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Globalization and the Great Divergence: terms of trade booms, volatility and the poor periphery, 1782–1913

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W. Arthur Lewis argued that a new international economic order emerged between 1870 and 1913, and that global terms of trade forces produced rising primary product specialization and de-industrialization in the poor periphery. More recently, modern economists argue that volatility reduces growth in the poor periphery. This article assesses these de-industrialization and volatility forces between 1782 and 1913 during the Great Divergence. First, it argues that the new economic order had been firmly established by 1870, and that the transition took place in the century before, not after. Second, evidence from 1870–1939 confirms that while terms of trade improvements raised long-run growth in the rich core, they did not do so in the poor periphery. Given that the secular terms of trade boom, and thus de-industrialization, was *much* bigger in the poor periphery before 1870 than after, one might plausibly infer that it might help explain the Great Divergence. Third, growth-reducing terms of trade volatility also contributed to the Great Divergence. Terms of trade volatility was much greater in the poor periphery than the core before 1870. It was still very big after 1870, certainly far bigger than in the core. Based on evidence drawn from 1870–2000, we know that such volatility lowers long-run growth in the poor periphery, and that the negative impact is big. Since terms of trade volatility in the poor periphery was even bigger before 1870, one might plausibly infer that it also helps explain the Great Divergence before 1870.

1. Globalization and the Great Divergence between core and periphery

The economic impact of the industrializing core on the poor periphery during the century before 1870 was carried by four dramatic global events: a world transport revolution, a liberal policy move in industrial Europe towards greater openness, an acceleration in GDP growth rates associated with the industrial revolution, and colonialism. The transport revolution in seaborne

trade connecting ports and in the railroads connecting ports to interiors helped integrate world commodity markets (O'Rourke and Williamson 1999, ch. 3; Shah Mohammed and Williamson 2004; Williamson 2005, chs. 2 and 3). While the previous literature may have exaggerated the impact of a transport revolution on ocean trade routes (Jacks 2006; Jacks and Pendakur 2007), it certainly did not overestimate the impact of the railroads on land routes (Keller and Shiue 2007). Since falling trade costs from all sources accounted for more than half of the trade boom between 1870 and 1914 (Jacks *et al.* 2008: 529), it must have accounted for even more than that before 1870 when the fall in transport costs was more rapid and the move to free trade was in full swing. In any case, it is clear that falling trade costs played a major role in fueling the trade boom between core and periphery, and that it created commodity price convergence for tradable goods between all world markets. By raising every country's export prices and lowering every country's import prices, it also contributed to a rise in every country's external terms of trade, especially, as it turned out, in the periphery. The move by the European industrial core toward more liberal commercial policy (Estevadeordal *et al.* 2003), a commitment to the gold standard (Meissner 2005) and perhaps even imperialism itself (Ferguson 2004; Mitchener and Weidenmier 2007) all made additional contributions to the world trade boom.

The accelerating growth in world GDP, led by industrializing Europe and its offshoots, was the second force driving the trade boom before 1870. The derived demand for industrial intermediates – like fuels, fibers, and metals – soared as manufacturing production led the way. Thus, as the European core and its offshoots raised industrial output shares, manufacturing output growth raced ahead of GDP growth. Rapid manufacturing productivity growth lowered costs and prices in the core, and by so doing generated a soaring derived demand for raw material intermediates. This event was reinforced in the core by accelerating GDP per capita growth and a high income elasticity of demand for luxury consumption goods, like meat, dairy products, fruit, tea and coffee. Since industrialization was driven by unbalanced productivity advance favoring manufacturing relative to agriculture and other natural-resource based activities (Clark *et al.* 2008), the relative price of manufactures fell everywhere, including the poor periphery where they were imported.

All three forces – liberal trade policy, transport revolutions and fast manufacturing-led growth – produced a positive, powerful and sustained terms of trade boom in the primary-product-producing periphery, an event that stretched over almost a century. As we shall see, some parts of the periphery had much greater terms of trade booms than others, and some reached a secular peak earlier than others, but all (except China and Cuba) underwent a secular terms of trade boom. Factor supply responses facilitated the periphery's response to these external demand shocks, carried by South–South migrations from labor-abundant (especially China and India) to labor-scarce

regions within the periphery, and by financial capital flows from the industrial core (especially Britain) to those same regions. That is, countries in the periphery increasingly specialized in one or two primary products, reduced their production of manufactures, and imported them in exchange.

Let me rephrase these events in a different way. Whether in terms of culture, geography or institutions, western Europe launched modern economic growth first, carried by rising productivity growth rates, especially in manufacturing. The economic leaders had to share these productivity gains with the rest of the world by absorbing a decline in the price of their manufactured exports. To the extent that the leaders could retain some of the productivity advance for themselves, and to the extent that the productivity advance also took place in their big non-tradable sectors, the terms of trade effect was hardly a big enough transfer for the periphery to keep up with the core. Even though trade made it possible for the periphery to share some of the fruits of the industrial revolution taking place in the core, an industrialization-driven Great Divergence still emerged. To add to the forces of divergence, globalization fostered de-industrialization (e.g. specialization) in the periphery so that, according to modern theory, growth rates in the periphery fell behind those in the core still further. In addition, globalization-induced specialization in primary products must have meant greater price volatility in the periphery, and thus, according to modern theory, even greater divergence in growth rates.

Eventually all these global forces abated. A protectionist backlash swept over continental Europe and Latin America (Williamson 2006a). The rate of decline in real transport costs along sea lanes slowed down before World War I, and then stabilized for the rest of the twentieth century (Hummels 1999; Shah Mohammed and Williamson 2004). Most of the railroad networks were completed before 1913. The rate of growth of manufacturing slowed down in the core as the transition to industrial maturity was completed there. As these forces abated, the resulting slowdown in primary product demand growth was reinforced by resource-saving innovations in the industrial core, induced, in large part, by those high and rising primary product prices during the century-long terms of trade boom. Thus, the secular boom faded, eventually turning into a twentieth-century secular bust during the interwar slowdown and the great depression of the 1930s. Exactly when and where the boom turned to bust depended, as we shall see, on export commodity specialization, but the terms of trade peaked somewhere between 1860 and 1913 throughout the poor periphery. Typically, that peak occurred very early in that half-century, rather than late, most often between the 1870s and 1890s. To repeat, the terms of trade in the periphery peaked *long* before the crash of the 1930s, in some cases seven decades earlier.

This article reports this terms of trade experience for 21 countries located everywhere around the poor periphery except sub-Saharan Africa (where the data are missing): the European periphery 1782–1913 (Italy, Portugal,

Russia, Spain), Latin America 1782–1913 (Argentina, Brazil, Chile, Cuba, Mexico, Venezuela), the Middle East 1796–1913 (Egypt, Ottoman Turkey, Levant), South Asia 1782–1913 (Ceylon, India), Southeast Asia 1782–1913 (Indonesia, Malaya, the Philippines, Siam) and East Asia 1782–1913 (China, Japan). I focus on the nineteenth-century secular boom since so much has already been written about the subsequent twentieth-century bust, the latter triggered by the writings of Raul Prebisch (1950) and Hans Singer (1950) more than half a century ago. Furthermore, I focus on the period from the 1780s to the 1870s, after which the boom had pretty much run its course. This focus is in sharp contrast with that of W. Arthur Lewis whose famous writings in the 1970s (Lewis 1978a, 1978b) dealt almost exclusively with the 1870–1913 period. I argue here that his new international economic order had been established long before the late nineteenth century. Indeed, there were signs of a *retreat* from Lewis's new international economic order between the 1870s and World War I. I also argue that the secular terms of trade boom must have contributed far more to the Great Divergence before 1870 than after. Having established that the secular terms of trade boom in the periphery led to de-industrialization, slow growth and GDP per capita divergence between it and the core, I then measure the extent to which terms of trade volatility did the same. Terms of trade volatility was *much* greater in the poor periphery than in the rich core between 1820 and World War I. Since modern development economists have established that volatility retards growth, and since external price volatility in the poor periphery was far greater before 1870 than at any time between 1870 and 1940, I argue that these forces must have contributed even more to the Great Divergence before 1870 than after.

2. The Great Divergence

All economic historians agree that a wide income gap between the rich European core and the poor periphery opened up before 1913. Economic historians do not agree, however, as to *when* it opened up, and *why*. My purpose is not to engage in the *when* debate, but rather only to remind us just how much the periphery lagged behind during this first global century, and to suggest how importantly globalization forces are likely to have contributed to it. Table 1 uses Angus Maddison's (1995) GDP per capita estimates to document the Great Divergence after 1820, and real wage data are used to extend his series backwards to 1775. Between 1775 and 1913, the economic gap between core and periphery widened greatly: southern Europe income per capita fell from 75.2 to 47.3 percent of western Europe, so the gap rose from about 25 to 53 percent; the eastern Europe gap rose from 30 to 58 percent; Latin America from about 25 to 59 percent; Asia from about 44 to 80 percent; and Africa from about 54 to 85 percent. Note that the gap rose much more *before* 1870 than after: on average, the poor periphery gap rose

Table 1. *The Great Divergence: income per capita gaps 1775–1913*

	1775	1820	1870	1913
Western Europe	100	100	100	100
Southern Europe	75.2	62.4	52.7	47.3
Eastern Europe	70.0	58.1	48.8	42.0
Latin America	75.2	55.3	37.9	40.9
Asia	56.4	42.6	27.5	20.0
Africa	46.1	34.8	22.7	15.5
Poor periphery average	64.6	50.6	37.9	33.1

Notes and sources 1820–1913: The underlying data are GDP per capita in 1990 Geary-Khamis dollars, and from Maddison (1995, table E-3).
Notes and sources 1775: The projection backwards to 1775 is based on unskilled real daily wages, and is an 1750–99 average. The southern and eastern Europe trends 1775–1820 are assumed to be the same, and the African trend 1775–1820 is assumed to replicate Asia. For Europe and Asia (India), Broadberry and Gupta (2006, table 1, panel A; table 6, panel B). For Latin America (Mexico), Dobado, Gómez and Williamson (2008, appendix table). The poor periphery average is unweighted.

by about 27 percentage points up to 1870, but only by about 5 percentage points thereafter. Thus, Table 1 informs us that the forces causing the Great Divergence were never constant, but rather that they were *much* greater before 1870 than after.

