European Review of Economic History, **6**, 23–50. Printed in the United Kingdom © 2002 Cambridge University Press

When did globalisation begin?

KEVIN H. O'ROURKE† AND JEFFREY G. WILLIAMSON‡
†*Department of Economics and IIIS, Trinity College, Dublin 2, Ireland*
‡*Department of Economics, Harvard University, Cambridge MA 02138 USA*

Some world historians attach globalisation 'big bang' significance to 1492 and 1498. Such scholars are on the side of Adam Smith who believed that these were the two most important events in recorded history. Other world historians insist that globalisation stretches back even earlier. There is a third view which argues that the world economy was fragmented and completely de-globalised before the early nineteenth century. None of these three competing views has distinguished explicitly between trade expansion driven by booming import demand or export supply, and trade expansion driven by the integration of markets between trading economies. This article makes that distinction, and shows that there is no evidence supporting the view that the world economy was globally integrated prior to the 1490s; there is also no evidence supporting the view that this decade had the trading impact that world historians assign to it; but there *is* abundant evidence supporting the view that a very big globalisation bang took place in the 1820s.

'The year 1500 marks an important turning point in world history . . . The European discoveries made the oceans of the earth into highways for their commerce . . .' William H. McNeill 1999, p. 295.

1. Globalisation and world history

Globalisation was a defining term of the 1990s. Optimists argued that trade with the Third World would keep American inflation low, despite ten years of high US growth rates, a belief that helped underpin the great bull market of the Clinton Presidency. Pessimists argued that globalisation was boxing the world into a 'global trap', increasing inequality and undermining the ability of the state to deal with pressing social problems. While they might have disagreed about everything else, optimists and pessimists seemed to think that modern globalisation was unprecedented. Economic historians know better.

Few of us would disagree with the statement that the world economy was in 1913 extremely well-integrated even by late twentieth century standards (O'Rourke and Williamson 1999a). World historians have gone much further. They argue that globalisation is a phenomenon which stretches back several centuries, or even several millennia. According to Andre Gunder

Frank, 'there was a single global world economy with a worldwide division of labour and multilateral trade from 1500 onward' (Frank 1998, p. 52), while Jerry Bentley argues that even before 1500, 'trade networks reached almost all regions of Eurasia and sub-Saharan Africa and large volumes of commerce encouraged specialisation of agricultural and industrial production' (Bentley 1999, p. 7). Some attach globalisation 'big bang' significance to the dates 1492 (Christopher Columbus stumbles on the Americas in search of spices) and 1498 (Vasco da Gama makes an end-run around Africa and snatches monopoly rents away from the Arab and Venetian spice traders), viewing the period after 1500 as inaugurating 'a genuinely global epoch of world history' (Bentley 1996, pp. 768–9). Such scholars are on the side of Adam Smith who believed that these were 'the two most important events in recorded history' (Tracy 1990, p. 3).

Not all world historians agree. James Tracy expressed his scepticism with the 1490s big bang theory this way: 'What remains . . . in doubt is the *contemporary impact or significance* of these new configurations of long-distance trade', and 'it is far less clear what meaning the new connections had for those who lived in the sixteenth or even the seventeenth century' (Tracy 1990, pp. 2–3, emphasis added). Many economic historians now 'argue that long-distance trade has been overemphasised', that 'the international economy was poorly integrated before 1800', and that 'if there was a transport revolution . . . it happened . . . in the nineteenth century' (Menard 1991, pp. 228 and 272). While Immanuel Wallerstein believes that it was 'in the sixteenth century that there came to be a European world-economy based upon the capitalist mode of production' (Wallerstein 1974, p. 67), he also believes that several parts of the world (India, Russia, the Ottoman Empire and West Africa) only became incorporated into this world economy some time between 1750 and 1850, as the trade in luxury goods which had linked these regions to the core was replaced by trade in bulk goods (Wallerstein 1989, ch. 3).

Others think that globalisation was a significant phenomenon long before 1500, including Frank himself (1998, pp. 329–9). Janet Abu-Lughod (1989, pp. 8, 286) describes 'an international trade economy . . . that stretched all the way from northwestern Europe to China' in the century before 1350, based on the *pax Mongolica* in which 'trade and exchange moved relatively freely'. Frank and Barry Gills (1993, p. 3) go further, arguing that 'the existence of the same world system in which we live stretches back at least 5,000 years'.

So, is globalisation 20, 200 or 2000 years old?

2. How to measure globalisation

This article looks at just one dimension of globalisation, international commodity trade, and thus ignores other dimensions, such as international factor mobility. The article brings empirical evidence to bear on what thus

far has been largely a qualitative discussion. Before doing so, we need to define terms: globalisation is taken here to mean the integration of international commodity markets. Figure 1 presents a stylised view of trade between some home country and the rest of the world (the latter denoted by an asterisk). MM is the home import demand function (that is, domestic demand minus domestic supply), with import demand declining as the home market price p increases. SS is the foreign export supply function (foreign supply minus foreign demand), with export supply rising as the price abroad $p^{\star}$ increases. In the absence of transport costs and trade barriers, international commodity markets would be perfectly integrated: prices would be the same at home and abroad, determined by the intersection of the two schedules. Transport costs and protection drive a wedge t between prices. Commodity market integration, or globalisation as we define it here, is represented by a decline in the wedge: falling transport costs or trade barriers lead to falling import prices, rising export prices, commodity price convergence, and an increase in trade volumes.

The fact that trade should rise as transportation costs or trade barriers fall is, of course, the rationale behind using trade volumes or the share of trade

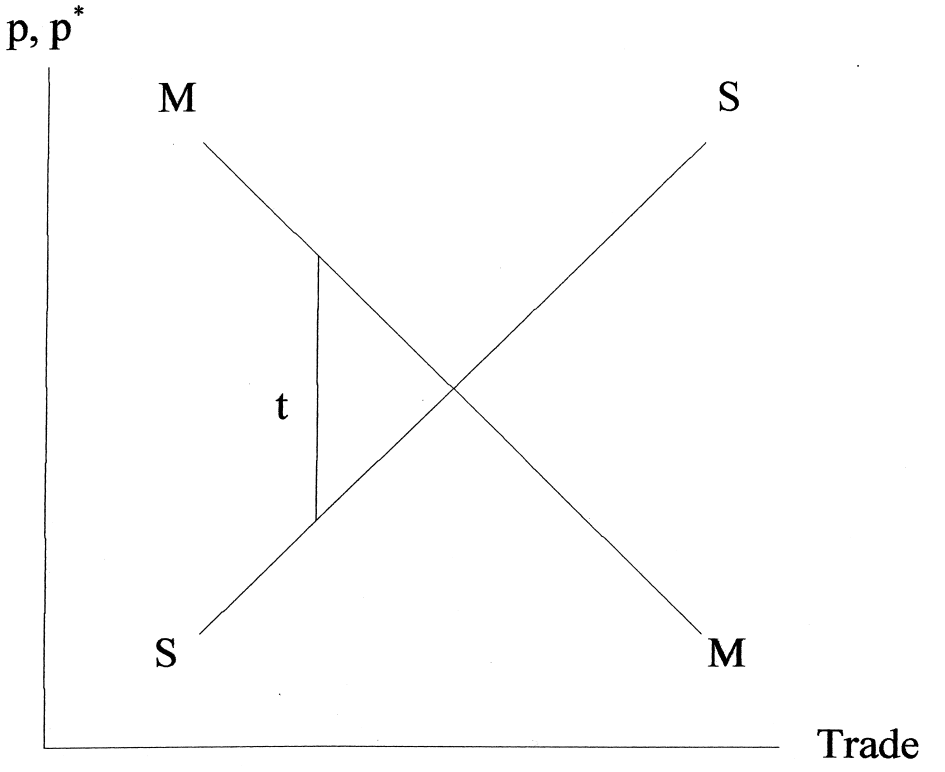

Figure 1. *Trade between home country and rest of world.*

in GDP as a proxy for globalisation and international commodity market integration, a practice adopted by several authors (for example, Chase-Dunn *et al.* 1999). However, Figure 1 makes it clear that globalisation is not the only reason why the volume of trade might change over time. Outward shifts in either import demand MM or export supply SS can also lead to trade expansion, and such shifts could occur as a result of population growth, the colonisation of empty lands, capital accumulation, technological change, and a variety of other factors. Alternatively, globalisation could coincide with falling trade volumes if *MM* or *SS* were shifting inwards over time. Thus, *the only irrefutable evidence that globalisation is taking place is a decline in the international dispersion of commodity prices or what might be called commodity price convergence*.

