# The Periphery's Terms of Trade in the Nineteenth Century: A Methodological Problem Revisited

Francis, Joseph A.

August 2014

# The Periphery's Terms of Trade in the Nineteenth Century:
## A Methodological Problem Revisited

Joseph A. Francis[*]

Technical Paper 1

August 2014

www.joefrancis.info

## Abstract

There is a major downward bias in the trend of most existing estimates of the periphery's nineteenth-century terms of trade. By using prices from the North Atlantic core as proxies for prices in the peripheral countries themselves, historians ignore the dramatic price convergence that took place during the nineteenth century. This has been reflected in Jeffrey Williamson's recent work. Measured correctly, the periphery's nineteenth-century terms-of-trade boom would appear considerably longer, greater, and more widespread than Williamson has suggested. His grand narrative about the relation between globalisation and the 'great divergence' would therefore be greatly reinforced. Many of the details of his narrative would, however, need to be revised. This is illustrated by the case of India.

# The Periphery's Terms of Trade in the Nineteenth Century:
# A Methodological Problem Revisited

## Joseph A. Francis

Debates about the terms of trade have long focused on Raúl Prebisch and Hans Singer's famous hypothesis that a long-term deterioration in peripheral countries' terms of trade had undermined the assumption that they should specialise in the production of primary commodities for export.[1] In the subsequent debate, the main question became whether this long-term deterioration had in fact taken place.[2] The consensus among economic historians, at least until recently, has been that there were no trends in the terms of trade, only cyclical fluctuations.

Jeffrey Williamson, by contrast, has contended that there was a secular boom in the periphery's terms of trade during the nineteenth century.[3] He has argued, moreover, that the long terms-of-trade boom was of considerable significance for the 'great divergence' between rich and poor countries. Williamson has thus placed the terms of trade at the center of the main debate of global economic history.

Williamson's grand narrative is compelling. He claims that the terms of trade improved due to three processes, all of which can be considered aspects of globalisation: (1) trade liberalisation, (2) falling transportation costs, and (3) increasing imports to the periphery of cheap manufactured goods being produced by the core's industrial revolution. The terms-of-trade boom that followed, Williamson argues, led to deindustrialisation by undermining the periphery's proto-industry, as it pulled capital and labor towards the primary

---

1. H.W. Singer, 'The Distribution of Gains between Investing and Borrowing Countries', *American Economic Review*, 40:2, 1950; and R. Prebisch, 'The Economic Development of Latin America and Its Principal Problems', *Economic Bulletin for Latin America*, 7:1, (1950) 1962.

2. J. Spraos, *Inequalising Trade? A Study of Traditional North/South Specialisation in the Context of Terms of Trade Concepts*, New York, 1983, ch. 3; D. Diakosavvas and P.L. Scandizzo, 'Trends in the Terms of Trade of Primary Commodities, 1900-1982: The Controversy and Its Origins', *Economic Development and Cultural Change*, 39:2, 1991, pp. 232-46; and J.A. Ocampo and M.A. Parra, 'The Continuing Relevance of the Terms of Trade and Industrialization Debates', in E. Peréz Caldentey and M. Vernengo, eds., *Ideas, Policies and Economic Development in the Americas*, London, 2007, pp. 163-66.

3. J.G. Williamson, 'Globalization and the Great Divergence: Terms of Trade Booms, Volatility and the Poor Periphery, 1782-1913', *European Review of Economic History*, 12:3, 2008; and idem, *Trade and Poverty: When the Third World Fell Behind*, Cambridge, MA, 2011.

commodity-focused export sector. Divergence resulted because, in Williamson's words, (1) 'industrial-urban activities contain far more cost-reducing and productivity-enhancing forces than do traditional agriculture and traditional services';[4] (2) deindustrialisation led to a 'resource curse' that saw the periphery's institutions come to reflect the interests of the rent-seeking elites that were the principal beneficiaries of primary-commodity exports;[5] and (3) there was more growth-inhibiting volatility because primary-commodity prices fluctuated more dramatically than those of manufactured goods.[6] Williamson's grand narrative thus has the globalisation-induced terms-of-trade boom generating divergence by dividing the world into an industrialised core and a poor, deindustrialised periphery afflicted by bad institutions and instability.

This paper will reinforce Williamson's narrative, but only by criticising the evidence that he has used to illustrate it. This task is important because Williamson has been applauded for assembling a dataset of the terms of trade of numerous peripheral countries. One prominent reviewer, for example, states that a 'major contribution of Williamson's research is the compilation of a data set on the terms of trade for 21 poor countries'.[7] Here, by contrast, it is demonstrated that most of Williamson's 21 series are of doubtful quality because they have been calculated using prices from the core countries as proxies for prices in the periphery. Given the massive price convergence that took place during the nineteenth century,[8] the result is a downward bias in the trends of these estimates, which leads Williamson to greatly underestimate the length, magnitude, and extent of the periphery's terms-of-trade boom. In this, he appears to have repeated the methodological error that originally led Singer to detect a long-term secular deterioration in the periphery's terms of trade by looking at British prices as a proxy for the peripheral countries' own prices.[9]

---

4. Williamson, *Trade and Poverty*, p. 49.

5. Ibid., pp. 50-51.

6. Ibid., pp. 51-53, ch. 10.

7. N. Crafts, 'Book Review Feature: *Trade and Poverty: When the Third World Fell Behind*', *Economic Journal*, 123, 2013, p. F193.