I stress the point that the Great Divergence was much more dramatic before 1870 than after since it is consistent with the fact that globalization-induced terms of trade forces in the poor periphery – to be discussed below – were also much more powerful before 1870 than after. Furthermore, the modern debate over 'fundamental' growth determinants like culture (Landes 1998; Clark 2007), geography (Diamond 1997; Sachs 2001; Easterly and Levine 2003) and institutions (North and Weingast 1989; Acemoglu, Johnson and Robinson 2005), in contributing to the Great Divergence, cannot speak to variance in its intensity over time. Indeed, William Easterly and his collaborators (1993) pointed out some time ago that the contending 'fundamental' growth determinants – culture, geography and institutions – exhibit far more historical persistence than the late twentieth-century growth rates they are supposed to explain. What is true for the late twentieth century is even truer for the nineteenth century. Since globalization forces were variable between 1782 and 1913 while the fundamentals were not, the former have a much better chance of explaining the timing and magnitude of the Great Divergence than the latter.

3. The secular terms of trade boom in the poor periphery, 1782–1913

A word about the terms of trade data

While the appendix supplies the details, this section offers a brief commentary on the heterogeneous character and limitations of the net barter

terms of trade data that underlie the analysis. Twenty-one important regions in the periphery offer terms of trade estimates from points well before 1865, some deep into the eighteenth century, thus covering the era prior to the mid–late nineteenth century when, typically, the relative price of primary products reached their peak. In every case but Argentina and Mexico, these new series are taken up to 1913 and replace the 1865–1939 series used previously in my work with Chris Blattman and Jason Hwang (hereafter BHW; Blattman *et al.* 2007). For Argentina and Mexico, the new series are linked to the BHW series at 1870.

For the purposes of this article, the best measure of the terms of trade is to construct a weighted average of export and import prices quoted in local markets, *including* home import duties, thus capturing the impact of relative prices on the local market. The weights, of course, should be constructed from the export and import commodity mix for the country in question. Unfortunately, the data are sometimes unavailable for such estimates – what I call the worst case scenario. It is easy enough even in those cases to get the export prices (and the weights) for every region in our sample. However, these prices are rarely quoted in the local market, but rather in destination ports, such as London or New York. To the extent that transport revolutions caused price convergence between exporter and importer, export prices quoted in core import markets will understate the rise in the periphery country's terms of trade. On this score alone, any boom in a periphery country's terms of trade, where it is based on the worst case scenario estimation, was actually somewhat bigger than that measured. However, since the terms of trade booms are, as we shall see, so big, these worst case scenario flaws on the export side are unlikely to matter much for the analysis. Things are a bit less accommodating on the import side in the worst case scenario. As with export prices in the worst case scenario, import prices are also taken from export markets in the industrial core. Since transport revolutions reduced freight costs on the outward leg from the industrial core much less (they were high-value, low-bulk products: see Shah Mohammed and Williamson 2004), the periphery import price estimates are less flawed in the worst case scenario than are the export price estimates. The more serious problem on the import side is the difficulty of documenting the import mix for many of the periphery countries, especially as we move earlier in the nineteenth century. The appendix describes the proxies used to solve this worse case scenario problem.

Having pointed out the flaws in the worst case scenario, it should be stressed that there are only 6 of these (out of 21). The following 15 are taken from country-specific sources, which do an excellent job in constructing estimates which come close to the ideal measure: Argentina 1810–1870 (Newland 1998); Brazil 1826–1913 (Prados de la Escosura 2006); Chile 1810–1913 (Braun *et al.* 2000); Cuba 1826–1913 (Prados de la Escosura 2006); Egypt 1796–1913 (Williamson and Yousef 2008); India

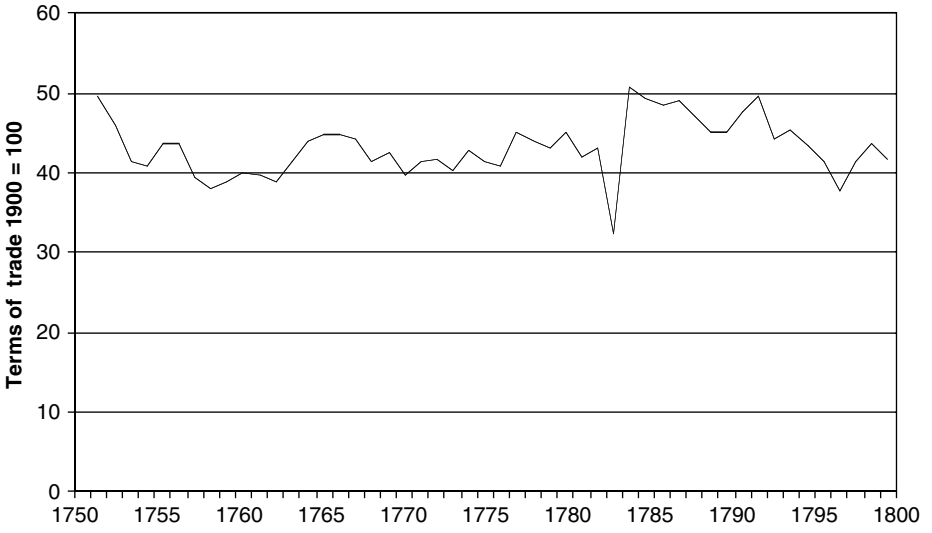

Figure 1. *Eighteenth-century terms of trade secular stability in the poor periphery*

1800–1913 (Clingingsmith and Williamson 2005); Indonesia 1825–1913 (Korthals 1994); Japan 1857–1913 (Miyamoto *et al.* 1965; Yamazawa and Yamamoto 1979); Levant 1839–1913 (Issawi 1988); Malaya 1882–1913 (Huff and Caggiano 2007); Mexico 1751–1870 (Dobado *et al.* 2008); Ottoman Turkey 1800–1913 (Pamuk and Williamson 2008); Portugal 1842–1913 (Lains 1995); Spain 1750–1913 (see Appendix); and Venezuela 1830–1913 (Baptista 1997). The worst case scenarios apply to Italy 1817–1913 (Glazier *et al.* 1975) and the remaining five (see Appendix): Ceylon 1782–1913; China 1782–1913; the Philippines 1782–1913; Russia 1782–1913; and Siam 1782–1913.

4. The big picture: stability, boom and bust

Although the number of countries underlying the poor periphery average is limited for most of the eighteenth century,[1] what we do have reveals no trend in the net barter terms of trade, that is, in the ratio of the poor periphery's average export price to its average import price. The averages are calculated so that the price of each commodity exported or imported is weighted by the importance of that traded commodity in the country's total exports or imports. Furthermore, the poor periphery average is calculated using fixed country 1870 population weights. The resulting series plotted in Figure 1

[1] Until the 1780s, I have only been able to find long time series on the terms of trade in the poor periphery for Mexico and Spain. See Appendix Part 2.

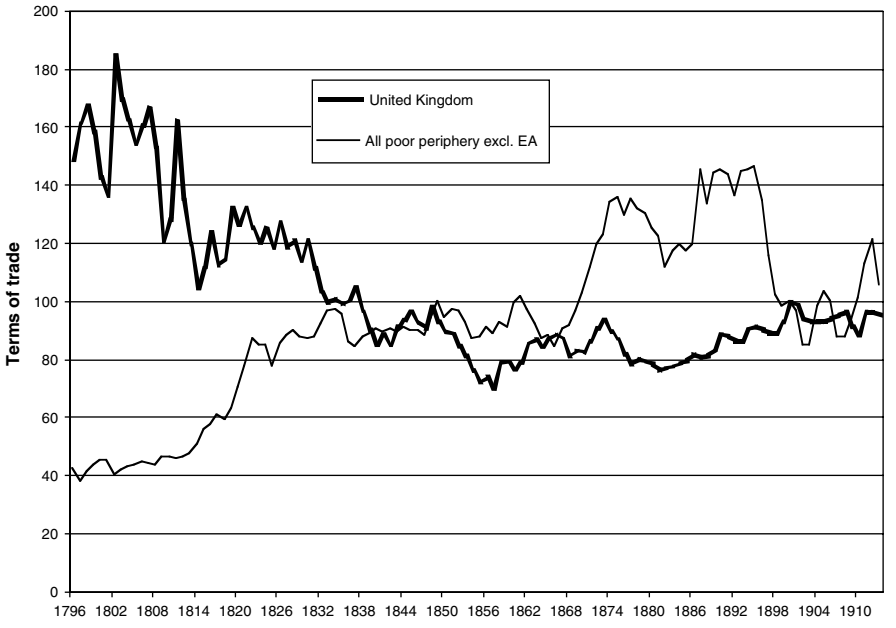

Figure 2. *United Kingdom versus the poor periphery: net barter terms of trade 1796–1913*

is certainly volatile, but there is no long-run trend. This is consistent with a world still waiting for the industrial revolution, the transport revolution, peace in Europe, liberal trade policy and a world trade boom.

Figure 2 describes quite a different century. Excluding China and the rest of East Asia (more on that below), the terms of trade in the poor periphery soared from the late eighteenth century to the late 1880s and early 1890s, after which it underwent a decline up to 1913, before starting the interwar collapse about which so much has been written. The timing and the magnitude of the boom up to the late 1860s and early 1870s pretty much replicates – but in the opposite direction – the decline in the British terms of trade over the same period. The secular price boom was huge in the poor periphery: between the half-decades 1796–1800 and 1856–1860, the terms of trade increased by almost two and a half times, or at an annual rate of 1.5 percent, a rate which was vastly greater than per capita income growth in the poor periphery (0.1 percent per annum, Asia 1820–70; Maddison 1995: p. 24), and even greater than per capita income growth in Britain (1.2 percent per annum, United Kingdom 1820–70: Maddison 1995; p. 23).