Although it is commodity price convergence that matters, historians rarely look for evidence of such convergence or its absence.[1] They look instead at shipping technologies, port histories, the evolution of trading monopolies, the rise and fall of trade routes, trade volumes, foreign coins in local burial grounds and so on. Such evidence may or may not correlate with commodity price convergence, since trade could merely be responding to shifts in demand or supply, at home or abroad. For globalisation to have an independent influence on an economy, two conditions must be fulfilled. First, trade-creating forces must change domestic commodity prices before anything else can happen. Second, the changes in domestic commodity prices must induce a reshuffling of resources in order for trade to influence the things that really matter, like the scale of output, the distribution of income, absolute living standards or the quality of life. This inference follows regardless of how colourful are the tales of explorers, discoverers, sea battles, plunder, pirates, flows of specie, the size of spice trade profits, financial bubbles and financial busts that fill our history books. These are tales about *rent-seeking*, not about the integration of global markets.

Long-distance trade between continents developed as transport costs, monopoly, mercantilist intervention, pirates, and international conflicts declined. Initially, only goods with very high value to bulk ratios were shipped, like silk, exotic spices and precious metals. The range of goods traded extended over time, but it was *not* a gradual evolution, but rather a history punctuated by abruptly changing trade regimes. In fact, the six centuries after 1400 trace out three very distinct eras of commodity exchange and specialisation. Long-distance trade in the pre-eighteenth century period was largely limited to what might be called non-competing goods: Europe

[1] One revealing indicator is to look for entries under 'prices' in the subject index of well-known world history texts. Here are some partial results: Prakesh (1998), none; McNeill (1999), one to 'price revolution'; Curtin (1984), two, one on 'administered prices' and another to 'price fixing'; and Chaudhuri (1982), none. The examples could be multiplied.

imported spices, silk, sugar and gold, which were hardly found there at all; Asia imported silver, linens and woollens, which were hardly found there at all (with the important exception of Japanese silver before 1668). Dutch exports of precious metals to Asia accounted for between a half and two-thirds of the value of Asian products imported into Europe by the Dutch East India Company (hereafter, VOC: Vereenigde Oostindische Compagnie), while VOC imports into Europe were dominated by spices, tea, coffee, drugs, perfumes, dye-stuffs, sugar and saltpetre. Indeed these were 84 per cent of the VOC import total in 1619–1621, 73 per cent in 1698–1700, and still a hefty 64 per cent as late as 1778–1780 (Prakesh 1998, Table 4.1, p. 115). Imports into Lisbon from Asia were almost all spices in 1518 (Prakesh 1998, Table 2.2, p. 35). Textiles came to take a larger share of that total, but spices were still 88 per cent of Asian imports into Lisbon by 1610 (Prakesh 1998, Table 2.3, p. 36). Even the English East India Company, which specialised in the textile trade, had imports heavily weighted by spices and specie: 43.4 per cent in 1668–1670 and 46.5 per cent in 1758–1760 (Prakesh 1998, Table 4.2, p. 120). By definition, these non-competing goods were very expensive luxuries in importing markets, and thus could bear the very high cost of transportation from their (cheap) sources. Also by definition, their presence or absence in Europe had little impact on domestic production since they were largely non-competing. Again by definition, their presence or absence in Europe had an impact only on the living standards of the very rich who could afford these expensive luxuries.

The second era starts in the early nineteenth century with the rise of trade in 'basic' competing goods such as wheat and textiles, preceded by an eighteenth century transitional phase sprinkled with trade in furs, tobacco and cotton. The century records spectacular transport cost declines and commodity price convergence. It is a century when price gaps between trading partners fell sharply and when globalisation forces had a big income distribution impact on long-distance trading partners, just as Heckscher-Ohlin trade theory would suggest (O'Rourke and Williamson 1999a, ch. 4).

The third era contains the present, decades which have seen trade in both basic and highly differentiated manufactured commodities. The power of simple Heckscher-Ohlin theory is more difficult to identify in this period, characterised as it is by the rising dominance of skills and new technologies, than it is in the previous era of less complicated and more stable technologies during which endowments of land, labour and capital mattered most.

When did globalisation become sufficiently advanced that it started influencing overall living standards and income distribution, by changing domestic commodity prices and inducing the widespread reallocation of resources within national economies? This article offers what we think is

powerful evidence that these two conditions were *not* satisfied during the three centuries following 1492 and 1498, but that they did start being satisfied about two centuries ago. We see no evidence documenting significant pre-nineteenth century global price convergence for the (competing) commodities that really mattered to the economic lives of the vast majority. Nor do we see any evidence of significant commodity price convergence even for those (non-competing) commodities that mattered little to the vast majority. The implications for world history are, we think, revisionist and profound.

Sections 3 and 4 review the price evidence which we think establishes the superiority of our dating of global history over that of Andre Gunder Frank and other world historians. Section 5 offers the key test of our central proposition: that globalisation was sufficiently advanced by the early nineteenth century to influence domestic factor prices and living standards, but not before. Here we explore almost four centuries of English experience with relative factor prices, commodity prices and factor endowments. We find that the terms of trade between agriculture and industry (relative commodity prices) and the wage-rental ratio (relative factor prices) were closely tied to the land-labour ratio (relative endowments) prior to the nineteenth century, while we find far more independence between them after the French Wars and the dismantling of the Corn Laws. Thus, the date for big bang theories of global economic history should be the 1820s, not the 1490s. Section 6 offers some concluding remarks.

3. The first era: no commodity price convergence

3.1. The North Atlantic before 1800

The best summary we have seen dealing with the evolution of transport costs in the North Atlantic prior to the early nineteenth century is by Russell Menard (1991). Much of Menard's evidence was taken from James Shepherd and Gary Walton (1972), but these scholars did not deflate their nominal indices as did Menard, who found very little evidence favouring a transport revolution. Of course, our interest is in commodity price convergence, while Menard's interest was limited to freight costs and the role of productivity advances in transportation in reducing them. Still, Menard's freight cost indices offer very mixed evidence with no unambiguous support for a pre-nineteenth century transport revolution.

The most negative evidence for the world historians' view is the sugar trade of Barbados and Jamaica, and the rice trade of Charleston, both with England. Menard (1991, Table 6.6, p. 264) documents stability in the peacetime real freight charges on sugar between the 1650s and the 1760s, deflating the nominal charges by the Brown-Hopkins (1981) consumer price index. But if sugar prices in Barbados and Jamaica fell by more than did the CPI in

England, the rise in Menard's real freight rate index would be understated and its fall overstated. Apparently sugar prices *did* fall by more (Mechner 1999, Figure 2.2, p. 58a; McCusker and Menard 1991, Figure 7.1, p. 158). In short, 'the sugar trade offers little support for the notion of a . . . transport revolution' (Menard 1991, p. 267) in the North Atlantic prior to the nineteenth century. The North Atlantic rice trade also shows no fall in real freight rates between the 1690s and the 1760s, although it did undergo a decline thereafter (Menard 1991, Table 6.8, pp. 268–9). Once again, if rice prices in Charleston fell by more than did the CPI in England, then this late eighteenth century decline in freight rates is overstated, an offset that would have been greatly reinforced by rising insurance charges in the more hostile world of the French Wars.

Menard also offers a freight rate index for the wine trade between Bordeaux and London, from the 1290s to the 1660s, again deflated by the British CPI (Menard 1991, Table 6.1, pp. 241–2). His index rises up to the 1490s, and it remains relatively high and unchanged until the 1550s. No progressive transport revolution here, but rather a transport regression. During the next century, however, the index drops sharply. Yet that big drop is not caused by a fall in nominal freight charges, since they did not fall. It is the huge surge in the Brown-Hopkins consumer price index between 1550–54 and 1616 that drives down Menard's real freight rate. Here again, why deflate by the English CPI? Since our interest is solely in commodity price convergence, we should deflate the freight rate by the price of wine. Did the price of wine rise less than the CPI, an index that excludes wines entirely and is dominated by grains (Brown and Hopkins 1981, pp. 32–59)? Unfortunately, we have not been able to find wine prices for the early modern period, but we note that there was absolutely no fall in the real freight index on the wine trade connecting Malaga and London between the 1590s and the 1680s (Menard 1991, Table 6.10, p. 273).