8. K.H. O'Rourke and J.G. Williamson, 'When Did Globalisation Begin?', *European Review of Economic History*, 6:1, 2002, pp. 32-39; D. Jacks, 'Intra- and International Commodity Market Integration in the Atlantic Economy, 1800-1913', *Explorations in Economic History*, 42:3, 2005; D. Jacks, C.M. Meissner, and D. Novyd, 'Trade Costs in the First Wave of Globalization', *Explorations in Economic History*, 47:2, 2010; and D. Chilosi and G. Federico, 'Asian Globalizations: Market Integration, Trade and Economic Growth, 1800-1938', Economic History Working Paper 183, London School of Economics and Political Science, 2013.

9. Singer's findings were published in United Nations, *Relative Prices of Exports and Imports of Under-Developed Countries: A Study of Post-War Terms of Trade between Under-Developed and Industrialized Countries,* Lake Success, 1949. He drew on the British export and import price series calculated by W. Schlote, *British Overseas Trade: From 1700 to the 1930s*, Oxford, 1952. Singer also presented a second series that he claimed to be 'based on the trade statistics of the major trading countries and a number of others' (United Nations, *Relative Prices*, p. 21), taken from the League of Nations, *Industrialization and Foreign Trade,* Geneva, 1945, p. 157,

The case of India is presented here to illustrate why this methodological issue matters. Williamson does not simply use his dataset to test whether the periphery experienced a terms-of-trade boom – if he did, the introduction of a bias in favour of his null hypothesis would be highly commendable. Rather, the dataset has been utilised for various other purposes. Williamson uses it, for example, to determine which parts of the periphery experienced the boom and to what degree.[10] This leads him to an 'Indian paradox', as India appears to have deindustrialised without a terms-of-trade boom. Williamson therefore gives an alternative account of India's deindustrialisation that is at odds with his grand narrative and, more importantly, is not entirely convincing.[11] It is suggested here, by contrast, that the apparent Indian paradox is only a result of Williamson's use of British and US prices to measure India's terms of trade. Were they measured correctly using India's own prices, it is highly likely that a dramatic improvement would be seen.

The paper begins with an extensive literature review that demonstrates that Williamson has predominantly relied upon terms-of-trade estimates that use prices from the core countries as proxies for the peripheral countries' own prices. A comparison between proxy and own-price estimates for six countries suggests that there is a major downward bias in the trend of the former for the nineteenth century due to the effects of price convergence. The comparison suggests that this downward bias is sufficient to give a proxy estimate the *wrong trend* – that is, to make it appear like a country's terms of trade are deteriorating, even though they were actually improving. Data from Indonesia, a peripheral country with an unusually rich collection of prices,[12] confirms this finding. Finally, the case of India is discussed, in order to show why this methodological issue matters. The paper concludes that better data would greatly strengthen Williamson's grand narrative, although many of its details may need to be revised. To do so, further reconstructions of peripheral countries' price records will be required.

---

Tables 7 and 8. The methodology of the League of Nations study (ibid., pp. 154-55) nonetheless reveals that its principle source was Schlote! Unsurprisingly, Singer's two series reinforced each other. For the key critiques of his numbers, see P.T. Ellsworth, 'The Terms of Trade between Primary Producing and Industrial Countries', *Inter-American Economic Affairs*, 10:1, 1956; and P. Bairoch, *The Economic Development of the Third World since 1900*, London, (1977) 2006, pp. 111-26.

10. Williamson, 'Globalization and the Great Divergence'; and idem, *Trade and Poverty*, ch. 3.
11. Williamson, *Trade and Poverty*, ch. 6; also D. Clingingsmith and J.G. Williamson, 'Deindustrialization in 18th and 19th Century India: Mughal Decline, Climate Shocks and British Industrial Ascent', *Explorations in Economic History*, 45:3, 2008; cf. T. Roy, 'Review of *Trade and Poverty: When the Third World Fell Behind*', EH.net, 2012, online at http://eh.net/book_reviews/trade-and-poverty-when-the-third-world-fell-behind (accessed 7 October 2012).
12. W.L. Korthals Altes, *Changing Economy in Indonesia: A Selection of Statistical Source Material from the Early 19th Century up to 1940*, XV, *Prices (Non-Rice) 1814–1940*, Amsterdam, 1994.

## The Downward Bias

To clarify, in this paper the 'terms of trade' refer to what are technically known as the 'net barter terms of trade' (NBTT).[2] They are calculated by dividing a country's export price index (Px) by its import price index (Pm), as follows:

$$NBTT = \frac{Px}{Pm} \qquad\qquad 1$$

The terms of trade thus show a country's export prices relative to its import prices. When the terms of trade go up, they are improving; when they go down, they are deteriorating.