A rise in the primary-product specializing country's terms of trade implied, of course, a fall in the relative price of imported manufactures. And the decline in that price implied de-industrialization. When Lewis published his now-famous *The Evolution of the International Economic Order* in 1978 (based

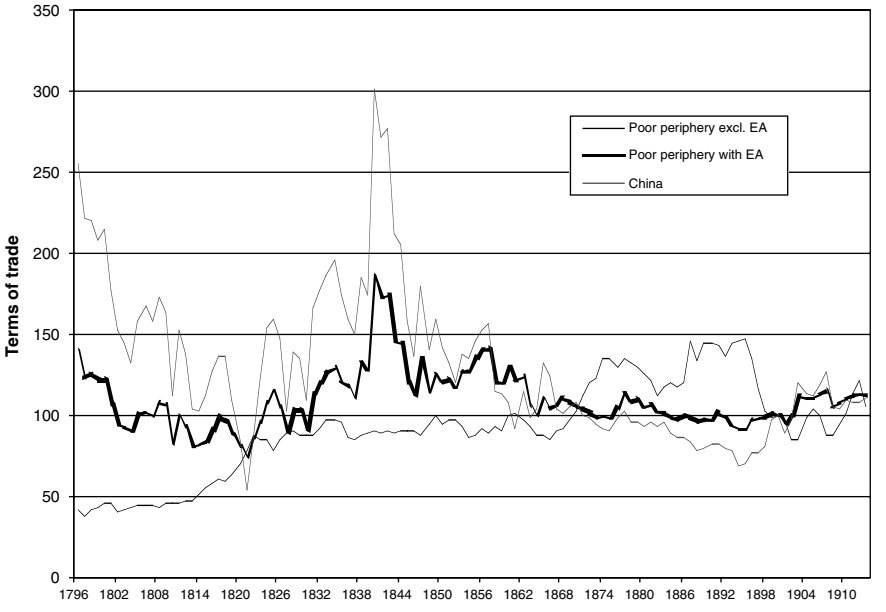

Figure 3. *Chinese exceptionalism: net barter terms of trade in the poor periphery 1796–1913 with and without East Asia*

on his 1977 Janeway Lectures), he placed his emphasis on 'the second half of the nineteenth century' (1978a, p. 14). But if we are looking for the Dutch disease forces that caused de-industrialization in the poor periphery – the same forces that helped create Lewis's new international economic order – the century *before* 1870 is the place to look, not after.

5. Chinese and East Asian *exceptionalism*

Not every part of the poor periphery followed the average since what a region traded mattered.[2] The best example of this is the biggest country in our sample, China. Figure 3 plots the terms of trade for China, for the poor periphery with East Asia (and thus China[3]) included, and for the poor periphery without it. The difference is astounding. First, China did not undergo a terms of trade boom over the century before 1913, but rather underwent a secular slump. Second, as the rest of the periphery began the

[2] Carlos Diaz-Alejandro (1984) made this point some time ago, and called it the 'commodity lottery'.

[3] The other member of the East Asian sample is Japan, but it does not enter the sample until 1857. Thus, all of the differences between the series with and without East Asia can be attributed to China before the late 1850s. In the second half of the century, the population weight for China is so huge it still dominates the East Asian terms of trade trends.

boom between 1796 and 1821, China underwent its first big *collapse*, with its terms of trade falling to one-fifth (sic!) of the 1796 level. Third, when China finally joined the boom taking place in the rest of the periphery, it was very brief since its terms of trade peaked out much earlier than the rest, in 1840, after only a two-decade boom. Following the early 1860s, China underwent the same slow secular decline in its terms of trade that was common across much of the poor periphery.[4] China's terms of trade *exceptionalism* is, of course, driven by its unusual country-specific mix of imports and exports. On the import side, what distinguished China from the rest of the periphery was opium. The price of imported opium rose sharply from the 1780s to the 1820s and it maintained those high (but volatile) levels until the 1880s (Clingingsmith and Williamson 2008).[5] Since opium imports rose from about 30 to 50 percent of total Chinese imports over the period, the rise in the opium price helped push China's terms of trade downwards, and in a direction opposite to that of the rest of the periphery. Reinforcing that secular fall in China's terms of trade was the fact that it also exported the 'wrong' products since the price of silk, cotton and tea all fell dramatically over the century between the 1780s and 1880s, by 60, 71 and 79 percent, respectively (Mulhall 1892, pp. 471–8).[6] Chinese *exceptionalism* indeed.

While China was certainly big enough to dominate East Asian trends, it should be pointed out that Japan was exceptional as well. First, it remained closed to world trade until 1857, so that there is no terms of trade trend worth reporting up to that time. Second, when Japan was forced to go open by American gunships, it underwent the biggest terms of trade boom by far, just when the rest of the poor periphery had pretty much completed its secular boom. East Asian *exceptionalism* indeed.

6. Poor periphery variance around the average

While each region in the poor periphery had much the same import mix (except for China and its opium), they had very different export mixes. Endowments and comparative advantage dictated the export mix, and different commodity price behavior implied different magnitudes during the secular boom, as well as different timing in its peak. Figures 4–10 document

[4] It should be noted that one other country, Cuba, showed 'exceptional' terms of trade experience. The Cuban terms of trade trend is not plotted in Figure 6, but it *fell* by 49 percent between 1826 and 1860, and by 50 percent up to 1885–90. The source of the decline lay, of course, with sugar prices.

[5] I am not suggesting here that the price of opium was exogenous to the Chinese market. Indeed, rising Chinese demand helped account for the price boom.

[6] To repeat the previous footnote, I am not suggesting that the price of silk and tea were exogenous to China. Indeed, China was a major supplier of both to world markets.

