992) 703-730.

The world economy to a large extent developed on the existing British trade and investment networks. Other industrial countries built up their own networks, though they never were as extensive as the British. Further expansion of trade was made possible by the establishment of colonies, while states too strong to be colonised were forced to open their markets. The institutions of the world market did not predate but followed its establishment: the telegraph, the gold standard, contract formats and time zones were all later inventions.

In 1901 London was characterised as: 'Mittelpunkt des Welthandels, wenngleich nicht mehr des Weltverkehrs.'[37] It was also no longer the 'workshop of the world' and although it still produced almost a fifth of world manufactures, it was being overtaken by new industrial powers, such as Germany and the USA. These countries broke all the rules of classical economics: they were protectionist and their industry was dominated by mighty cartels and trusts, yet they thrived. Up to 1914 the paradoxical evidence seems to be that protectionism was a better condition for growth than free trade.[38] It might be that privileged access to markets and resources was more important to industrialisation and economic growth than free trade and cheap transport.

Statistical appendix

Transport

Table 1. – Annual rate of growth of water transport in Great Britain.

		%
Length of inland waterways	1780-1830	1.3
Coastal shipping capacity	1770-1826	2.5

Source: C. Petersen, *Bread and the British economy, 1770-1780* (Aldershot 1995) 153.

Table 2. – Growth rate of world carrying capacity.

[37] Wiedenfeld, *Nordwesteuropäischen Welthäfen*, 282.
[38] Bairoch, *Economics and world history*, 44-55.

	1780-1850	*1850-1913*
UK	2.0	3.9
World	1.9	4.0

Source: B.R. Mitchell and P. Deane, *Abstract of British historical statistics* (Cambridge 1963) 217-219.

World Economy

Table 3. – Share of commodity trade in production / GDP.

	1830	*1870*	*1913*
UK (Maddison)		12.2	17.5
Europe (Bairoch)	4.4	10.9	14.0
World (Maddison)		4.6	7.9

Source: P. Bairoch, *Commerce extérieur et développement économique de l'Europe au XIXe siècle* (Paris 1976) 78-79 ; A. Maddison, *The world economy : a millennial perspective* (Paris 2001) 363.

Table 4. – Annual Growth in % of GDP.

	1700-1820	*1820-70*	*1870-1913*
UK	1.02	2.05	1.90
World	0.52	0.93	2.11

Source: A. Maddison, *The world economy: a millennial perspective* (Paris 2001) 261-262.

Table 5. – Annual growth rates of world exports at 1913 prices.

		%
All exports, world at constant prices	1850-1913	3.8
Manufacturing exports, world at constant prices	1850-1913	3.7
All exports, UK at constant prices	1850-1913	3.1
Agricultural exports, world at constant prices	1876/80-1911/13	3.2

Source: A. Lewis, 'The rate of growth of world trade, 1830-1973' in: S. Grassman and E. Lundberg eds., *The world economic order: past and prospects* (London 1981) 62-65; League of Nations, *Industrialisation and foreign trade*, 157.

Table 6. – Annual growth rate of export value at constant prices.

	1870-1913
UK	2.8
World	3.4

Source: A. Maddison, *The world economy: a millennial perspective* (Paris 2001) app F, 359-361.

Table 7. – Share of exports in British national output and gross industrial output 1760-1801.

	National output	*Gross industrial output*
1760	14.6	35.2
1780	9.4	21.8
1801	15.7	34.4

Source: R. Floud and D. McCloskey, *The economic history of Britain since 1700* (Cambridge 1995) 188.

British trade

Table 8. – Pattern of British foreign trade, products.

Imports	*1794/6*	*1860*	*1910*
Food, drink, tobacco	48	38	38
Raw materials and semi-manufactures	41	57	39
Manufactures	11	5	24

Exports	*1794/6*	*1854/6*
Food, drink, tobacco	9	6
Raw materials and semi-manufactures	5	13
Manufactures	86	81

Re-exports	*1794/6*	*1854/6*
Food, drink, tobacco	62	31
Raw materials and semi-manufactures	18	64
Manufactures	20	6

Source: P. Deane and W.A. Cole, *British economic growth 1688-1959. Trends and structure* (Cambridge 1962) 33; R. Davis, *The industrial revolution and British overseas trade* (Leicester 1979) 88-93; B.R. Mitchell and P. Deane, *Abstract of British historical statistics* (Cambridge 1962) 289-308.