Williamson's analysis of the periphery's terms of trade draws on estimates for 21 countries from eastern and southern Europe, the Middle East, Asia, and Latin America. From this dataset, Williamson has constructed an index of the terms of trade of 19 countries, weighting them according to their populations in 1870.[13] China and Japan were the two excluded because Williamson found that the price of opium increased, causing a deterioration in China's terms of trade that, due to the country's large population, would have distorted the overall picture if it had been included. The resulting index for the 'poor periphery (excluding East Asia)' is shown in Figure 1, where, following Williamson,[14] it is contrasted with Britain's terms of trade. The poor-periphery index shows an increase of 75 percent from the 1800s to the 1860s, which largely mirrors the deterioration in Britain's terms of trade over the same period.[15]

Williamson notes that he has probably underestimated the extent of the boom. He writes that for his purposes:

> […] the best measure of the terms of trade is the ratio of a weighted average of export and import prices quoted in local markets, *including* home import duties, that captures 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 might be called 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, like Amsterdam, London, or New York. To the extent that transport revolutions caused price convergence between exporter and importer, primary product prices quoted in core import markets will understate the rise in the periphery country's terms of trade. On this score alone, any reported boom in a periphery country
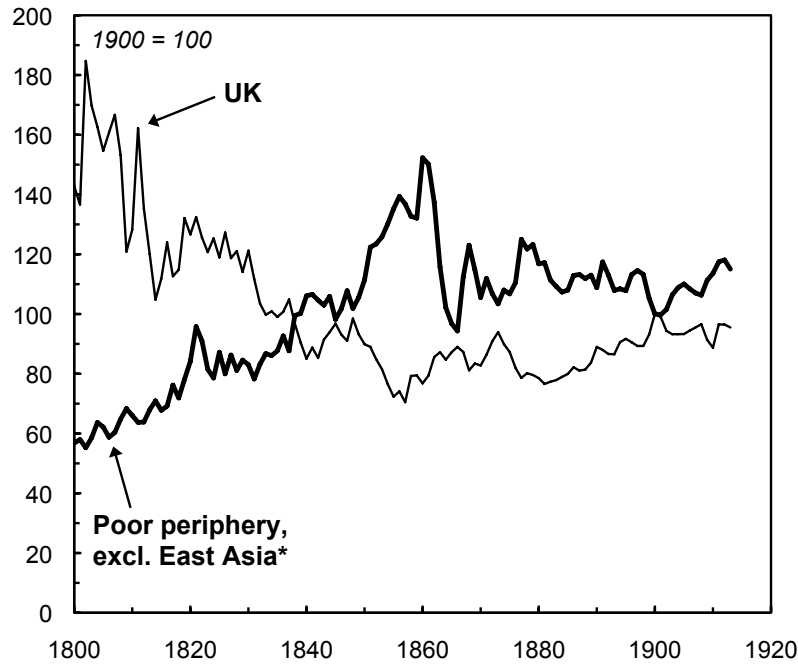
---

13. Williamson, 'Globalization and the Great Divergence', pp. 359-61, 386-91.
14. Ibid., p. 362, Figure 2; and idem, *Trade and Poverty*, p. 32, Figure 3.2.
15. Figure 1 is different from the equivalent figures in Williamson's published works because it was found in his underlying worksheets that he had accidentally used a series for Latin America, rather than the series for the poor periphery (excluding East Asia). This was confirmed by Professor Williamson in private correspondence on 25 May 2012.

*Figure 1*

Williamson's Terms of Trade Boom, 1800-1913



* Average net barter terms of trade of 19 peripheral countries, weighted by their populations in 1870. The countries are Argentina, Brazil, Ceylon, Chile, Cuba, Egypt, India, Indonesia, Italy, Levant, Malaya, Mexico, Ottoman Turkey, the Philippines, Portugal, Russia, Siam, Spain, and Venezuela.

Source: Data underlying Williamson, 'Globalization and the Great Divergence', p. 362, Figure 2; also idem, *Trade and Poverty*, p. 32, Figure 3.2; kindly provided by Professor Williamson.

terms of trade, where it is based on the worst-case scenario estimation, was actually somewhat bigger than that measured.[16]

Rephrasing Williamson, it can be said that the 'ideal measure' of a peripheral country's terms of trade is calculated from its own prices, whereas in the 'worst-case scenario' they are calculated using core countries' prices as proxies. Ideally, then, 'own-price terms of trade' should be calculated as:

$$Own\text{-}price\ NBTT = \frac{Px}{Pm} \qquad\qquad 2$$

In practice, however, domestic prices are not available for many peripheral countries, so 'proxy terms of trade' are instead calculated using foreign prices:

---

16. Williamson, *Trade amd Poverty*, p. 29, original emphasis.

$$Proxy\ NBTT = \frac{Foreign\ Px}{Foreign\ Pm}$$

As Williamson notes, such proxy estimates are likely to have a downward bias in the trend when there has been price convergence, as there was in the nineteenth century.

An illustration of the downward bias in the trend of proxy estimates comes from comparing them with own-price estimates for the same country. Figure 2 provides such evidence for six peripheral countries for which it proved possible to find both proxy and own-price estimates. Four had own-price estimates calculated using unit values from trade statistics: Canada,[17] China,[18] Italy,[19] and Japan.[20] Own-price estimates calculated with wholesale prices were found for another two: India,[21] and Indonesia.[22] For all six, the proxy estimates were mainly produced using a mixture of British and US unit values and wholesale prices.[23]

17. K.W. Taylor and H. Michel, *Statistical Contributions to Canadian Economic History*, II, Toronto, 1931, pp. 18-19; reproduced in F.H. Leacy, *Historical Statistics of Canada*, 2nd ed., Ottawa, 1983, Series G388, online at http://www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=11-516-XIE&lang=eng (accessed 24 April 2011).