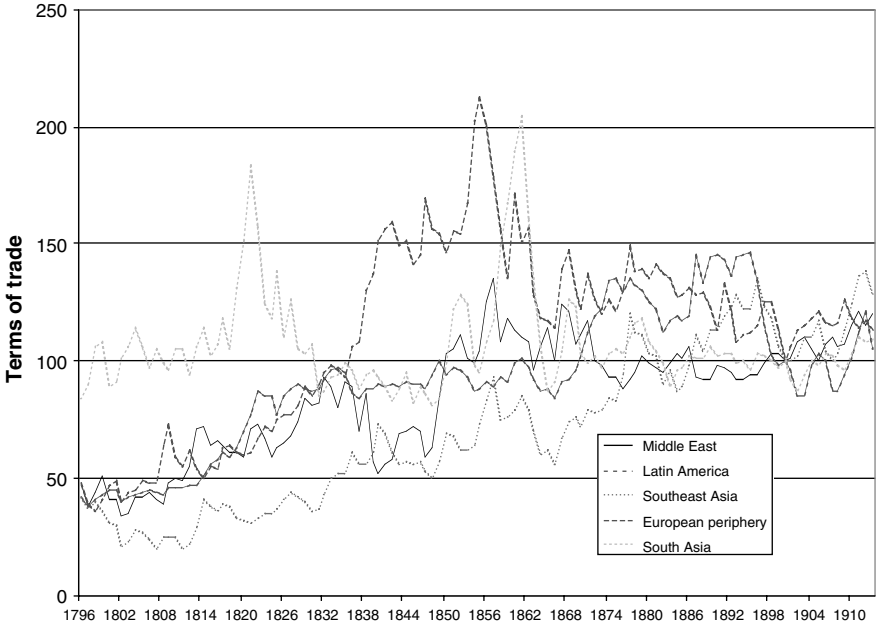

Figure 4. *The poor periphery: net barter terms of trade 1796–1913*

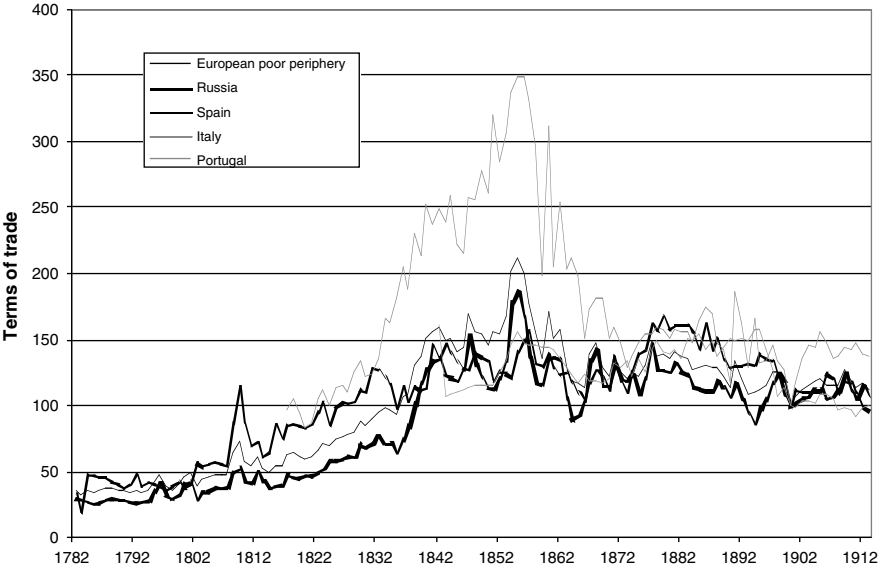

Figure 5. *European poor periphery: net barter terms of trade 1782–1913*

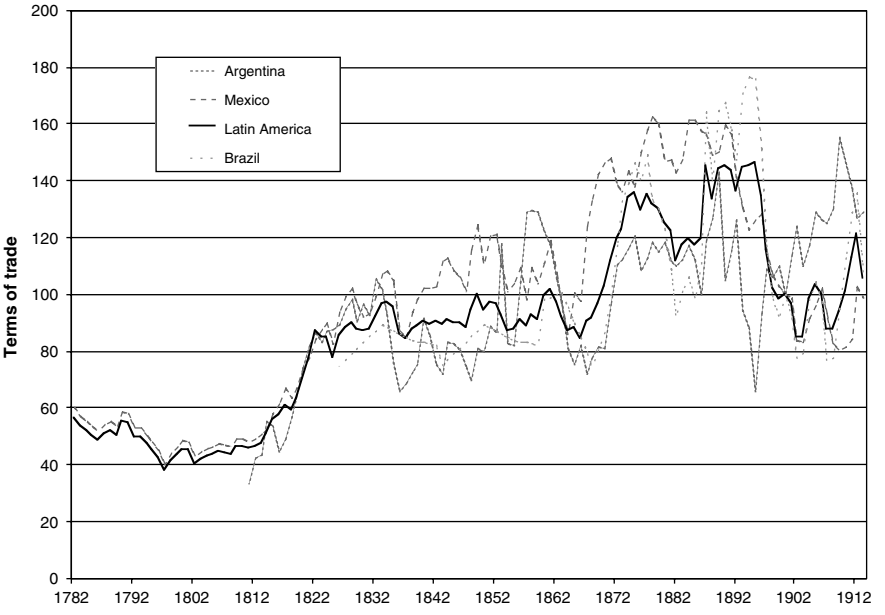

Figure 6. *Latin America: net barter terms of trade 1782–1913*

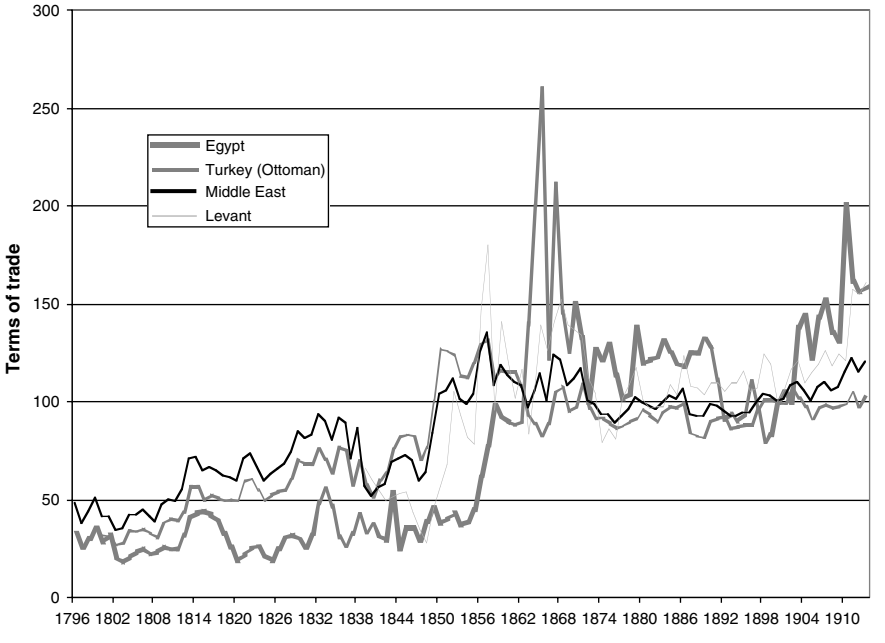

Figure 7. *Middle East: net barter terms of trade 1796–1913*

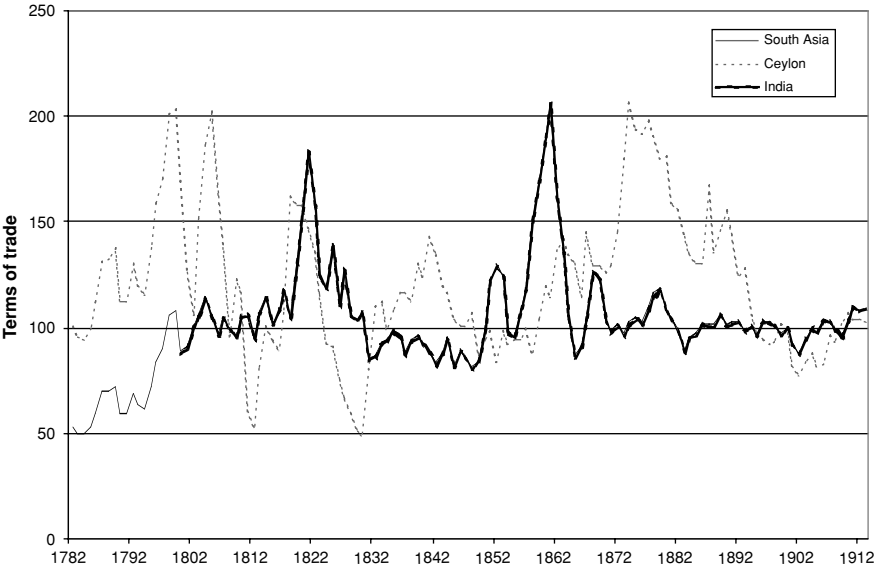

Figure 8. *South Asia: net barter terms of trade 1782–1913*

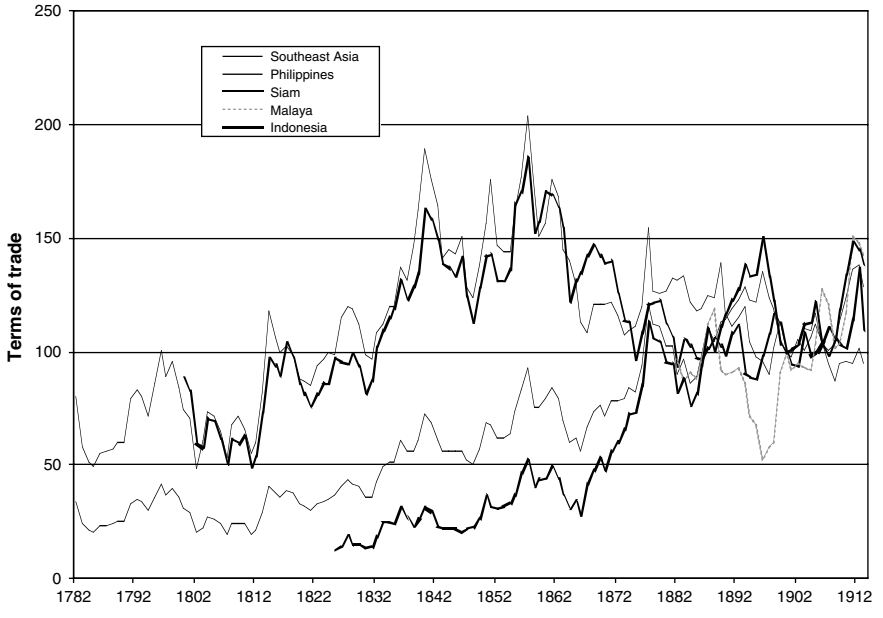

Figure 9. *Southeast Asia: net barter terms of trade 1782–1913*

terms of trade performance in each of the six poor periphery regions, some starting as early as 1782. The regional time series are constructed as a fixed 1870 population-weighted average of the region's countries (listed above: the European periphery four, the Latin American eight, the Middle East three, the South Asian two, the Southeast Asian four and the East Asian two).

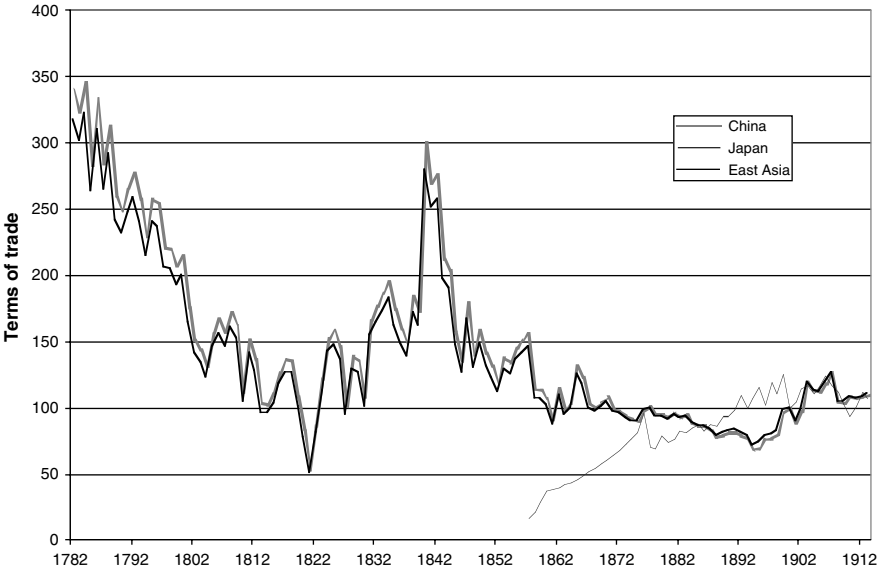

Figure 10. *East Asia: net barter terms of trade 1782–1913*

Table 2 and Figure 4 summarize the magnitude of the boom and its length (or peak) by region and by major country members, making a comparative assessment possible.

European poor periphery 1782–1913. Figure 4 and 5 and Table 2 suggest that the shape of the secular boom and bust in the European periphery was pretty much like that of the overall poor periphery average, with peaks very close together (1855 versus 1860). However, the *magnitude* of the booms certainly differed. The terms of trade boom in the European periphery was *much* greater than the average (2.4 versus 1.4 percent per annum), especially for Italy and Russia. This was also true of the century-long boom up to 1885–90 (1.2 versus 0.7 percent per annum). As we suggest below, these powerful Dutch disease effects may help explain why the industrial revolution was slow to spread from the core to the European east and south.

Latin America 1782–1913. Figures 4 and 6 and Table 2 report that Latin America also deviated significantly from the poor periphery average, but on the down side. The terms of trade boom up to 1860 was much more modest in Latin America. Indeed, there was very little change at all in the Latin American terms of trade between about 1830 and 1870. At least the new Latin America republics did not have to deal with global de-industrialization forces during their 'lost decades' of poor growth when violence and political instability were already doing enough economic damage (Bates, Coatsworth and Williamson 2007; Williamson 2007). Still, the Latin American terms of trade boom lasted far longer (1895) than was true for the average periphery region (1860), more than three decades longer. The more modest early

Table 2. *Terms of trade boom across the poor periphery: timing and magnitude*

Region	Starting year in the series	Peak year	Annual growth rate between half-decades start to peak (%)	Annual growth rate between half-decades start to 1886–90 (%)
All periphery excl. EA	1796	1860	1.431	0.726
European periphery	1782	1855	2.434	1.234
Latin America	1782	1895	0.873	0.851
Middle East	1796	1857	1.683	0.872
South Asia	1782	1861	0.904	0.037
Southeast Asia	1782	1896	1.423	1.423
East Asia	1782	None	NA	−2.119
European periphery	1782	1855	2.434	1.234
Italy	1817	1855	3.619	0.697
Russia	1782	1855	2.475	1.335
Spain	1782	1879	1.505	1.264
Latin America	1782	1895	0.873	0.851
Argentina	1811	1909	1.165	1.284
Brazil	1826	1894	1.115	1.067
Chile	1810	1906	0.966	0.140
Cuba	1826	None	NA	−1.803
Mexico	1782	1878	1.096	0.989
Venezuela	1830	1895	0.692	0.677
Middle East	1796	1857	1.683	0.872
Egypt	1796	1865	2.721	1.571
Ottoman Turkey	1800	1857	2.548	1.233
South Asia	1800	1861	0.904	0.037
Ceylon	1782	1874	0.670	0.366
India	1800	1861	0.932	0.024
Southeast Asia	1782	1896	1.423	1.423
Indonesia	1825	1896	3.294	3.335
Philippines	1782	1857	1.480	0.720
Siam	1800	1857	1.534	0.397
East Asia	1782	None	NA	−2.119
China	1782	None	NA	−2.342

Notes: The following countries are excluded from the table's detail since their series begin too late (starting date in parentheses): Portugal (1842), Columbia (1865), Peru (1865), Venezuela (1830), Levant (1839), Malaysia (1882) and Japan (1857). These country observations were used, however, when constructing the regional aggregates and the All Periphery aggregate. Where it says 'start', the calculation is the average of the first five years. Where it says 'peak', the calculation is for the five years centered on the peak year. The regional and all the periphery averages are weighted by 1870 population.

boom in Latin America and its great length about balanced out, such that the century-long boom was much the same as in the average poor periphery region (0.9 versus 0.7 percent per annum up to 1885–90). To summarize, de-industrialization forces were very weak in Latin America during its

lost decades, when they were strong everywhere else in the poor periphery; and they were very strong during its *belle époque*,[7] when they were weak everywhere else in the poor periphery.