The best case for a North Atlantic pre-nineteenth century transport revolution lies with the tobacco trade. Between 1618 and 1775, freight charges on tobacco shipments from the Chesapeake to London fell consistently, and by a lot. Adjusted by the Brown-Hopkins CPI, real freight rates fell by 1.6 per cent per annum over the entire colonial period (Menard 1991, p. 255). Menard is unimpressed by this fall since it had nothing to do with transport revolutions: almost all of the gains were due to the introduction of standard containers and the more efficient use of cargo space.

We have searched for evidence of transport revolutions affecting the Newfoundland cod fisheries, but have been unable to locate evidence on freight rates or trans-Atlantic commodity price gaps. What we do have is Earl Hamilton's data on dried codfish prices in Andalusia (1505–49 and 1606–50) and Valencia (1555–1646). If transport costs connecting the cod fisheries to European markets were plummeting, wouldn't we expect the relative price of cod to fall in Spain? Yet, when regional codfish prices are deflated by general regional prices, there is no such trend. The series for the entire period from 1505 to 1650, plotted in Figure 2, suggests, if anything, an *upward* trend in

Andalusian cod prices. And if the first three Valencian observations are excluded in Figure 2, there is no trend for that province between 1555 and 1650.[2] These data are suggestive but not conclusive. After all, Iberian fishermen dried their fish at home, and so the dried codfish prices collected by Hamilton incorporated a Spanish drying component (Michell 1977, p. 157). Furthermore, the failure of dried cod prices to fall in Europe during this period could be consistent with globalisation if import demand was soaring or export supply was collapsing. Nonetheless, the cod price facts do not on the face of it suggest any big trans-Atlantic freight rate decline during this period.

It seems that the tobacco freight data offer the only evidence of trans-Atlantic transport revolutions and commodity price convergence prior to the nineteenth century.

3.2. Along Asian trade routes before 1800

In Joseph Schumpeter's grand vision, major innovations are followed by long periods of minor tinkering, so that costs fall, very fast at first, approaching asymptotically stable levels later. If 1492 and 1498 saw the beginning of

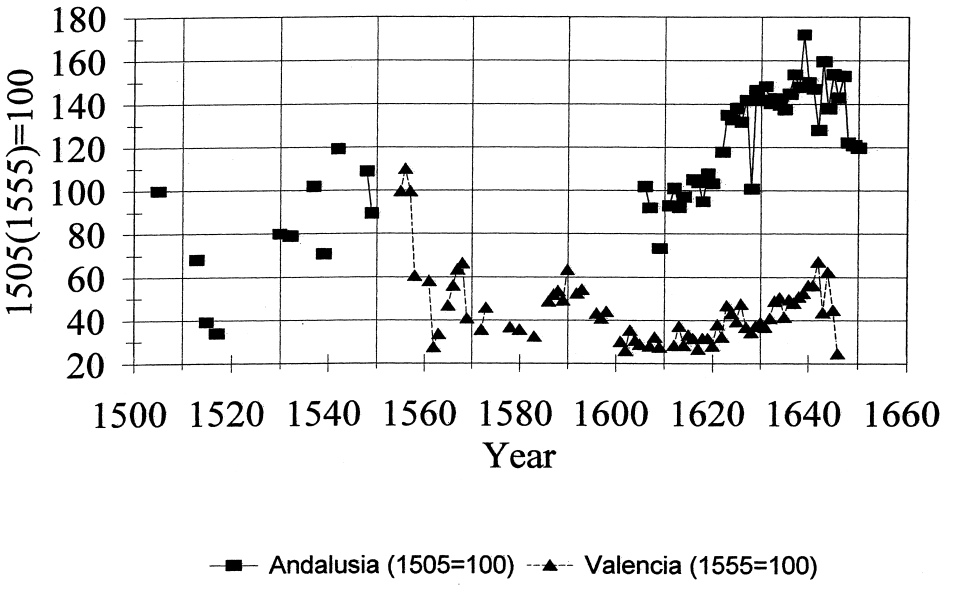

Figure 2. *Real dried cod prices: Spain, 1505–1650.*

[2] We use Hamilton's (1934) Appendices 3, 4 and 5. Andalusian prices are converted into silver prices using the premiums reported by Hamilton (pp. 93, 96); Valencian prices are converted using his premiums on Castilian silver in terms of Valencian silver (p. 131). The average silver price index is given in his Appendix 8.

a truly global world economy, then we should see plenty of evidence of transport cost declines, commodity price convergence and trade booms along Euro-Asian trade routes in the three centuries that followed. As far as trade booms are concerned, Ralph Davis (1962, p. 17) points out that even by 1663 only a tiny 6 per cent of the total tonnage of ships engaged in English external trade was involved with east Asia. Furthermore, there is not much evidence documenting what happened to transport costs along Euro-Asian routes. Nor is there even an active scholarly tradition of seeking that evidence. One impressive exception, however, is a paper by Niels Steensgaard (1965) on Dutch and English freight costs on southeast Asian trade routes between 1601 and 1657.

At the beginning of the seventeenth century, freight costs on the East India round-trip voyage from Europe were £30–32 per ton, whether carried in a Dutch or an English vessel (Steensgaard 1965, p. 148). By the 1650s, the freight costs on English chartered ships had fallen to £16–23 (Steensgaard 1965, Table 1, p. 152). Surely Steensgaard's evidence points to a big fall in transport costs? Looks, however, can be deceiving. The source of the decline 'was undoubtedly the reduction in the time that ships were away [and] after 1640 it was appreciably shorter – not only for chartered ships but for the Company's own ships as well' (Steensgaard 1965, p. 154). Steensgaard is not talking about the duration of the voyage out and the voyage back, both of which remained unchanged, but rather the turnaround time in Southeast Asia. Prior to 1640, these ships were also required to perform protective duties in Asian waters – to put down local revolts, build forts, show the flag, negotiate agreements and so on. After 1640, chartered ships did not perform these functions, but rather a permanent Asian fleet of smaller VOC ships did. The cost per ton per trip does not include the cost of the permanent fleet, borne by the East India Company as before, but not directly included as part of the charter cost per ton. When these costs are added back in, most of the transport cost decline would probably evaporate.

Ralph Davis (1962, pp. 262–4) and Bal Krishna (1924, pp. 321–3) extend the freight cost evidence from the 1650s to the 1730s. They find that freight costs 'were higher in the 1720s and 1730s than they had been in the 1660s and 1670s and they took another step upward in the 1760s, when they return to the levels prevailing in the early seventeenth century' (Menard 1991, p. 250). Figure 3 plots Davis' data on freight rates for 'fine' goods, such as textiles, from 1702–60. These freight rates, from the Malabar Coast and Bay of Bengal on the one hand, and Bombay and Surat on the other, are deflated by the average prices paid for Bengali and Bombay textiles respectively (Davis 1962, p. 263; Chaudhuri 1978, Tables C.20, C. 22). The figures show no sign that freight rates were declining on the large-scale textile trade routes between India and Europe during the eighteenth century.

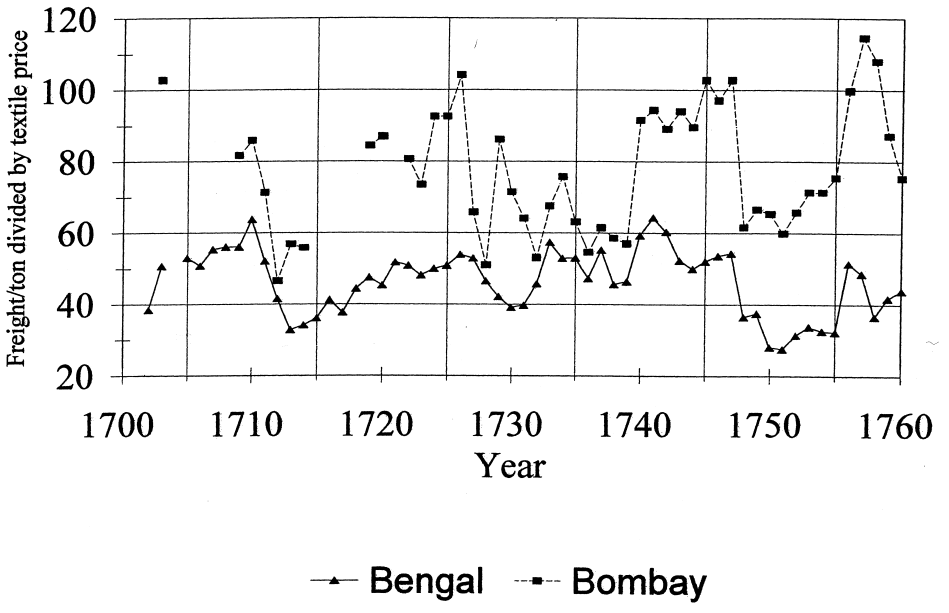

Figure 3. *Real textile freight rates: India, 1702–1760.*

As far as we can tell, there is absolutely no evidence of any transport revolution along Euro-Asian trade routes during the Age of Commerce.