18. F.L. Ho, *Index Numbers of the Quantities and Prices of Imports and Exports and of the Barter Terms of Trade in China, 1867-1928*, Tientsin, 1930; subsequently corrected for or a change in the method of valuing exports and imports in 1904 by C. Hou, *Foreign Investment and Economic Development in China 1840-1937*, Cambridge, MA, 1965, pp. 194-98.

19. G. Federico and M. Vasta, 'Was Industrialization an Escape from the Commodity Lottery? Evidence from Italy, 1861-1940', Dipartimento di Economia Politica Quaderno 573, Università degli Studi di Siena, 2009, pp. 22-23, Table 2; cf. G. Federico, S. Natoli, G. Tattara, and M. Vasta, *Il commercio estero italiano 1862-1950*, Rome, 2011, pp. 74-76, 226-32.

20. I. Yamazawa and Y. Yamamoto, *Estimates of Long-Term Economic Statistics of Japan since 1868*, XIV, *Foreign Trade and Balance of Payments*, Tokyo, 1979, pp. 169-70, 193, 197. These are not strictly own-price estimates because Japan's imports prior to 1903 were valued 'free on board' (FOB) and did not include cost, insurance, and freight (CIF). Considerable effort was nevertheless made by the estimate's authors to convert the FOB figures to CIF using a shipping freight-rate index, so it can be considered as equivalent to an own-price estimate.

21. J.A. Francis, 'The Terms of Trade and the Rise of Argentina in the Long Nineteenth Century', PhD diss., London School of Economics and Political Science, 2013, Appendix 2.2 and p. 258, Table DA.5.

22. Korthals Altes, *Changing Economy*, XV, pp. 158-60.

23. Five of the proxy estimates were calculated as chained Laspeyres indices by Williamson and his co-authors, largely using British price series for the peripheral countries' exports, and a mixture of British export prices and US wholesale prices for their imports. C. Blattman, J. Hwang, and J.G. Williamson, 'Winners and Losers in the Commodity Lottery: The Impact of Terms of Trade Growth and Volatility in the Periphery 1870-1939', *Journal of Development Economics*, 82:1, 2007; and Williamson, 'Globalization and the Great Divergence'. These authors do not appear to have made adjustments for trade costs, even though they promised in an earlier working paper that '[i]n a moment we will discuss the adjustments made to our terms of trade figures to account for transport cost changes'. C. Blattman, J. Hwang, and J.G. Williamson, 'The Impact of the Terms of Trade on Economic Development in the

*Table 1*

A Summary of Williamson's 21 Terms-of-Trade Series

| Type of estimate | Countries (number) |
|---|---|
| Own price | Indonesia, and Japan (2) |
| Proxy | Argentina, Ceylon, China, Cuba, India, Italy, Malaya, Mexico, the Philippines, Russia, Siam, and Venezuela (12) |
| Part proxy | Brazil, Egypt, and the Levant (3) |
| Adjusted proxy | Ottoman Turkey, and Spain (2) |
| Other | Chile, and Portugal (2) |

\* Excludes Cuba and Malaya due to insufficient data.

Sources: See the Appendix.

The comparison between the own-price and proxy estimates (the thick and thin lines, respectively) in Figure 2 clearly illustrates the downward bias in the trend of the latter. In five out of six cases, the bias is sufficient to make it seem like the terms of trade were deteriorating, even though the own-price series suggest that they were really improving. Proxy estimates are, then, liable to have trends with the *wrong sign*.

Williamson believes that his findings are unaffected by this downward bias because he has largely avoided proxy estimates when constructing his dataset. He writes:

> Having pointed out the flaws in the worst-case scenario, it should be stressed that there are only 6 of these (out of 21) [in his dataset]. The other 15 are taken from country-specific sources and do an excellent job in constructing estimates that come close to the ideal measure [...].[24]

Hence, Williamson concludes that the downward bias is of relatively little importance because it only affects six of his series.

Yet an extensive review of the methodology and sources underlying each of the 21 series, detailed at length in the Appendix of this paper, suggests that Williamson's assessment of his dataset is inaccurate. As summarised in Table 1, the review finds that only two of Williamson's 21 series are own-price esti-

Periphery, 1870-1939: Volatility and Secular Change', NBER Working Paper 10600, 2004, p. 32. Judging from the underlying worksheets, it would appear that the adjustments were never made. The worksheets are available online at http://chrisblattman.com/documents/data/commod/Commodity%20price%20indices%201865-1950.zip (accessed 4 July 2012). The only proxy series not to come from Williamson and his associates is for Italy, which was calculated using British trade statistics by A. Glazier, V.N. Bandera, and R.B. Berner, 'Terms of Trade between Italy and the United Kingdom 1815–1913', *Journal of European Economic History*, 4:1, 1975, pp. 30-33, Table 5. As Federico and Vasta ('Was Industrialization', p. 232, fn. 12) observe, this series is not actually for Italy, but rather for Britain's terms of trade with Italy, although it is routinely used as if it represented Italy's terms of trade.