Middle East 1796–1913. Figures 4 and 7 and Table 2 document that the terms of trade facing the Middle East were pretty much the same as for the average poor periphery: the peak was about the same (1857 versus 1860), and the magnitude of the boom was similar (1.7 versus 1.4 percent per annum), although it was much more dramatic for Egypt and Ottoman Turkey (2.7 and 2.5 percent per annum) than it was in the Levant.[8] The magnitude of the century-long boom to 1885–90 was also similar between the Middle East and the periphery average (0.9 versus 0.7 percent per annum). In terms of the globalization price shock, the Middle East therefore seems to have been the most representative of the poor periphery.

South Asia 1782–1913. Our South Asia sample has only two observations, Ceylon and India, but the latter is so large that the South Asian weighted average lies on top of the India series in Figure 8. Like Latin America, India (and thus South Asia) had a very weak terms of trade boom up to mid-century.[9] The South Asian and the average periphery terms of trade (still excluding East Asia) peaked only one year apart (1861 versus 1860), but beyond that similarity there are only differences. The boom in South Asia up to 1861 was far weaker than the average (0.9 versus 1.4 percent per annum), and this was even more true over the century to 1885–90 (no growth versus 0.7 percent per annum). Indeed, all of that early growth in India's terms of trade took place up to the 1820s; after that decade, India exhibited great volatility (like the spike up to 1861) but no secular growth whatsoever. And, to repeat, there was no growth at all in India's terms of trade between 1800 and 1890. Like China, India was exceptional, an especially ironic finding given that the literature on nineteenth-century de-industrialization in British India has been the most copious and contentious by far, starting with the words of Karl Marx about the bones of the weavers bleaching on the plains of India (Roy 2000, 2002; Clingingsmith and Williamson 2008).

Southeast Asia 1782–1913. Like Latin America, the terms of trade boom in Southeast Asia persisted much longer, in this case to 1896, and the size of the century-long boom up to 1885–90 was much greater (1.4 versus 0.7 percent per annum). Yet there was immense variance within the region (Figure 9), much more than elsewhere in the poor periphery. For example, the terms

[7] Mexico is an exception. See Dobado, Gómez and Williamson (2008 forthcoming) and Williamson (2007).

[8] Levant is not shown in Table 2 since the series starts only with 1839.

[9] One explanation for the weak terms of trade boom is that India remained a gross (but not a net) exporter of cotton goods even when British factory textiles flooded India's domestic economy. Since cotton textiles influenced India's export prices, and since the latter were falling dramatically up to 1850, P_X/P_M did not enjoy quite the same boom in India that it did in the rest of the poor periphery.

of trade for Siam grew at only 0.4 percent per annum over the century up to 1885–90, but grew almost twice as fast in the Philippines (0.7 percent per annum), and more than eight times as fast in Indonesia (3.3 percent per annum). Due to its size, the latter dominates the regional weighted average.

East Asia 1782–1913. We have already discussed Chinese *exceptionalism*, but Figure 10 also highlights Japan's unusual experience. That is, having been forced by American gunboat diplomacy to go open in 1857, after centuries of autarchy, Japan underwent a textbook response (Bernhofen and Brown 2005): the price of importables collapsed, and the price of exportables soared. Thus, the terms of trade improved, and by a factor of six or more (sic!) between 1857 and 1913 (Huber 1971; Yasuba 1996).

7. The impact of the terms of trade on the Great Divergence: argument and post-1870 evidence

How did secular change and volatility of the terms of trade impact economic growth before 1913? Was the impact asymmetric between rich core and poor periphery? Can the behavior of the terms of trade in the poor periphery help explain the GDP per capita divergence over the long nineteenth century?

Chris Blattman, Jason Hwang and myself (Blattman, Hwang and Williamson 2007) recently used a 35-country data base to explore these questions for the 1870–1939 period. The sample contained 14 from the rich core and 21 from the poor periphery, and it covered about 90 percent of world population in 1900. The impact of secular change and volatility in the terms of trade was reported separately for the core and periphery, making it possible to test for the presence of any asymmetric impact between them. Asymmetry regarding secular impact was predicted by the following reasoning. To the extent that the periphery specialized in primary products, and to the extent that industry is a carrier of development, then positive price shocks reinforced specialization and caused de-industrialization in the periphery, offsetting partially or totally the short-run income gains yielded by the terms of trade improvement and the trade response. However, there should have been no such offset in the industrial core, but rather a reinforcement, since specialization in industrial products would have been strengthened there by any improvement in the terms of trade. Thus, the prediction was that while a secular terms of trade improvement unambiguously raised growth rates in the industrial core, it raised them less in the periphery, or not at all. The asymmetry hypothesis was strongly supported by evidence covering the seven decades after 1870. The core benefited from a secular increase in its terms of trade since it reinforced comparative advantage there, and helped stimulate additional industrialization, thus augmenting growth-induced spillovers. That is, dynamic effects reinforced static effects. The fact that the periphery, in contrast, did not benefit when the terms of trade

rose over the long term, or suffer when they fell, appears to confirm some dynamic offset to more conventional static gains from trade. The place to look for the source of dynamic asymmetry between secular impact on core and periphery is likely to be de-industrialization. However, since the secular terms of trade in the poor periphery had already reached their peak between the 1870s and the 1890s, there was hardly any terms of trade boom left to make a contribution to divergence in the half-century before World War II. However, there *was* such a boom before 1870.

We expected the same asymmetry with respect to terms of trade volatility given that 'insurance' was cheaper and more widely available in the core. Modern observers regularly point to terms of trade shocks as a key source of macroeconomic instability in commodity-specialized countries, but, until very recently, they paid far less attention to the long-run growth implications of such instability.[10] Most theories stress the investment channel in looking for connections between terms of trade instability and growth. Indeed, the development literature offers abundant modern microeconomic evidence linking income volatility to lower investment in both physical and human capital. Households imperfectly protected from risk change their income-generating activities in the face of income volatility, diversifying towards low-risk alternatives with lower average returns (Dercon 2004; Fafchamps 2004), as well as to lower levels of investment (Rosenzweig and Wolpin 1993). Furthermore, severe cuts in health and education follow negative shocks to household income in poor countries – cuts that disproportionately affect children and hence long-term human capital accumulation (Jensen 2000; Jacoby and Skoufias 1997; Frankenburg *et al.* 1999; Thomas *et al.* 2004).

Poor households find it difficult to smooth their expenditures in the face of shocks because they are rationed in credit and insurance markets, so they lower investment and take fewer risks with what remains. Poor firms find it difficult to smooth net returns on their assets, so they lower investment and take fewer risks with what remains. Perhaps most importantly, poor governments whose revenue sources are mainly volatile customs duties (Coatsworth and Williamson 2004; Williamson 2005, 2006a), and which also find it difficult to borrow at cheap rates locally and internationally, cannot, without serious difficulty, smooth public investment on infrastructure and education in the face of terms of trade shocks.[11] Lower public investment ensues, and growth rates fall. In short, theory informs us that higher volatility

[10] For important early exceptions, see Mendoza (1997), Deaton and Miller (1996), Kose and Reizman (2001), Bleaney and Greenway (2001) and Hadass and Williamson (2003). I review the more recent (booming) literature below in the text.

[11] While greater volatility increases the need for international borrowing to help smooth domestic consumption, Catão and Kapur (2004) have shown recently that volatility constrained the ability to borrow between 1970 and 2001. It seems likely that the same was true between 1870 and 1901, a century earlier, and even more so before 1870 when a global capital market was only just emerging (Obsfelt and Taylor 2004; Mauro *et al.* 2006).

in the terms of trade should reduce investment and growth in the presence of risk aversion. In addition, the less risky investment that does take place will also be low-return.

Modern evidence seems to be consistent with the theory. Using data from 92 developing and developed economies between 1962 and 1985, Garey and Valerie Ramey (1995) found government spending and macroeconomic volatility to be inversely related, and that countries with higher volatility had lower mean growth. This result has since been confirmed for a more recent cross-section of 91 countries (Fatás and Mihov 2006). Studies like these have repeatedly found that volatility diminishes long-run growth, and we now know more about why it is especially acute in poor countries. In an impressive analysis of more than 60 countries between 1970 and 2003, Steven Poelhekke and Frederick van der Ploeg (2007) find strong support for the core–periphery asymmetry hypothesis regarding volatility, and with a large set of controls. Furthermore, while capricious policy and political violence can and did add to volatility in poor countries, extremely volatile commodity prices 'are the main reason why natural resources export revenues are so volatile' (Poelhekke and van der Ploeg 2007, p. 3) and thus why those economies are themselves so volatile. While we have offered some reasons why poor countries face higher volatility and why that higher volatility costs them so much more in diminished growth rates, Philippe Aghion and his collaborators (2005, 2006) offer more: macroeconomic volatility driven either by nominal exchange rate or commodity price movements will depress growth in poor economies with weak financial institutions and rigid nominal wages, both of which characterized all poor economies before 1913 even more than it characterizes them today.[12] Thus, 'given the high volatility of primary commodity prices ... of many resource-rich countries, we expect resource-rich countries with poorly developed financial systems to have poor growth performance' (Poelhekke and van der Ploeg 2007, p. 6).