3.3. Asian spices and textiles before 1800

There is good evidence documenting commodity price convergence, or its absence, for three non-competitive commodities prior to 1800 – cloves, coffee and pepper, important evidence when we remember that spices and pepper combined were 68 per cent of Dutch homeward cargoes in the mid-seventeenth century (Reid 1993, pp. 288–9). We have enough evidence to compute clove price gaps between Amsterdam and Maluku (in the Southeast Asian archipelago); the pepper price gap between Amsterdam and Southeast Asia (in and around Sumatra); and the coffee price gap between Amsterdam and Java or Sumatra (Bulbeck *et al.* 1998). Figure 4 plots mark-ups for the three commodities, where mark-ups are defined as the ratio of the European to the Asian price. The price convergence for cloves up to the 1640s was short-lived, since the spread soared to a 350-year high in the 1660s, maintaining that high level during the VOC monopoly and up to the 1770s. The clove price spread fell steeply at the end of the French Wars, and by the 1820s was one-fourteenth of the 1730s level. This low spread was maintained across the nineteenth century. Between the 1620s and the 1730s, the pepper price spread showed no trend, after which, however, it soared to a 250-year high in the 1790s. By the 1820s, the pepper

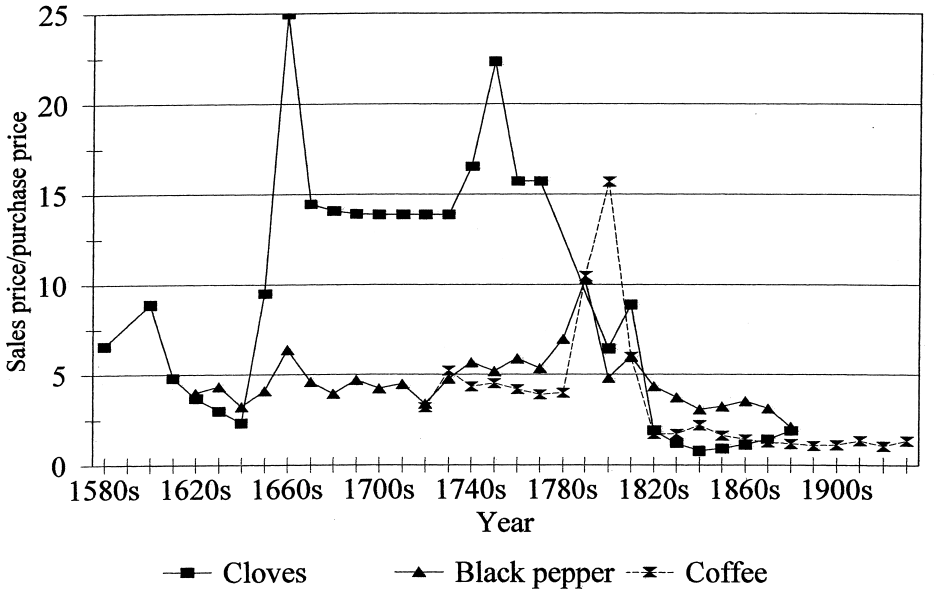

Figure 4. *Spice and coffee mark-ups: Amsterdam vs Southeast Asia, 1580–1939.*

price spread of the early seventeenth century was recovered, and price convergence continued up to the 1880s, when the series ends. There was modest coffee price convergence during the half century between the 1730s and the 1780s, but anything gained was more than lost during the French Wars. At the war's end, price convergence accelerated, so that the coffee price spread in the 1850s was one-sixth of what it had been in the 1750s.

These long time series are certainly instructive, but they are limited to Dutch trade in Asia. What about English trade in Asia? Figure 5 reproduces Chaudhuri's mark-up figures for the East India Company's trade in pepper, saltpetre, tea, raw silk, coffee, and indigo, between about 1660 and 1710. With the possible exception of saltpetre, it would be very hard to establish a convincing case that mark-ups were declining during this fifty-year period.

The moral is this: there is no evidence of commodity price convergence for these non-competing goods prior to the nineteenth century. Of course, the price spread on pepper, cloves, coffee, tea and other non-competing goods was not driven solely, or even mainly, by the costs of shipping, but rather, and most importantly, by monopoly,[3] international conflict, and government tariff and

[3] Douglas Irwin (1991, esp. p. 1297) suggests that pretty much *all* of the intercontinental trade at this time was by state-chartered monopolies. Like most monopolies, they raised prices paid by consumers (in Europe), lowered prices paid to suppliers (in Asia), restricted output and limited trade. These are hardly ingredients that make globalisation flourish!

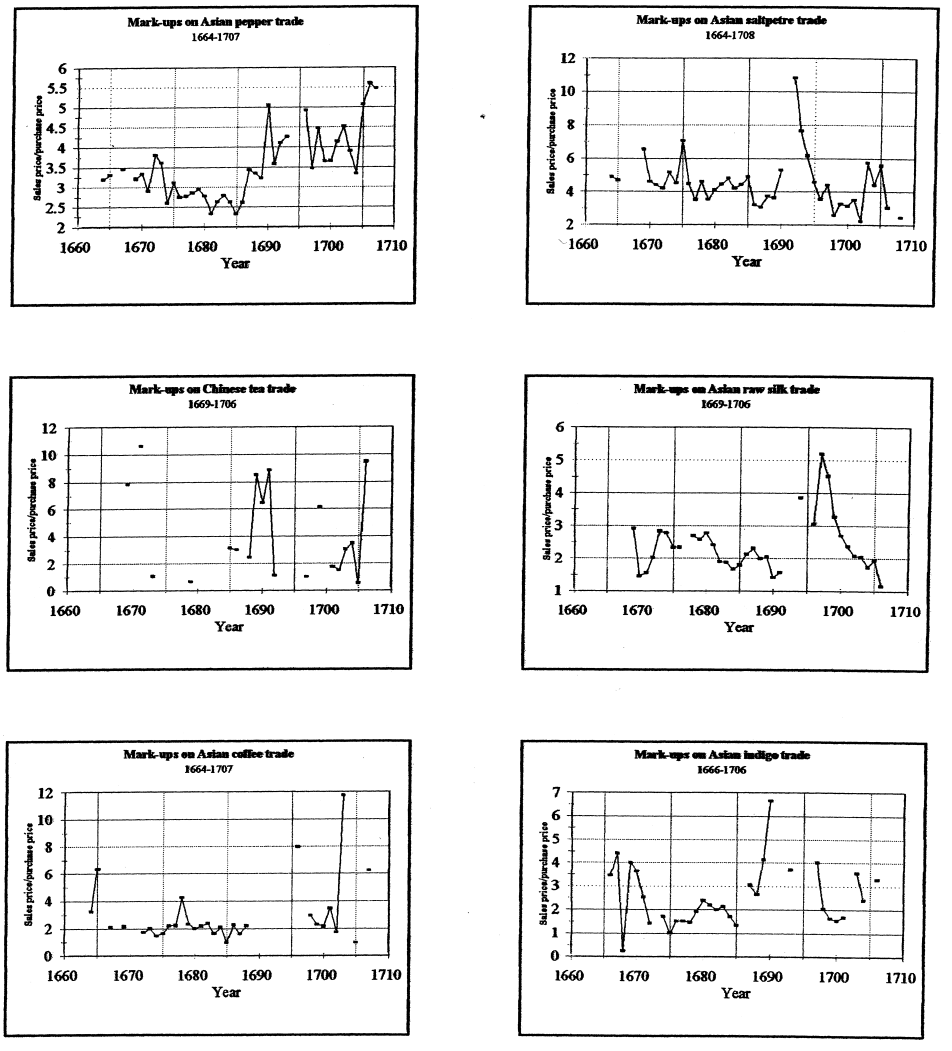

Figure 5. *British-Asian mark-ups on six non-competing goods.*

Source: Chaudhuri (1978).

non-tariff restrictions. Anything that impedes price convergence suppresses globalisation, and there is no evidence of globalisation before the 1820s.