24. Williamson, *Trade and Poverty*, p. 29, cf. idem, 'Globalization and the Great Divergence', p. 360.

## Figure 2

### The Downward Bias in Proxy Terms-of-Trade Estimates prior to 1913
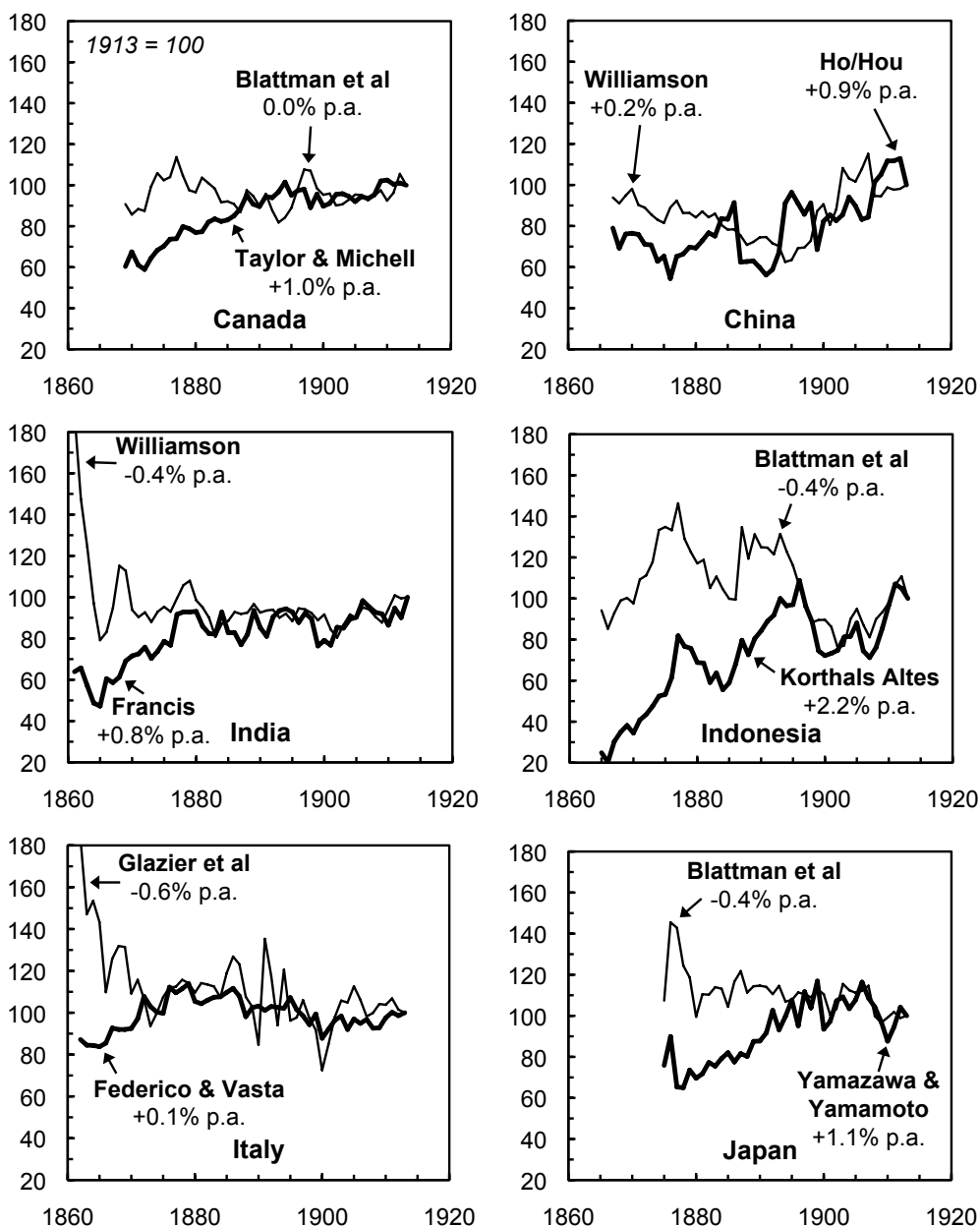


Note: The thick lines are own-price terms of trade, the thin lines are proxy terms of trade. The annual trends are calculated as the rate of change of the exponential trend line.

Sources: See the text.

mates, while fully 12 were mainly estimated using proxy prices. Three more were calculated as 'part-proxy terms of trade', using own prices for exports but foreign prices for imports,[25] as follows:

25. Own-price series for the periphery's exports tend to be far more abundant than those for its imports; hence, the part-proxy estimates have always used the peripheral country's own-

$$Part\text{-}proxy\ NBTT = \frac{Domestic\ Px}{Foreign\ Pm} \qquad\qquad 4$$

Another two were calculated using the core's prices as proxies, as in Equation 2, but adjusting them for changes in trade costs, which produces 'adjusted proxy terms of trade' in this way:

$$Adjusted\ proxy\ NBTT = \frac{Foreign\ Px\ \text{-}\ trade\ costs}{Foreign\ Pm\ +\ trade\ costs} \qquad\qquad 5$$

Of the two remaining series, one (Portugal) is, by the admission of its own author, of little analytical value, and the last (Chile) is estimated from a variety of sources, some of which inspire little confidence.

This reliance on proxy estimates suggests that Williamson must have understated the periphery's terms-of-trade boom considerably more than he believes. Like Singer before him, Williamson has taken the inverse of the core's terms of trade with the periphery as a proxy for the periphery's own terms of trade, which is why there is a close negative correlation between the series for the poor periphery and Britain in Figure 1.[26] As Singer's critics pointed out,[27] this methodology ignores the price convergence that took place during the nineteenth century, which meant that it was possible for two countries or regions to simultaneously have improving terms of trade vis-à-vis each other. Consequently, using prices from core countries to calculate peripheral countries' terms of trade is likely to produce estimates with a downward bias in the trend.