Table 9. – Pattern of British foreign trade, destinations and origins.

Imports	*1794/6*	*1854/6*	*1913*
Europe	44	36	41
Asia	22	14	16
North America	7	24	23
West-Indies	25	6	1
Other	2	20	20

Exports + re-exports	*1794/6*	*1854/6*	*1913*
Europe	38	40	37
Asia	13	11	23
North America	28	21	14
West-Indies	18	3	1
Other	3	24	25

Source: P. Deane and W.A. Cole, *British economic growth 1688-1959. Trends and structure* (Cambridge 1962) 33; R. Davis, *The industrial revolution and British overseas trade* (Leicester 1979) 88-93; B.R. Mitchell and P. Deane, *Abstract of British historical statistics* (Cambridge 1962) 309-324.

Table 10. – Re-exports as share of total exports.

	1794/6	*1854/6*	*1904/6*
%	24	17	19

Source: R. Davis, *The industrial revolution and British overseas trade* (Leicester 1979) 88, B.R. Mitchell and P. Deane, *Abstract of British historical statistics* (Cambridge 1962) 283-284.

Balance of payments

Table 11. – Balance of payments of the UK in million pounds.

	1816/1820	*1856/1860*	*1906/1910*
Balance of visible trade	-11	-34	-144
Net shipping earnings	9	26	89
Profits, interests, dividends	9	33	196
Insurance, brokerage, commissions	2	8	22
Smugglers, emigrants, tourists, government	-2	-8	-18
Balance invisibles trade	18	59	289
Net balance	**10**	**25**	**145**

Source: P. Deane and W.A. Cole, *British economic growth 1688-1959. Trends and structure* (Cambridge 1962) 36.

Technology and competition

Table 12. – UK share in manufacturing production and share of 'new technology' production in all manufacturing.

	1750	*1800*	*1860*	*1913*
UK share of world manufacturing production in %	1.9	4.3	19.9	13.6
UK share of world industrial production (Capie 1983) in %			21	14
Share of 'new technology' industries in total UK manufacturing in %	0-1	6-10	60-70	72-80
Share of 'new technology' industries in total world manufacturing in %	<0.5	1-2	17-23	54-62

Source: P. Bairoch, 'International industrial levels from 1750 to 1980', *Journal of European Economic History* 11 (1982) 275, 288, 294; S. Pollard, *Britain's prime and Britain's decline. The British economy 1870-1914* (London 1989) 13.

Table 13. – British share of world exports, 1870-1913.

	1870	*1913*
Merchandise exports	24	19
Sanufactured exports	46	27

Source: S. Pollard, *Britain's prime and Britain's decline. The British economy 1870-1914* (London 1989) 15; A. Maddison, *The world economy: a millennial perspective* (Paris 2001) app F, 359-361. Manufactured exports 1872-1913.

Agricultural imports

Table 14. – Annual rate of increase of average distance travelled by agricultural imports to Great Britain 1831-1909.

	%	*Fastest growing products*
1831/35–1856/60	2.8	Wool & hides, live animals, fruit & veg., feed grains
1856/60–1871/75	1.1	Dairy products, wheat & flour, fruit & vegetables
1871/75–1891/95	0.8	Live animals, fruit & vegetables
1891/95–1909	1.0	Fruit & vegetables, dairy products, feed grains

Source: J.R. Peet, 'The spatial expansion of commercial agriculture', *Economic geography* 45 (1969) 295.

Table 15. – Share of British imports in world imports 1909 to1913.

	%
Wool	34.6
Sugar	24.0
Wheat	34.1
Corn	32.2
Butter	66.2

Source: Taylor and Taylor, *World trade in agriculture* 34, 103-4, 123, 146, 189.

Table 16. – Imports as % of apparent consumption in United Kingdom.

	1870-6	*1904-10*
Milk	0	0.1
Fruit & vegetables	8	24
Meat & livestock	12	36
Dairy & poultry products	40	53
Feed grains	39	61
Wheat & flour	50	84
Wool	53	80
All above commodities	26	46

Source: J.R. Peet, 'The spatial expansion of commercial agriculture', *Economic geography* 45 (1969) 297.