Is there any reason to expect the price spread on competing goods to have behaved differently? We think it unlikely, especially if the Indian cloth trade is representative. Figure 6 plots the average prices received by the East India Company on its Asian textile sales in Europe, divided by the average prices it paid for those textiles in Asia. Again, there is no sign of declining mark-ups (where mark-ups include all trade costs, as well as any East India Company monopoly profits) over the century between 1664 and

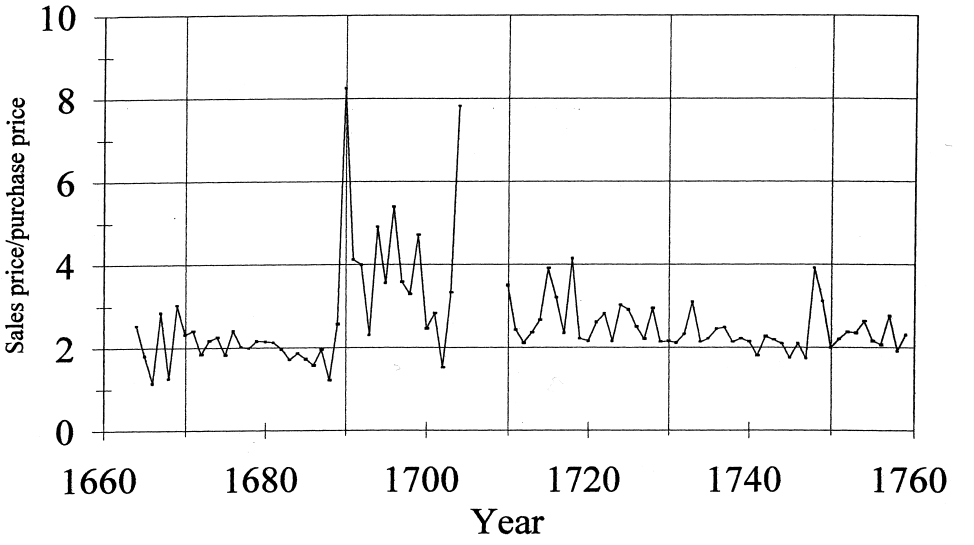

Figure 6. *Asian textile trade mark-ups, 1664–1759.*

1769.[4] This textile trade was extremely large and it was on the rise. Yet, the evidence on freight rates offered in the previous section and the mark-ups shown in Figure 6 suggest that growing trade volumes were almost certainly driven by the outward expansion of import demand or export supply rather than by world commodity market integration *per se*. If it was globalisation at work, we would see evidence of a long term fall in the mark-ups plotted in Figure 6. Such evidence is completely absent from the Figure.

There is plenty of evidence of a trade boom during the Age of Commerce. There is hardly any evidence of globalisation. World historians who have concluded that a post-1490s trade boom must imply powerful globalisation forces seem to have missed the obvious: a far more likely explanation is a growing import demand fuelled by population growth.

4. The second era: nineteenth century commodity price convergence

4.1. The amazing nineteenth century worldwide decline in international transport costs

In the nineteenth century, international freight rates collapsed, as

[4] All import price data come from Chaudhuri's (1978) Table C.24, which also provides data on sales prices and mark-ups from 1664 to 1704. From 1710 to 1759, the sales prices used are those given in Chaudhuri's Table A.13 (p. 302); like the earlier data in Table C.24, these are average prices, but since they are listed in a separate table, we cannot be sure that they are strictly comparable with those earlier figures.

steamships and the Suez Canal linked continents, and railroads penetrated their interiors. It is important to stress that this nineteenth century transport revolution was not limited to the Atlantic economy: Gelina Harlaftis and Vassilis Kardasis (2000) have shown that the declines in freight rates between 1870 and 1914 were just as dramatic on routes involving Black Sea and Egyptian ports as on those involving Atlantic ports, and perhaps even more so. Asia was also a participant: the tramp charter rate for shipping rice from Rangoon to Europe, for example, fell from 73.8 to 18.1 per cent of the Rangoon price between 1882 and 1914. China and Japan were also involved in this Asian transport revolution. The freight rate on coal (relative to its export price) between Nagasaki and Shanghai fell by 76 per cent between 1880 and 1910, and total factor productivity on Japan's tramp freighter routes serving Asia advanced at 2.5 per cent per annum in the thirty years between 1879 and 1909 (Yasuba 1978, Tables 1 and 5).

Figure 7 offers a summary of the impact of these productivity improvements on transport costs in the Atlantic economy. What is labelled the North index (North 1958) accelerates its fall after the 1830s, and what is labelled the British index (Harley 1988) is fairly stable up to mid-century before undergoing the same, big fall. The North freight rate index dropped by more than 41 per cent, in real terms, between 1870 and 1910, while the British index fell by about 70 per cent between 1840 and 1910. These two

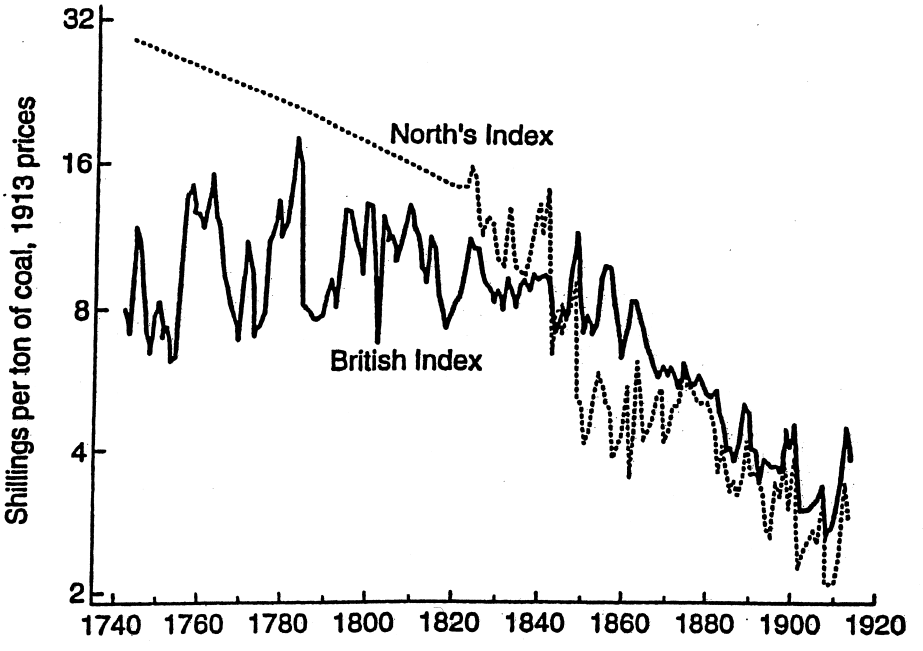

Figure 7. *Freight rate indexes, 1741–1913.*

Source: Harley (1988, figure 1), nominal rates deflated by UK GNP deflator.

indices imply a steady decline in Atlantic economy transport costs of about 1.5 per cent per annum, for a total of 45 percentage points up to 1913, a big number indeed. There is another way to get a comparative feel for the magnitude of this decline. The World Bank reports that tariffs on manufactures entering OECD markets fell from 40 per cent in the late 1940s to 7 per cent in the late 1970s, a 33 percentage point decline over thirty years (Wood 1994, p. 173). This spectacular postwar reclamation of 'free trade' from interwar autarky was still smaller than the 45 percentage point fall in pre-1914 trade barriers due to transport improvements.

Figure 7 makes another point: the nineteenth century transport revolution accelerates after 1820, suggesting that the globalisation big bang might be in the 1820s, not the 1490s.

4.2. Nineteenth century worldwide commodity price convergence

What was the impact of these transport innovations on the cost of moving goods between markets? The cost has two parts, that due to transport and that due to trade barriers (such as tariffs). The price spread between markets is driven by changes in these costs, and they need not move in the same direction. Since tariffs in the Atlantic economy did not fall from the 1870s to World War I, the globalisation which took place then cannot be assigned to more liberal trade policy. Indeed, rising tariffs were mainly a defensive response to the competitive winds of market integration as transport costs declined (O'Rourke 1997). However, there were no offsetting tariff hikes in the eastern Mediterranean; and political barriers to trade fell substantially in Asia. Under the persuasion of Commodore Perry's gunships, Japan emerged from autarky in 1858: during the following fifteen years, Japan's foreign trade rose from nil to 7 per cent of national income (Huber 1971). One researcher thinks that Japan's terms of trade rose by a factor of 3.5 between 1858 and the early 1870s, as prices of exportables soared and prices of importables slumped to world market levels (Huber 1971); another thinks it rose by a factor of 4.9 (Yasuba 1996, p. 548). China opened up to trade in 1842 after centuries of isolation; Korea emerged from isolation about the same time; Siam adopted a 3 per cent tariff limit in 1855; both India and Indonesia followed liberal policies as a result of colonial dominance (Williamson 1999a). Thus, in Asia policy reinforced the impact of the transport revolution, rather than muting it.