It should be reiterated at this point that this does *not* refute Williamson's grand narrative. Far from it. As shown in Figure 2, the downward bias in the trend of proxy estimates can be sufficient to make an improvement in the terms of trade appear like a deterioration – that is, to give the trend the wrong sign. It seems likely, therefore, that further own-price estimates would greatly reinforce Williamson's grand narrative by making the periphery's terms-of-trade boom appear far more substantial than he supposes. To strengthen this conclusion, tests can be run using data from Indonesia, a peripheral country with an unusually rich collection of price series.

---

prices for exports and foreign prices for imports. They should have considerably less downward bias because price convergence would only affect the foreign import price index.

26. Williamson himself would probably not have been aware of this because, as mentioned above in footnote 15, he had entered the wrong series into his figure.

27. Ellsworth, 'Terms of Trade'; and Bairoch, *Economic Development*, pp. 111-26.

Indonesia's Own-Price Terms of Trade, 1825-1913
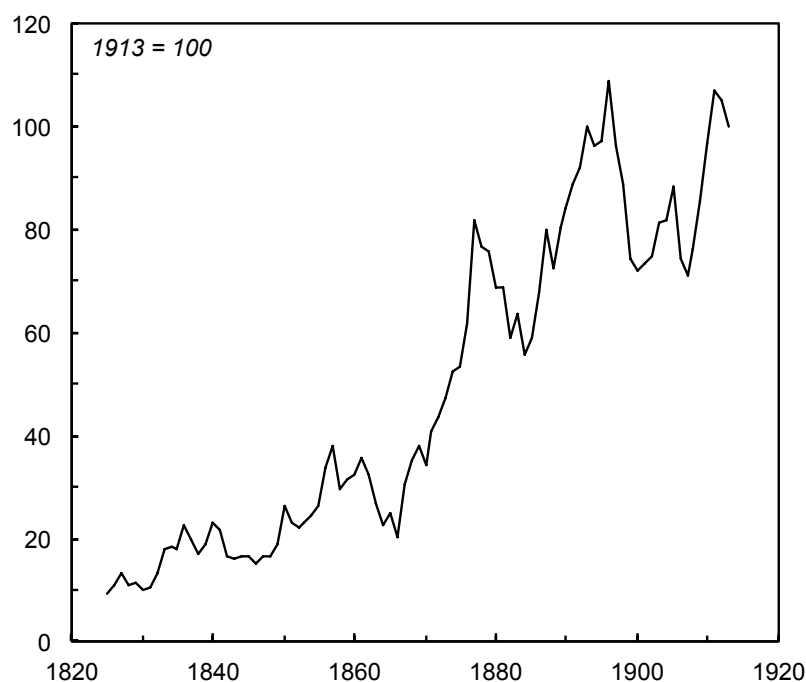


Source: Calculated from the export and import price indices in Korthals Altes, *Changing Economy*, XV, pp. 159-60.

## Indonesia's Prices

Indonesia's nineteenth-century wholesale prices were compiled by the colonial authorities in the early twentieth century, then later added to and published by Dutch researchers.[28] They mainly came from the Dutch East Indies' commercial press, which focused particularly on the prices of exports and imports. For this reason, they are perfect for calculating Indonesia's terms of trade.

Export and import price indices constructed by W.L. Korthals Altes provide an own-price estimate of Indonesia's terms of trade since 1825.[29] The export price index consists of the wholesale prices of coffee, copra, rubber, sugar, and tobacco, with weights changed every decade; and the import price index mainly consists of cotton piece goods, but also copper sheets and iron, with the weights adjusted more sporadically. They result in terms of trade that show a roughly 700 percent improvement from the second half of the 1820s up to the decade prior to the First World War, as seen in Figure 3. Notably, this is the longest own-price estimate for any peripheral country, so the magnitude of the boom is particularly significant.

The price data underlying Figure 3 can be used to test for the downward bias in proxy estimates. A simple two-good test has the advantage of bypassing

---

28. Korthals Altes, *Changing Economy*, XV.
29. Ibid., pp. 161-64.

the questions of which type of index to use and the composition of the indices – issues that have been given much attention in the existing literature.[30] Instead, here the relative prices of just two goods in Indonesia will be compared with the relative prices of the same goods in a core country. Such a two-good test isolates the issue of whether or not the prices from the core country can be used as proxies for prices in the peripheral country.