What is true of the modern era was thought by Blattman *et al.* (2007) to be even *more* true of 1870–1939 when more undeveloped financial institutions and more limited tax bases made it even harder for poor households, poor firms and poor governments to smooth expenditures. Analysis bore this out: greater volatility diminished growth in the periphery, but not in the core. Strong support for the asymmetry hypothesis for the 1870–1939 years was especially welcome since that result raised the value of a research agenda that would explore its implications for the post-1870 years. Furthermore, the economic effects for 1870–1939 were very large: a one-standard-deviation increase in terms of trade volatility lowered output growth by nearly 0.39 percentage points, a big number given that the average per capita growth rate

[12] See also Aizenman and Marion (1999), Flug *et al.* (1999), Elbers *et al.* (2007) and Koren and Tenreyro (2007).

in the periphery was just 1.05 percent *per annum*.[13] These magnitudes suggest that terms of trade volatility was an important force behind the rising Great Divergence between core and periphery after 1870. The gap in per capita income growth rates between core and periphery in the 1870–1939 sample was 0.54 percentage points (1.59–1.05). Had the periphery experienced the same (lower) terms of trade volatility as the core, price volatility would have been reduced, adding 0.16 percentage points to average GDP per capita growth rates there. This alone would have erased about a third of the output per capita growth gap (0.16/0.54=0.3). In addition, had the core experienced the same secular deterioration in its terms of trade that the periphery did (−0.28), instead of the observed positive 0.3 percent *per annum* growth rate, this would have reduced output growth there by 0.37 percentage points. Combined, these two counterfactual events would have eliminated nearly the entire gap in growth rates between core and periphery between 1870 and 1939.

At least for the seven pre-1940 decades, globalization seems to have had a bigger impact on the Great Divergence than did the so-called fundamentals. To put it more modestly, it appears that terms of trade shocks were an important force behind the substantial divergence in income levels between core and periphery during Lewis's post-1870 epoch. Note, however, that secular movements in the terms of trade contributed less to the growth gap between core and periphery after 1870 than did volatility (0.16 versus 0.37). The secular boom *before* 1870 ought to have contributed much more to the Great Divergence to the extent that the terms of trade boom in the poor periphery was so much bigger. And the contribution would have been bigger still if volatility was also bigger before 1870.

8. Impact of the terms of trade boom on the pre-1870 poor periphery

There should be no doubt that these global price shocks reinforced comparative advantage around the poor periphery, giving a powerful incentive to primary product export expansion while severely damaging import-competing manufacturing. That is, powerful de-industrialization (or Dutch disease) forces were set in motion everywhere in Latin America, Africa, the Middle East and Asia, helping contribute to Lewis's new international economic order. Just how powerful depended on the size of

[13] A contemporary estimate has it that a one-standard-deviation increase in output volatility in the Third World lowers annual GDP per capita growth by 1.28 percentage points (Loayza *et al.* 2007, pp. 345–6). While this is certainly a bigger growth impact than that estimated for 1870–1939 (0.39), the modern estimate is an *output* volatility impact, not, as for 1870–1939, a *price* volatility impact. That is, this modern estimate does not identify the *source* of the output volatility.

the export- and import-competing sectors. Where trade was a big share of GDP, and where, conversely, non-tradable activities were a small share of GDP, the de-industrialization impact was also big. It depended as well on whether, and the extent to which, the non-tradable food sector was able to keep the cost of food low, and thus the nominal wage in manufacturing low and competitiveness high. It also depended, of course, on the extent to which the poor periphery could absorb and use effectively the new European industrial technologies. All of these factors mattered, but the main determinant was the size of the price shock itself. Where the secular terms of trade boom was greatest, de-industrialization should have been greatest, *ceteris paribus*. Lewis and most of the subsequent literature have argued that the big de-industrialization impact occurred between 1870 and 1913 (Lewis 1969, 1978a, 1978b; Tignor 2006, pp. 256–60). Based on the new terms of trade evidence just reviewed, it appears that Lewis was off by three-quarters of a century; the big impact must have been during the century before 1870 when the terms of trade boom was so much bigger.

So much for timing. What about *location* of de-industrialization? To make the comparative judgment, look at the annual growth rate in each country's terms of trade up to its country-specific nineteenth-century peak (Table 2). According to this criterion, nineteenth-century Dutch disease and de-industrialization effects must have been much more powerful in the European periphery than they were anywhere else in the periphery, even more so than the tropical periphery that Lewis stressed (1969, 1978a). It follows that part of the explanation for a lag in the spread of the industrial revolution to the European periphery (Gerschenkron 1966; Pollard 1981) might be blamed, at least in part, on these powerful terms of trade forces. The second strongest de-industrialization effect should have been in the Middle East and Southeast Asia, at least up to the late 1850s and early 1860s.[14] The weakest de-industrialization effects were in East Asia; indeed, since China's terms of trade *deteriorated*, it might be expected that industry was favored there, helping account for industrial success in Shanghai. The next weakest de-industrialization effects must have been in Latin America where the terms of trade boom was almost half that of the periphery average. Perhaps it is no longer a puzzle why Mexico and other parts of Latin America were so effective in fending off the global forces of de-industrialization up to 1870 (Dobado, Gómez and Williamson 2008; Williamson 2007). Nor was South Asia far behind since its terms of trade boom was not much bigger than that of Latin America. To the extent that India underwent one of the most

[14] Note that the Middle Eastern and Southeast Asian regional terms of trade growth rates to peak are not always bounded by the country rates reported for those regions in Table 2. One reason is that some countries embedded in the regional averages are not reported in Table 2, e.g. Levant and Malaysia. Another is that the regional averages are weighted, and are often extended backwards on the basis of a small country.

dramatic rates of de-industrialization in the poor periphery (Clingingsmith and Williamson 2008), that experience must be attributed to domestic forces rather than to external price shocks.

When the magnitude of the secular terms of trade boom is measured up to 1885–90, the regional ranking remains pretty much the same. South Asia drops farther down the list with even weaker terms of trade effects (indeed, close to zero), the relatively rapid terms of trade growth of Southeast Asia and the European periphery persist, and East Asia continues its *exceptional* terms of trade decline. The Latin American boom keeps the modest middle ground, and the Middle East joins it. Thinking comparatively helps. Consider two examples. First, and to repeat, the South Asia result should surprise any specialist who is steeped in the enormous and contentious literature on Indian de-industrialization written by nationalist historians. However, the facts are that the terms of trade shock facing South Asia in general, and India in particular, were very modest, implying that much of the de-industrialization India underwent was of its own supply-side doing (Clingingsmith and Williamson 2008). Second, Latin American economic historians make much of export-led growth after 1870 during what they call the *belle époque*, implying that the region exploited these world market conditions better than the rest of the periphery (Bulmer-Thomas 1994, chs. 3 and 4). Yet, the Latin American terms of trade boom was not much greater than the periphery average, and for Mexico it was much less (Gómez Galvarriato and Williamson 2008).

9. Impact of terms of trade volatility on the pre-1870 poor periphery

By 1870 and certainly by the end of the nineteenth century, most countries in the poor periphery had responded to the terms of trade boom by exploiting comparative advantage and increasing their specialization with the export of just a few commodities. The top two exports made up 70 percent of all exports from the average poor periphery country in 1913 (Bulmer-Thomas 1994, p. 59), while the figure was only 12 percent in the industrial core even two decades earlier (Blattman *et al.* 2007, Table 1). Furthermore, most countries in the poor periphery had raised exports so that they claimed a large share of GDP by 1890. Finally, while some of these commodities had prices which were a lot more volatile than others, primary products generally had much more volatile prices than did manufactures exported by the core.

Was the deleterious impact of volatility as powerful before 1870 as it was afterwards? While limited data make it impossible to estimate the impact, we can certainly calculate whether the volatility was as great or even greater before 1870, and infer the deleterious impact on periphery growth and thus its contribution to divergence. Table 3 summarizes the results using

Table 3. *Terms of trade volatility 1782–1913, core vs poor periphery*

Region	Starting year in the series	Before 1820	1820–1870	1870–1913
United Kingdom	1782	11.985	2.910	2.006
European periphery		**4.036**	**10.720**	**7.058**
Italy	1817	0.922	19.003	11.214
Russia	1782	3.226	10.722	6.104
Spain	1782	7.959	6.472	6.023
Portugal	1842	N/A	6.681	4.891
Latin America		**3.728**	**6.429**	**8.140**
Argentina	1811	4.409	6.961	8.303
Brazil	1826	N/A	2.174	10.283
Chile	1810	5.116	6.367	7.865
Cuba	1826	N/A	9.435	6.822
Mexico	1782	1.658	5.531	5.379
Venezuela	1830	N/A	8.108	10.185
Middle East		**2.902**	**13.611**	**7.316**
Egypt	1796	2.982	17.861	11.760
Ottoman Turkey	1800	2.821	6.549	3.289
Levant	1839	N/A	16.423	6.898
South Asia		**11.876**	**9.628**	**5.364**
Ceylon	1782	17.860	7.590	7.532
India	1800	5.891	11.666	3.196
Southeast Asia		**7.788**	**6.977**	**7.303**
Indonesia	1825	N/A	3.202	6.678
Malaya	1882	N/A	N/A	9.199
Philippines	1782	7.992	9.778	6.603
Siam	1800	7.583	7.951	6.732
East Asia		**15.554**	**10.527**	**4.952**
China	1782	15.554	19.752	4.311
Japan	1857	N/A	1.302	5.592
Average periphery		**6.460**	**9.176**	**7.089**

Note: Volatility measured using the Hodrick–Prescott filter with smoothing parameter 6.25, which is appropriate for annual observations (Ravn and Uhlig 2002, p. 375), as we have here. The periphery average is unweighted.

the Hodrick–Prescott filter, where the United Kingdom is taken to be representative of the core. That said, terms of trade volatility was much greater in the UK during the wartime years 1782–1820 than it was in the peacetime *Pax Britannica* century that followed. This result is hardly surprising given what we know about the volatility of the conflict itself and its stop–go impact on trade (Findlay and O'Rourke 2007). The peacetime years after 1820 were another matter entirely.[15] First, terms of trade volatility in the

[15] David Jacks, Kevin O'Rourke and myself are collecting monthly commodity price data 1750–1913 to explore more fully these volatility issues, one dealing with the impact of the

periphery was more than three times what it was in the UK, either in 1820–70 (9.18/2.91 = 3.2) or 1870–1913 (7.09/2 = 3.5).[16] It is of some interest to note that the ratio of terms of trade volatility between industrialized economies and the periphery in the 1990s was 2.9.[17] Apparently, there has been a lot of historical persistence in the data, even though the difference between core and periphery was greater in the nineteenth than in the late twentieth century. Second, terms of trade volatility in the periphery rose over the century, from 6.46 before 1820 to 9.18 between 1820 and 1870, and to 7.09 after 1870, a result consistent with evolving export concentration as the region exploited comparative advantage. Third, terms of trade volatility varied considerably around the periphery. Between 1820 and 1870, the highest volatility measures were recorded in the European periphery (especially Italy and Russia), the Middle East (especially Egypt and the Levant) and East Asia (especially China), regions whose long-run economic progress must have suffered accordingly. Latin America and Southeast Asia consistently recorded lower volatility than the rest of the periphery, but it was still more than twice that of the United Kingdom. South Asia was about average, but it was still more than three times that of the United Kingdom. If we are looking for countries in the periphery where terms of trade volatility would have had an especially powerful deleterious effect on GDP growth performance before 1870, the places to look would be China, Cuba, Egypt, India, Italy, Levant, the Philippines and Russia. But with the exception of Brazil and Japan, every periphery country had much higher price volatility than did the European core before 1870. There were no exceptions after 1870: every country in the poor periphery had higher price volatility than did the United Kingdom.