What were the implications of these technological and political developments for commodity price convergence? Take the Atlantic economy first. Trend estimates based on Harley's (1980) annual data show that Liverpool wheat prices exceeded Chicago prices by 57.6 per cent in 1870, by 17.8 per cent in 1895, and by 15.6 per cent in 1912. Both the Liverpool–New York and New York–Chicago price gaps declined steeply, which is consistent with the evidence on freight rates offered earlier. Moreover, these estimates

understate the size of the price convergence because they ignore the collapse in price gaps between Midwestern farm-gates and Chicago markets, as well as that between Liverpool and inland British consumers. This price convergence in Anglo-American wheat markets was repeated for other foodstuffs. Indeed, the London–Cincinnati price convergence for meat after 1895 was even more dramatic than it was for wheat: price gaps were 92.5 per cent in 1870, over 100 in 1880, 92.3 in 1895, and 17.9 in 1913. The delay in price convergence for meat, butter and cheese has an easy explanation: it required the advances in refrigeration made towards the end of the century.

Anglo-American price data are also available for many other non-agricultural commodities (O'Rourke and Williamson 1994). The Boston–Manchester cotton textile price gap fell from 13.7 per cent in 1870 to about zero in 1913; the Philadelphia–London iron bar price gap fell from 75 to 20.6 per cent, while the pig iron price gap fell from 85.2 to 19.3 per cent, and the copper price gap fell from 32.7 to almost zero; the Boston–London hides price gap fell from 27.7 to 8.7 per cent, while the wool price gap fell from 59.1 to 27.9 per cent. Commodity price convergence can also be documented for coal, tin and coffee. Furthermore, similar trends can be documented for price gaps between London and Buenos Aires, Montevideo and Rio de Janeiro (Williamson 1999b).

Price gaps between Britain and Asia were driven down by the completion of the Suez Canal in November 1869, by the switch from sail to steam, and by other productivity advances on long-distance sea lanes. The cotton price-spread between Liverpool and Bombay fell from 57 per cent in 1873 to 20 per cent in 1913, and the jute price-spread between London and Calcutta fell from 35 to 4 per cent (Collins 1996, Table 4). The same events were taking place even farther east, involving Burma and the rest of Southeast Asia. Indeed, the rice price-spread between London and Rangoon fell from 93 to 26 per cent in the four decades prior to 1913. These events had a profound impact on the creation of an Asian market for wheat and rice, and, even more, on the creation of a truly global market for grains (Latham and Neal 1983; Brandt 1985). Finally, the impact of transport revolutions on commodity price convergence involving the eastern Mediterranean was just as powerful. The price-spread on Egyptian cotton in Liverpool and Alexandria markets plunged off a high plateau after the 1860s. The average percentage by which Liverpool exceeded Alexandria price quotes was: 1824–32, 42.1; 1837–46, 63.2; 1863–67, 40.8; 1882–89, 14.7 and 1890–99, 5.3 (Issawi 1966, pp. 447–8).

Much of the evidence on commodity price convergence just reviewed covered the decades from 1870 to the Great War. What about the half century before? The data are not as abundant, but if they were, they would surely also support commodity price convergence. After all, 1846 dates a major victory for liberalism, the year of Corn Law Repeal in the United Kingdom. Furthermore, Repeal was proceeded by two decades of quota

and embargo removal and tariff reduction. One estimate has it that the *ad valorem* tariff equivalent on grain in Britain fell from about 73 per cent in 1815–27, to about 59 per cent in 1828–41, and to about 24 per cent in 1842–45, a spectacular move to freer trade even before Repeal (Williamson 1990, p. 128). Although rarely by choice, Asia went through the same liberal wave during the 1860s and 1870s. In short, it seems very likely that the dramatic commodity price convergence in the half century after 1870 had its source in the half century before.

5. Documenting the globalisation big bang date: what determined English factor and commodity prices 1565–1936?

If the first great globalisation shock hit the world economy in the early nineteenth century rather than in the late fifteenth century, then it follows that European commodity prices should have been determined primarily by domestic supply and demand prior to the early nineteenth century, while they should have been determined by global supply and demand afterwards. Moreover, the distributional implications of international trade should only have begun to manifest themselves some time between Waterloo and the Great War. Here we test this intuition for Great Britain, an economy which was at the heart of the nineteenth century global economy and thus fully exposed to the effects of growing international trade. Previous work has shown that international commodity price convergence can explain a large proportion of British distributional trends between 1870 and 1914 (O'Rourke and Williamson 1994; O'Rourke *et al.* 1996), and that British grain markets were well integrated with those on the European Continent as early as the 1830s (Williamson 1990; O'Rourke 1994). Was this also true of earlier centuries?

To answer this question, we gathered data on British endowments, commodity prices, and factor prices from 1565 to 1936. For these four centuries, we were able to construct: the ratio of agricultural land to the economy-wide labour supply (LANDLAB); the ratio of agricultural prices to industrial prices (PAPM); and the ratio of wage rates to farm land rents (WR1 and WR2, corresponding to two alternative rent series).[5] All variables are expressed in natural logarithms.

How should these variables be related in a closed economy *versus* one open to trade? Imagine a world in which there are only two commodities: food, produced with land and labour; and manufactures, produced with

[5] We emphasise the results obtained with WR1 in the text. The results using WR2 were similar. Thus, the debate over whose early modern rental series is closest to the truth is irrelevant to the empirical findings of this essay. An appendix describing the underlying data base will be made available from the authors upon request, including the data themselves.

capital and labour. In a closed economy without trade, increases in land-labour ratios should lead to a decline in relative agricultural prices, as the relative supply of food increases, and to an increase in the wage-rental ratio: commodity prices and factor prices should both be determined by endowments (as well as technology and demand). Moreover, if Malthus was right then a technology-induced rise in the real wage should induce an increase in the labour force, and a reduction in the land-labour ratio. Thus, we might also observe factor and commodity prices having an impact on endowments in a closed economy. As commodity prices at home become increasingly dependent on foreign markets as an economy opens up to trade, factor prices, like the rents for farmland and the wages for labour, should be determined more and more by world commodity prices and less and less by domestic endowments, like land and labour. Rising land-labour ratios will still raise wage-rental ratios in an open economy, but increases in the relative price of food, which is now an exogenous variable, will have an independent, depressing effect on the wage-rental ratio. Land-labour ratios might still depend on wages and prices through some sluggish Malthusian mechanism, or through more responsive international migration flows.

If we are correct in our assertion that sustained globalisation only began in the early nineteenth century, then the autarkic model should fit the pre-nineteenth century facts, while the open economy model should fit the post-eighteenth century facts. That is, we should be able to see what economists call a regime switch somewhere around the 1820s. Furthermore, in order to justify the globalisation big bang or watershed label, the econometric evidence should be absolutely unambiguous. If instead the world historian is right, then the open economy model should fit the pre-nineteenth century facts too. To determine which prediction wins, we split the data into two parts: 1565–1828 and 1828–1936. We chose 1828 as the break point since that year saw a radical liberalisation of British commercial policy, and Britain stuck to that liberal policy up to the 1846 Repeal and beyond. Prior to 1828, grain imports were prohibited if domestic prices fell below a certain 'port-closing' level, and during the early postwar years grain imports were effectively excluded much of the time. In 1828, the Duke of Wellington's government replaced these import restrictions with tariffs: this not only lowered British grain prices but increased the integration of British with Continental grain markets (Williamson 1990). Moreover, Wellington's sliding scale tariff came at the end of a decade which had seen several other moves towards freer trade: a reform of the Navigation Acts in 1822; tariff reductions across the board; and the repeal of more than 1,100 tariff acts in 1825. Of course, prior to 1815, the French Wars effectively served to block commodity trade.