Figure 4 presents the basic data to be used in the test. It compares the prices of cotton shirtings in Britain and Indonesia in panel (a) and the prices of raw sugar in Britain and Indonesia in panel (b), with all converted to British currency and metric units. Aside from the issue of data availability, cotton piece goods and sugar have been chosen because of their representativeness. Cotton textiles were peripheral countries' main import and are at the heart of Williamson's narrative, while sugar is one of the classic, bulky primary (or perhaps semi-processed) commodities that dominated the periphery's exports, including Indonesia's. They are therefore appropriate goods to use in the test.[31]

The price convergence between core and periphery can be clearly seen in Figure 4. Hence, the price of sugar fell far more dramatically in Britain than it did in Java, particularly in the first half of the nineteenth century. What is more surprising is that a similar process appears to have been at work for cotton shirtings. Historians have previously supposed that price convergence primarily affected bulky commodities, such as sugar. Williamson, for example, assumes that the use of proxy prices is less problematic for imports than for exports: 'Since transport revolutions reduced freight costs on the outward leg from the industrial core much less (they were high-value, low-bulk products […]), the periphery [proxy] import price estimates are less flawed in the worst-case scenario than are the export price estimates'.[32] The prices for Britain and Indonesia in Figure 4 nevertheless suggest that both low-bulk and bulky commodities experienced similar price convergence: in their home countries both cotton shirtings and sugar were selling at around 50 percent of the price of the importing country in the 1840s, which then increased to about 80 percent in the

30. Ş. Pamuk, 'Foreign Trade, Foreign Capital and the Peripheralization of the Ottoman Empire', PhD diss., University of California, 1978, pp. 259-73; and L. Prados de la Escosura, 'Las relaciones reales de intercambio entre España y Gran Bretaña durante los siglos XVIII y XIX', in P.M. Aceña and L. Prados de la Escosura, eds., *La nueva historia económica en España*, Madrid, 1985, pp. 129-31.

31. These prices should be treated as close approximations because measuring prices across time is complicated by changes in the quality of goods. In the case of raw sugar, this is less of a problem, but it is more so in the case of cotton shirtings. In panel (a) of Figure 4 the actual prices of cotton shirtings has been used for both places during 1908-13, then extrapolated backwards using the prices of other types of cotton shirtings or cloths. Consequently, the prices prior to 1908 are estimates with some margins of error. Those margins are probably insufficient, however, to affect the finding of price convergence and the results of the test.

32. Williamson, *Trade and Poverty*, p. 29.

*Figure 4*

Prices of Cotton Goods and Sugar in Britain and Indonesia, 1836-1913
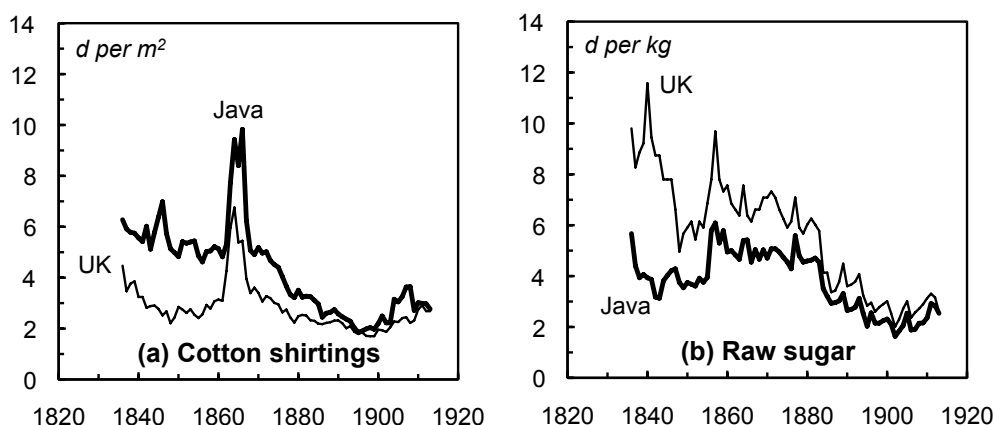


Note: The series were constructed as follows:

Cotton shirtings in Java: Longfold, white English shirtings for 1908-13, extrapolated back through ratio splicing with another series for white English shirtings during 1861-1908, and a series for bleached Dutch calicoes (madapollams) during 1836-61. All series are wholesale prices in Batavia.

Cotton shirtings in Britain: 16 by 15 thread shirtings for 1908-13, extrapolated back through ratio splicing with Lars Sandberg's grey cloth price index for 1836-1908. Both series are wholesale prices in Manchester.

Raw sugar in Java: Sugar in Batavia for 1848-1913, extrapolated back through ratio splicing with another series for sugar in Java for 1836-48. Both series are wholesale prices.

Raw sugar in London: Sugar in London throughout. The series is the 'in bond' (that is, CIF) price.

Sources:

Cotton shirtings and sugar prices: *Economist*, 'Commercial History', supplement, various years; and Korthals Altes, *Changing Economy*, XV, pp. 27-31, 87-96, Table 2A, Series 68 and 69.

Exchange rate: J.T.M. van Laanen, *Changing Economy in Indonesia*, VI, *Money and Banking 1816-1940*, The Hague, 1980, pp. 123-26, Table 8, Lines 4 and 16.

first decade of the twentieth century. Presumably this was mainly due to the effects of trade liberalisation, which reduced commercial markups by increasing competition among merchants, as well as falling trade costs other than freight – a point that will be returned to below.