Given that terms of trade volatility was higher before 1870 than after, and given that this volatility contributed powerfully to the Great Divergence after 1870, it seems reasonable to infer that terms of trade volatility in the periphery contributed even more powerfully to the Great Divergence before 1870 than after.

10. Concluding remarks

W. Arthur Lewis (1978a, 1978b) and the literature that followed his pioneering work has argued that a new international economic order emerged

world going open during *Pax Britannica*, and the other dealing with asymmetry between manufactures and primary products.

[16] It may at first seem that the UK should have had the same terms of trade volatility as the periphery since it imported all those commodities with volatile prices. However, the UK imported a diverse market basket of primary products while each periphery exported just one or two.

[17] Loayza *et al.* (2007, data underlying Figure 3, p. 346) where volatility is calculated as the standard deviation of the logarithmic change.

between 1870 and 1913, and that global terms of trade forces induced rising primary product specialization and de-industrialization in the poor periphery. This article has offered five revisionist findings that speak to the Lewis thesis. First, it has shown that the new order was firmly in place at the start of Lewis's epoch, and that the transition took place in the century before 1870, not after. Second, we know that terms of trade booms did not raise long-run growth in the poor periphery between 1870 and 1913, and may have lowered it. Given that the secular terms of trade boom in the poor periphery was much bigger over the century before 1870 than after, and given that de-industrialization and Dutch disease forces were much more powerful as well, it seems safe to infer that the Great Terms of Trade Boom helps explain the Great Divergence between core and periphery. Third, the terms of trade boom varied enormously across the poor periphery, and therefore its contribution to periphery performance must have varied as well. Over the century before the late 1880s, the boom was completely absent in East and South Asia, about average in the Middle East and Latin America, and powerful in Southeast Asia and the European periphery. Fourth, the terms of trade boom (with its de-industrialization impact) was only half the story; growth-reducing terms of trade volatility was the other half. Between 1820 and 1870, terms of trade volatility was *much* greater in the poor periphery than the core, in some cases six or seven times greater. In the post-1870 epoch, terms of trade volatility was still very big in the poor periphery and still much greater than the core, in some cases four to five times greater. We know that terms of trade volatility has lowered long-run growth in the poor periphery in both 1870–1939 and 1960–2000, and that the negative impact has been big. Given that terms of trade volatility in the poor periphery was even bigger during the century before 1870, it seems plausible to infer that it helps explain the Great Divergence. Fifth, and finally, since the secular terms of trade boom in the poor periphery reached its peak in the mid–late nineteenth century, de-industrialization forces should have abated afterwards. Indeed, as the terms of trade started their long secular decline in the twentieth century, those prior de-industrialization forces should have become *re-industrialization* forces, that is, industrialization in the poor periphery should have been favored by secular terms of trade deterioration in the half-century or more before 1930, an ironic finding given the rhetoric of Prebisch and Singer. Furthermore, the *re-industrialization* stimulus should have been strongest in locations where the terms of trade peak was earliest and the fall from it the steepest. These locations would have included East Asia (e.g. Shanghai),[18]

[18] Meiji Japan is an exception: it underwent an improvement in its terms of trade right up to World War I (Figure 10), so it never reached a secular peak before 1913. However, like western Europe, it was a net exporter of manufactures very early after opening up to trade, so those 'exceptional' global price events (compared with the rest of the periphery) fostered industrialization there.

the European periphery (e.g. the Italian triangle and Russia), Latin America (e.g. Brazil and Mexico) and South Asia (e.g. Bombay and Bengal). During the decades before 1913, early industrialization was taking place in all of these places, but how much of that is explained by a secular (pro-industrial) terms of trade slump, better pro-industrial policies, improved wage cost competitiveness in manufacturing, or getting the 'fundamentals' right?[19]

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[19] Aurora Gómez Galvarriato and I recently explored this question for Latin America (Gómez Galvarriato and Williamson 2008).

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Appendix

The post-1865 terms of trade data were first collected in working papers underlying Blattman, Hwang and Williamson (2007), hereafter BHW. The 1865–1913 data underlying Figures 2–10 reported in this article are based on my revisions of the BHW data. Several sources were used frequently, in addition to the ones listed under Part 2 below: Mitchell (1992, 1993, 1998).

The revised 1865–1939 BHW data set contains 35 countries, while the focus here is on the pre-1865 poor periphery subset of 21: Latin America (6) – Argentina, Brazil, Chile, Cuba, Mexico, Venezuela; European periphery (4) – Italy, Portugal, Russia, Spain; Middle East (3) – Egypt, the Ottoman core (present day Turkey and some of the Balkans), Levant (present-day Iraq, Israel, Lebanon, Palestine, Jordan, Syria); South Asia (2) – Ceylon, British India (including present-day Bangladesh and Pakistan); Southeast Asia (4) – Indonesia, Malaya, the Philippines, Siam; and East Asia (2) – China, Japan. While I have the data to expand the pre-1865 poor periphery sample size, these additional country pre-1865 time series are much shorter and thus have been excluded here.

1. The 1865–1913 terms of trade data for the poor periphery

A net barter terms of trade (NBTT) series was calculated from original sources, where the NBTT is simply the ratio of export to import prices, each weighted appropriately:

$$NBTT_{jt} = \frac{\sum p_{ijt}^{X} \cdot w_{ij}^{X}}{\sum p_{it}^{M} \cdot w_{i}^{M}}$$

for product i, country j and period t. In this formulation, the export price index in the numerator is country-specific while the import price index in the denominator is not. Three different import price indices have been used in the denominator, giving rise to the TOT1, TOT2 and TOT3 estimates (see below) for each country where the terms of trade were calculated in this way. This is a simplification employed due to (i) the limited quality and quantity of data on imports and import prices for countries in the periphery, and (ii) the similarity observed, in what records are available, between the composition of developing country imports. While detailed data on exports weights and prices are available for virtually all of the countries and all of the

years in our sample, import data are much more limited. These limitations and their consequences are discussed below.

Export weights. Export weights have been calculated by individual country using the *current value* of major commodity exports and *fixed weights*. The use of a fixed set of weights is essential for disentangling price from quantity movements. Of course, any such approach is fundamentally flawed, not least because over a long period of time the mix of major commodity exports can shift significantly. A compromise position was taken by changing the export weights at approximately 20-year subperiods. These subperiods are 1870–90 and 1890–1913, and within these subperiods the weights are calculated using sample year data. Export values for major commodities for **Argentina**, **Brazil**, **Colombia**, **Cuba**, **Mexico** and **Peru** are taken from Mitchell (1993, pp. 506ff, table E3). The revised data for **Uruguay** come from the data underlying Coatsworth and Williamson (2004). The revised data for **Chile** come from Braun, Braun, Briones *et al.* (2000, pp. 125–8). The data for **Burma**, **Ceylon**, **India**, **Indonesia**, **Japan**, **the Philippines** and **Siam** come from Mitchell (1998, pp. 637ff., table E3). The revised data for **Egypt** and **Ottoman Turkey** come from Williamson and Yousef (2008 ongoing) and Pamuk and Williamson (2008 ongoing). Main commodity exports for **Greece** and **Portugal** were calculated from *Statistical Abstract for Principal and Other Foreign Countries* (London, 1876–1912) and *Die Wirtschaft des Auslandes, Statistisches Reichsamt* (Berlin, 1928). The revised data for **Spain** come from Prados de la Escosura (2003, 2005). **Russia**'s export weights for the first two subperiods come from *Statistical Abstract for Principal and Other Foreign Countries* (London, 1876–1912), and the second two subperiods from Dohan (1973). Export weights for **Serbia** come from Sundhaussen (1989) for the first two subperiods, and for the latter two from *Die Wirtschaft des Auslandes, Statistisches Reichsamt* (Berlin, 1928). Export weights for **China** were obtained from Hsiao (1974). Only major export products were included (those whose value exceeded 5 percent of total trade value). These include beans and bean products, cotton yarn and piece goods, raw cotton, silk piece goods, raw silk and tea. Eggs and egg products were omitted due to lack of price data.

Export prices. Export prices are quoted in foreign markets (wherever possible, in the UK). Wholesale prices for **wheat**, **maize**, **rice**, **beef**, **butter**, **sugar**, **coffee**, **tea**, **iron**, **copper**, **tin**, **lead**, **coal**, **cotton**, **flax**, **hemp**, **jute**, **wool**, **silk**, **hides**, **nitrate**, **palm oil**, **olive oil**, **linseed**, **petroleum**, **indigo** and **timber** are taken from Sauerbeck (1886, appendix C), for the years 1860–85; Sauerbeck (1893, pp. 241ff.), for the years 1885–92; Sauerbeck (1909) for the years 1893–1908; Sauerbeck (1930, pp. 282ff.) for the years 1908–29; Sauerbeck (1917) for the years 1908–16; and Sauerbeck (1951, pp. 417ff.) for the years 1916–50. Prices for **cocoa**, **crude oil**, **rubber**, **tobacco** and **zinc** are taken from *Historical Statistics of the United States:*

Colonial Times to 1970, bicentennial edition, part 1 (Washington, DC: US Department of Commerce, Bureau of the Census, 1975). **Cotton yarn**, **cotton piece goods** and **silk piece goods** were approximated using the textiles price index from the same source. Prices for **fruits** and **nuts** 1880–1914 are taken from Critz, Olmsted and Rhode (2000, table 8.2). Prices for **oppium** 1860–1906 are taken from Seyf (1984, table 4). Prices for **beans** and **bean products** were calculated from Hsiao (1974, pp. 80ff.).