Figures 8A and 8B plot the raw data, and they show that the 1820s do indeed mark a watershed in British economic history. Prior to the 1820s, the relative price of agricultural commodities (PAPM) rose steadily, while the wage-rental ratio (WR) fell steadily. After the 1820s, the wage-rental ratio

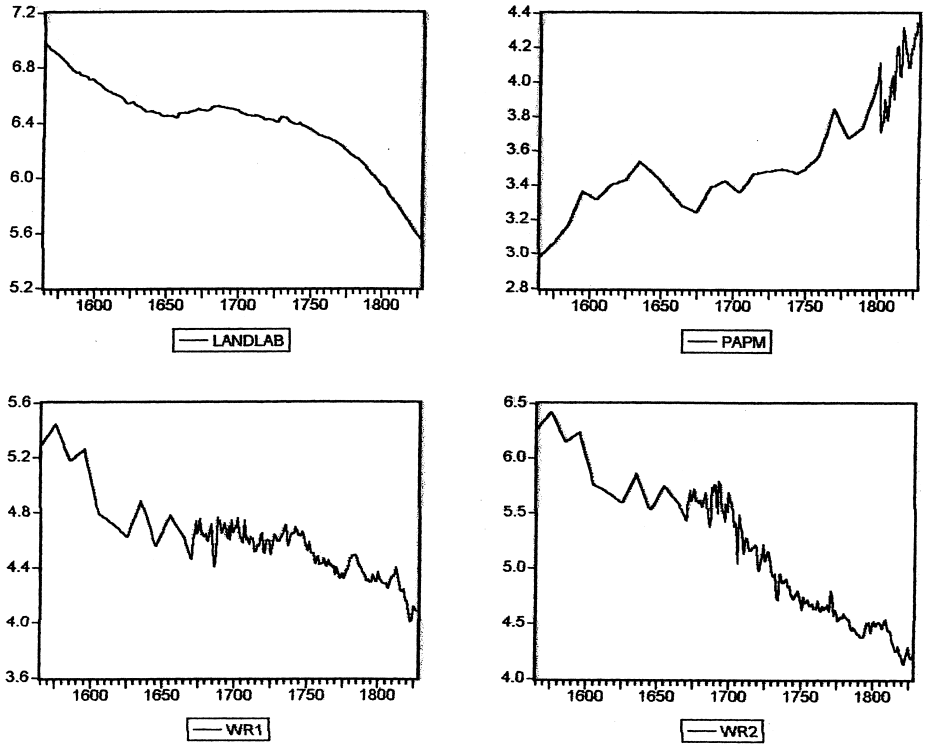

Figure 8A. *Trends in land-labour ratios, wage-rental ratios, and relative prices of agricultural goods: England 1565–1828.*

rose steadily, while from the 1840s onwards the relative price of agricultural goods stopped increasing and, eventually, started falling in response to cheap food imports from Russia and the New World. The reversal in distributional trends is striking. It certainly does look as though a regime switch took place from one in which wage-rental ratios were determined mostly by domestic endowments (and thus declined, as land-labour ratios fell at home) to one in which wage-rental ratios were determined mostly by trade with land-abundant economies (and thus rose, despite the fact that land-labour ratios at home kept falling). Can we show with econometrics that while the closed economy model is the relevant one before the 1820s, the open economy model is the relevant one thereafter?

Table 1 reports correlation coefficients between our three variables in each of the two periods, and they are certainly consistent with our hypotheses. In the earlier period, the land-labour ratio was strongly and positively correlated with the wage-rental ratio (0.889), and strongly and negatively correlated with the relative price of agricultural goods (−0.956), precisely as closed economy theory suggests. In the later period, prices and endowments are uncorrelated, as they should be in an open economy; what is now a

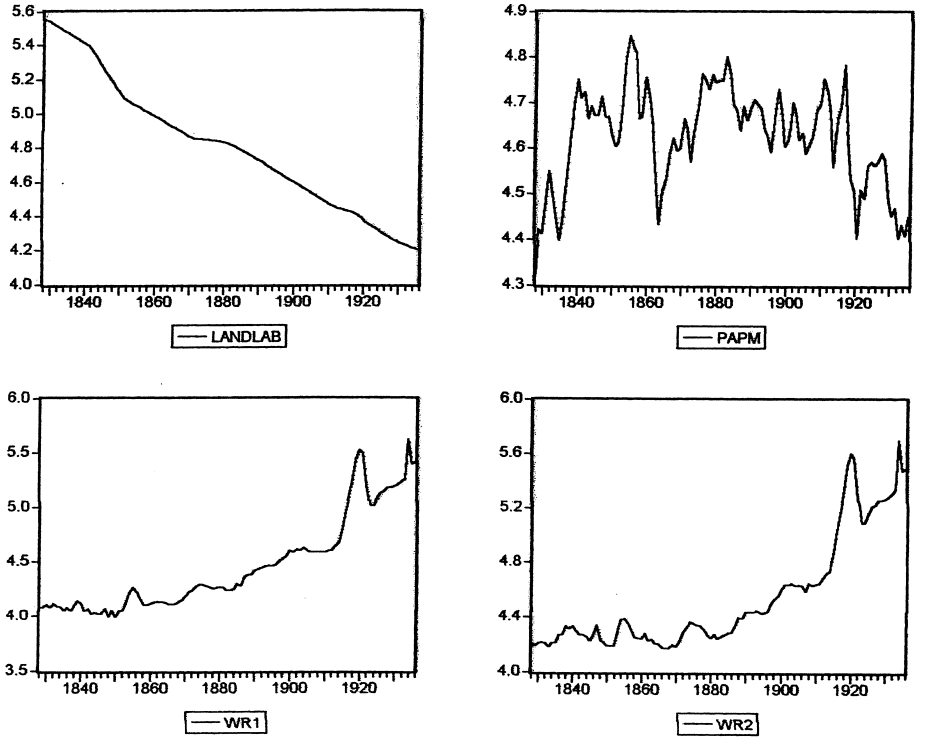

Figure 8B. *Trends in land-labour ratios, wage-rental ratios, and relative prices of agricultural goods: England 1828–1936.*

Table 1. *Correlation coefficients, 1565–1936.*

Panel A. 1565–1828	PAPM	WR	LANDLAB
PAPM	1.000	−0.829	−0.956
WR	−0.829	1.000	0.889
LANDLAB	−0.956	0.889	1.000
Panel B. 1828–1936			
PAPM	1.00	−0.34	0.058
WR	−0.34	1.00	−0.859
LANDLAB	0.058	−0.859	1.00

Source: See text.

negative correlation between endowments and wage-rental ratios (−0.859) seems puzzling, a bit of unexpected over-kill in favour of our hypothesis (but the puzzle disappears when we present our multiple regression results in Table 3 below).

In a background paper, we estimate VARs incorporating these three variables, as well as a time trend, for each of the two subperiods (O'Rourke and Williamson 1999b). The results were consistent with the closed economy prediction that endowments were driving commodity and factor prices prior to the early nineteenth century. In the later period, none of these variables were significantly related to each other, indicating that the earlier relationships had broken down. These VARs were then used to perform Granger-causality tests. The most important hypothesis tested concerned the impact of endowments on prices, and it was confirmed: endowments Granger-caused prices in the earlier period, but not in the later.

All variables appeared to be integrated of order one, and we next proceeded to see if there were cointegrating relationships linking them. We first estimated these relationships directly, using OLS methods. Table 2 reports the estimates which would obtain in a closed economy, in which both commodity and factor prices were driven by endowments. The results for the pre-1828 period indicate an elasticity of prices with respect to (hereafter w.r.t.) endowments of −0.882 [equation (1)], and an elasticity of wage-rental ratios w.r.t. endowments of 0.907 [equation (3)]. Unfortunately, when the residuals from these equations were inspected, the hypothesis that

Table 2. *Closed-economy theory: the determinants of commodity and factor prices, 1565–1936.*

	(1)	(2)	(3)	(4)	(5)
LHS variable	PAPM	PAPM	WR1	PAPM	WR1
Time period	1565–1828	1565–1800	1565–1828	1828–1936	1828–1936
C	9.152	9.048	−1.153	4.545	9.148
	(85.722)	(59.158)	(−6.234)	(33.606)	(33.857)
LANDLAB	−0.882	−0.866	0.907	0.017	−0.973
	(−52.921)	(−36.680)	(31.422)	(0.598)	(−17.390)
R-squared	0.914	0.852	0.790	0.003	0.739
Adjusted R-squared	0.914	0.851	0.789	−0.006	0.736
SE of regression	0.081	0.076	0.140	0.111	0.222
Sum squared resid.	1.708	1.335	5.128	1.327	5.295
Log likelihood	290.753	275.775	145.631	85.615	10.172
Durbin-Watson stat.	0.268	0.022	0.116	0.267	0.103
Mean dependent var.	3.508	3.441	4.653	4.625	4.464
SD dependent var.	0.276	0.196	0.305	0.111	0.433
Akaike info criterion	−2.188	−2.320	−1.088	−1.534	−0.150
Schwarz criterion	−2.160	−2.291	−1.061	−1.485	−0.101
F-statistic	2800.645	1345.412	987.336	0.358	302.421
Prob(F-statistic)	0.000	0.000	0.000	0.551	0.000
Included observations	264	236	264	109	109

Source: See text.

the series contained a unit root could not be rejected (albeit by a narrow margin). In the case of prices, this failure may have been due to the impact of the Napoleonic Wars; when the relationship was re-estimated for the sub-period 1565–1800, the elasticity of prices w.r.t. endowments was −0.866 [Table 2, equation (2)], and the Engle-Granger procedure shows PAPM and LANDLAB to have been cointegrated. For the 1828–1936 period, simple OLS regressions show no relationship at all between prices and endowments, consistent with our predictions [equation (4)], while wage-rental ratios are now negatively related to endowments [equation (5)]. Clearly, the structure of the economy was *very* different after 1828 than before: while the closed economy model fits the facts very well prior to 1828, it fits them very badly thereafter.

The wage-rental ratio should be a function of endowments, technology and prices in an open economy, with prices being exogenous. Land and labour were the most important factors of production in pre-industrial periods, but by the nineteenth century capital began to add its impact on economy-wide wages, eventually dominating land in importance. Any post-1828 equation expressing wage-rental ratios as a function of land-labour ratios and commodity prices without in addition including capital-labour ratios and technology would be mis-specified.[6] Since capital-intensity and total factor productivity were both trending up after the 1820s, we estimated the following equation (all variables in logarithms):

$$WR = a_1 + a_2 LANDLAB + a_3 PAPM + a_4 trend \qquad (1)$$

where the trend term is a proxy for the combined impact of capital deepening and technological change. The results for both periods are given in Table 3. They show that the open economy model fits the post-1828 facts extremely well, but that it fits the pre-1828 facts extremely poorly (prices have the wrong sign in the regression). Table 3 also shows that there was a dramatic switch in the impact of capital-deepening and technical change on the wage-rental ratio after 1828. Moreover, when the residuals from the post-1828 regression were examined, the null hypothesis of a unit root in the series was rejected at the 1 per cent confidence level, indicating that the estimated equation constituted a cointegrating relationship between the variables.

We conclude that there is very strong evidence for our contention that the closed economy model fits the facts before 1828 but not afterwards, while the open economy model fits the facts after 1828 but not before. If the world historian is looking for a globalisation big bang, she will find it in the 1820s, not in the 1490s.

[6] O'Rourke, Taylor and Williamson (1996). Technology, as proxied by the Solow residual, was found to be positively related to the wage-rental ratio in Europe, suggesting that technological change was indeed labour-using, as historians had previously suggested.

Table 3. *Open-economy theory: the determinants of the wage-rental ratio, 1565–1936.*

Time period	(1) 1565–1828	(2) 1828–1936
C	0.053	−4.500
	(0.047)	(−1.691)
LANDLAB	0.666	1.013
	(5.481)	(3.706)
PAPM	0.158	−0.770
	(1.560)	(−5.496)
TREND	−0.002	0.024
	(−6.092)	(7.268)
R-squared	0.821	0.882
Adjusted R-squared	0.819	0.879
SE of regression	0.130	0.151
Sum squared resid.	4.372	2.384
Log likelihood	166.686	53.659
Durbin-Watson stat.	0.134	0.321
Mean dependent var.	4.653	4.464
SD dependent var.	0.305	0.433
Akaike info criterion	−1.232	−0.911
Schwarz criterion	−1.178	−0.812
F-statistic	398.067	262.437
Prob(F-statistic)	0.000	0.000
Included observations	264	109

Source: See text.

6. Political economy evidence and concluding remarks

We do not deny the long-run importance of the Voyages of Discovery to world economic history. After all, it generated a transfer of technology, plants, animals and diseases on an enormous scale, never seen before or since. But the *immediate* impact of Columbus and da Gama on trade and globalisation is another matter. For the economic implications of the Voyages of Discovery to be fully realised required the peopling of frontiers and the application of European capital to those frontiers. But, more importantly, it also required the breakdown of monopolies controlling long distance trade, and a technological revolution making possible the movement of bulk commodities between continents so much more cheaply that domestic prices, and domestic resource allocation, were significantly affected by international trade. It is our contention that these fundamental conditions were not satisfied prior to the early nineteenth century. They were satisfied after the early nineteenth century.

Standard Heckscher-Ohlin trade theory, used so commonly by economists, suggests that if globalisation does not affect wage-rental ratios, relative returns

to sector-specific capital and other income distribution measures, then it cannot have a significant impact on the structure of production or on economic welfare. By this standard, the results in Section 5 suggest that the nineteenth century international economy was globalised in a way which the world economy of earlier centuries never was. Our priors were that we would arrive at such results because pre-nineteenth century trade was overwhelmingly in 'non-competing' goods. But the data presented in section 3 suggests that there is a second reason for our results: even for non-competing goods, there is no convincing evidence of a widespread transport revolution before 1800, or of any inter-continental commodity price convergence. This poses an even more severe challenge for those who stress the continuity of the globalisation process over the past 500 years: the price data suggest a dramatic discontinuity in the early decades of the nineteenth century, associated with steamships, railroads, the demise of mercantilism, the rise of trade liberalisation and the disappearance of trading monopolies. There was little or no price convergence beforehand, but there was spectacular price convergence afterwards.

Important qualitative evidence coming from another source supports our view that it was only after the early nineteenth century that globalisation really took off. If globalisation is strong enough to have a potent effect on income distribution, then we should see intensive political battles over trade policy. As is well known, trade had a large impact on domestic politics in the nineteenth century, and the divisions to which it gave rise can largely be understood by Heckscher-Ohlin thinking, as Ronald Rogowski (1989) has shown so convincingly. Thus, free-trading slave and land owners in the cotton South opposed capitalists in the industrial North in the *ante-bellum* United States, free-trading labour and capital opposed protectionist landowners in mid-century Britain, and protectionist coalitions of land and capital opposed labour in Germany after 1879. The fact that trade policy frequently gave rise to major political debates, and that those debates seemed to evolve along class lines, is in itself powerful evidence of significant nineteenth century globalisation. The Heckscher-Ohlin model suggests that trade produces losers as well as winners, and by the end of the nineteenth century many of those losers were able to gain protection from accommodating legislators. History shows that globalisation backlash could sometimes be quite significant.[7]

The politics of trade were very different before 1800 when conflicts were far more likely to erupt between nations rather than within nations. Again

[7] See O'Rourke (1997) on European grain tariffs and Williamson (1997) on New World manufacturing protection and immigration restrictions. What remains to be written is a comparative history of the political economy of globalisation backlash in Latin America, the Mediterranean and Asia, an agenda that might be called 'dealing with de-industrialisation'.

this is consistent with the hypothesis of a globalisation big bang occurring only in the early nineteenth century. If trade had no large distributional effects within domestic economies, then the various classes in society had no great incentive to lobby for protection or free trade. If trade was still largely characterised by monopoly rents, then the key political question for (mercantilist) statesmen was who would get those rents; their own monopolists, or those of other nations? Thus, to take the best known example, the sixteenth and seventeenth centuries saw violent conflict over who would control the South East Asian spice trade. But a world in which monopoly rents, mercantilist intervention, and better warships played such an important part in intercontinental trade was not a world whose economy would be considered globalised by today's standards.

Globalisation did not begin 5,000 years ago, or even 500 years ago. It began in the early nineteenth century. In that sense, it is a very modern phenomenon.

Acknowledgments

The authors acknowledge with pleasure the excellent research assistance of Andrea Cid, Matt Rosenberg, and, especially, Ximena Clark. We thank Greg Clark for providing us with data on British land rents. This article was improved by comments from Arne Bigsten, Kirti Chaudhuri, Don Davis, Ron Findlay, Andre Gunder Frank, Colm Harmon, Elhanan Helpman, Doug Irwin, Ron Jones, Lars Jonung, Paul Krugman, Bob Mundell, Anthony Murphy, Cormac Ó Gráda, Dick Sylla, Rodney Thom, participants at the Ohlin Conference (Stockholm, 14–16 October 1999), the economic historians at Copenhagen, Harvard and LSE, and the referees for this journal. Williamson also acknowledges generous research support from the National Science Foundation SBR–9505656. The usual disclaimer applies.

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