Import weights. A set of three different import indices were employed uniformly for all non-European countries in the old BHW data base. TOT1 uses British export data to determine the import price index in the denominator, TOT2 uses an index of US manufacturer's prices, and TOT3 uses an index of US consumer and manufacturer's prices. Historical import data, unlike that of exports, are almost uniformly poor in countries outside the European core. Traditionally, studies of country terms of trade have compensated for this lack of data through the use of British export data as a proxy for the imports of less developed nations. This approach is undesirable if the composition of British exports is unrepresentative of the imports of developing countries as a whole, or to the extent that the use of current-year weights means that movements reflect changes in composition, not just prices. As an alternative, however, BHW employed a fixed index of non-primary goods from US statistics. This import index, like the British one, is country invariant. In the end, the differences are not material; the two series are almost identical (probably due to the heavy content of metals and textiles in both indices). This US manufactured export statistic is a weighted sum of the prices of **textiles** (55%), **metals** (15%), **machinery** (15%), **building materials** (7.5%) and **chemicals and pharmaceuticals** (7.5%). A fixed weighting for all developing nations may, of course, be unrepresentative of any country's specific import mix. Yet, such a metric may be quite relevant for measuring the changing value of the country's exports relative to a fixed package of manufactured products available for import. In this sense our terms of trade represent the purchasing power of local commodities in terms of rich-country goods. In any case, a review of each nation's external commerce documents reveals remarkably similar import compositions. For the years 1870–1900, import composition for **Ceylon** and **India** was examined from *Statistical Abstract for the Several Colonies and other Possessions of the United Kingdom* (London, 1863–1902), nos. 1–40. Import composition data for **Burma** come from Saito and Kiong (1999, p. 177, table VII-4). Import composition data for **China**, **Egypt**, **Greece**, **Japan**, **Portugal** and **Russia** were calculated from *Statistical Abstract for Principal and Other Foreign Countries* (London, 1876–1912), no. 13. Data for the **Philippines** are taken from *Quarterly Summary of Commerce of the Philippine Islands* (Washington, DC, 1908), p. 27 for the year 1893. Import composition for **Serbia** before 1914 is recorded in Sundhaussen

(1989, pp. 352–5). Main imports for **Turkey** are calculated from Mulhall (1892, p. 145) for the year 1888. For the years 1900–39, import weights for **Ceylon** and **India** are calculated for several reference years from *Statistical Abstract for the Several British Self-governing Dominions, Colonies, Possessions, and Protectorates* (London, 1903–15), nos. 41–53, *Statistical Abstract for the Several British Overseas Dominions and Protectorates* (1917–27), nos. 54–9, *Statistical Abstract for the British Empire* (London, 1929–38), nos. 60–8, *Statistical Abstract for the British Commonwealth* (London, 1945–7) nos. 69–70 and *Statistical Abstract for the Commonwealth (Trade Statistics)* (London, 1948–51), nos. 71–2. Composition of main imports for reference years after 1900 for **Chile**, **Greece**, **Indonesia**, **Japan**, **Mexico**, **Portugal**, **Russia**, **Serbia**, **Siam**, **Spain** and **Uruguay** comes from *Die Wirtschaft des Auslandes 1900–1927* (Berlin 1928). Data for **Burma** come from Saito and Kiong (1999, p. 177, table VII-4). Data for the **Philippines** are taken from *Foreign Commerce of the Philippine Islands* (Washington, DC, 1912–13) for the reference years 1907, 1908 and 1910. Composition of main imports for **Turkey** was calculated from *Annuaire Statistique, Republique Turque*, vol. 1, pp. 103, 106, and vol. 3, pp. 313 and 314 for the years 1923, 1926 and 1929.

Import prices. US price series for textiles, metals, machinery, building materials, and chemicals and pharmaceuticals come from *Historical Statistics of the United States*, part 1 (1975), pp. 200–1.

A note on import and export price data. UK and US prices are employed for the TOTj estimates under the assumption that the prices in these large, integrated and (in the UK, at least) unprotected markets would supply us with a relatively reliable 'world' price index for each commodity group. A chief disadvantage of using such world price indices, however, is that home market prices in each country may diverge from the world market prices in the short and even long term. This may be because of transport costs, differences in product features and quality, variations in the composition of the products within a category, and less-than-perfect market integration. But the key disadvantage of not using the home market price is the distortion created by changes in transport costs. Overall, though, the advantages of employing world price indices outweigh these disadvantages. First, home market prices are not available for most periods and most of our countries. Rather, only the somewhat less desirable unit prices (calculated as the value of imports divided by the volume) are available. Second, UK and US market prices are probably more reliable, accurate and comparable given the quality of reporting (at the time) and the quality of scholarship on these prices since then. Third, to the extent that commodity markets are well integrated worldwide, the UK and US market prices should approximate the world price. This is especially true given that this article is interested in price changes, not levels. To the extent that UK and US prices move in similar directions and with similar magnitudes compared with prices in the rest

of the world, these 'world' price indices will represent well price changes relative to an index year in other nations. Fourth, these foreign market price indices would have been available to (and probably used by) industrialists and policymakers throughout the period in question. Accordingly, for questions of policy response (and perhaps price setting) foreign market indices may be a more appropriate data source than those in home markets. Fifth, the use of a world price index harmonizes and simplifies construction of the indices, enabling us to examine a wider sample of countries.

2. The pre-1865 terms of trade data for the poor periphery

Twenty-one important regions in the periphery offer terms of trade estimates from points well before 1865, some deep into the eighteenth century, thus covering the era prior to the mid-nineteenth century when the relative price of primary products underwent their largest boom. In every case but Argentina and Mexico, these series are taken up to 1913 and replace the 1865–1939 BHW data; for Argentina and Mexico, the new series are linked to the BHW series at 1870.

2a. The first sixteen pre-1865 countries

Argentina 1810–70. Annual data underlying Newland (1998, pp. 409–16) (reported as half-decade averages). The annual data were shared with us by Leticia Arroyo Abad. This series is linked to the BHW series for 1870–1913.

Brazil 1826–1913. Prados de la Escosura (2006, p. 495).

Chile 1810–1913. Braun, Braun, Briones *et al.* (2000, pp. 125–8).

Cuba 1826–1913. Prados de la Escosura (2006, p. 495).

Egypt 1796–1865. Williamson and Yousef (2008 ongoing).

India 1800–1913. Clingingsmith and Williamson (2005).

Indonesia 1825–1913. Korthals (1994, appendix A, table II, pp. 159–60).

Italy 1817–1913. Glazier, Bandera and Brenner (1975), pp. 30–1.

Japan 1857–1913. 1857, 1860 and 1865 from Miyamoto, Sakudo and Yasuba (1965, p. 553). Geometric interpolation used between 1857–60, 1860–65, 1865–75, and then linked with Yamazawa and Yamamoto (1979, pp. 193 and 197).

Levant 1839–1913. The average of Aleppo, Beirut and Iraq, taken from Issawi (1988, pp. 148–50).

Malaya 1882–1913. Huff and Caggiano (2007, appendix 4).

Mexico 1751–1870. Dobado González, Gómez Galvarriato and Williamson (2008). This series is linked to the BHW series for 1870–1913.

Ottoman Turkey 1800–1913. Pamuk and Williamson (2008 ongoing).

Portugal 1842–1913. Lains (1995). Data file sent by Pedro Lains in 2005.

Spain 1750–1913. Prados de la Escosura (no date). Data file sent by Leandro Prados in 2005.

Venezuela 1830–1913. Baptista (1997), the underlying data from which shared with us by Leticia Arroyo Abad.

2b. Five additional pre-1865 countries

In all cases but China, Pm is taken to be the British 'Merchandise price indices' for exports given in Mitchell (1962, pp. 331–2). The 1813 observation is unavailable so has been taken as the average of 1812 and 1814. Px was constructed using prices of each country's major exports, weighted by export shares. The export weights are variable over the given base years.

Ceylon 1782–1913. Px construct as weighted average of coffee, tea (Mulhall 1892, pp. 491–5) and rubber prices (*Historical Statistics of the United States*, 1975). The export weights for 1782–1838 are those observed for 1839–48, while the rest of the variable weights are interpolated between the benchmarks 1839–48, 1878–82, 1898–1902 and 1920–4.

China 1782–1913. Px constructed as a weighted average of beans/bean products, cotton, silk (Mulhall 1892, pp. 471–6) and tea prices (*Historical Statistics of the United States*). The export weights for 1782–1791 are those observed for 1792, while the rest of the variable weights are interpolated between observations for 1792, 1833, 1867–71, 1878–82, 1898–1902 and 1920–24. China's import price index = Po*wo + Pm*(1-wo) where Po is opium prices and wo is the share of imports that were opium.

The Philippines 1782–1913. Px constructed as a weighted average of hemp, sugar, wood, coffee, tobacco, indigo (Mulhall 1892, pp. 471–5) and copra prices (as a proxy, food prices from *Historical Statistics of the United States*). The export weights for 1782–1840 are those observed for 1841, while the rest of the variable weights are interpolated between 1841, 1889, 1893, 1899–1903 and 1920–4.

Russia 1782–1913. Px constructed as a weighted average of grain, flax, hemp, linseed, wood, wool (Mulhall 1892, pp. 471–5), petroleum, meat (Sauerbeck 1886, 1893, 1909, 1930) and textile prices (*Historical Statistics of the United States*). The export weights for 1782–1792 are those observed for 1793–5, while the rest of the variable weights are interpolated between 1793–5, 1878–82, 1898–1902 and 1913.

Siam 1782–1913. Px constructed as a weighted average of rice, tin, cotton, sugar (Mulhall 1892, pp. 471–5), rubber (*Historical Statistics of the United States*) and hide prices (Sauerbeck 1886, 1893, 1909, 1930). The export weights 1782–1849 are those observed for 1850, while the rest of the variable weights are interpolated between 1850, 1865–7, 1870–82, 1888–92, 1898–1902 and 1920–4.