The four series in Figure 4 can be used to calculate own-price and proxy estimates of the terms of trade for the two goods, which are shown respectively as panels (a) and (b) in Figure 5. Supporting the finding above that the downward bias is sufficient to give a terms-of-trade estimate the wrong sign, the proxy estimate indicates a secular deterioration, even though the own-price estimate shows the terms of trade improving for much of the nineteenth century. In panel (a) the terms of trade show that, measured in wholesale prices

*Figure 5*

Two-Good Terms of Trade for Indonesia, 1836-1913
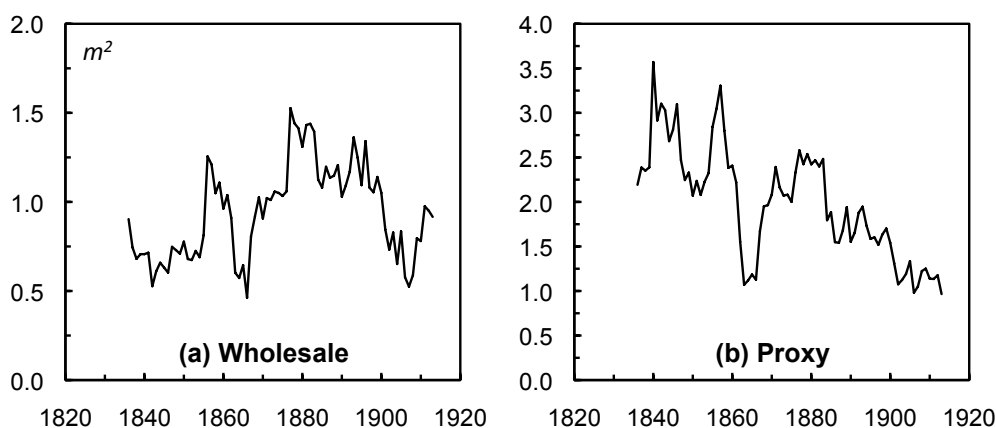
Note: The series show the purchasing power of a kilo of raw sugar in terms of square metres of cotton shirtings. They are calculated using the following series from Figure 4:
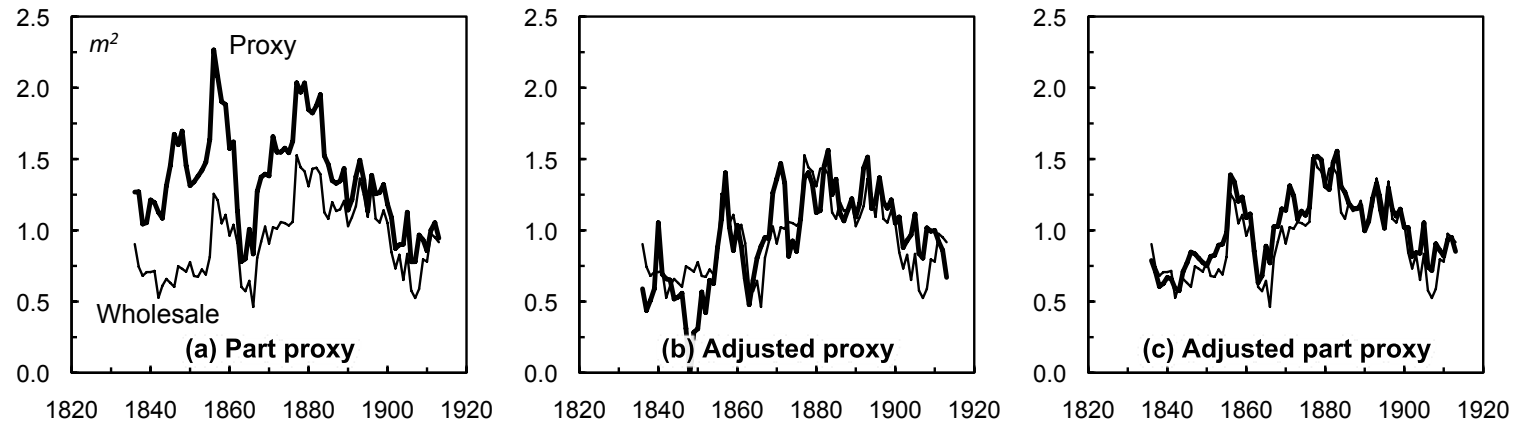
(a) Wholesale prices of raw sugar and cotton shirtings in Java.

(b) 'In bond' price of raw sugar in London and wholesale price of cotton shirtings in Manchester.

in Java, the purchasing power of a kilo of sugar increased from around 0.7 m$^2$ of cotton shirtings in the 1840s to 1.2 m$^2$ in the 1890s, then fell back to 0.7 m$^2$ in the 1900s. By contrast, panel (b) shows the purchasing power of a kilo of sugar, measured using prices in Britain, persistently falling from 2.8 m$^2$ in the 1840s to 1.2 m$^2$ in the 1900s. The downward bias is thus massive.

These data can also be utilised to evaluate the other methods that have been used to estimate the terms of trade in the existing literature. In panel (a) of Figure 6 the thick line is what was described above as a 'part-proxy' estimate, calculated using prices for sugar in Java and cotton shirtings in Manchester. The resulting terms of trade are still some distance from the wholesale estimate, which is shown by the thin line. Considerably closer is the thick line in panel (b), in which the proxy estimate has been adjusted by using an Indonesia-to-Europe freight-rate index to deduct trade costs from the British price of sugar and add them to the British price of cotton shirtings, as in Equation 5. The adjusted proxy estimate that results suggests that – when own-price estimates are impossible – making such adjustments is highly desirable, as it leads to terms of trade that are considerably closer to the wholesale estimate, again shown by the thin line. More desirable still, however, is what can be called the 'adjusted part-proxy terms of trade' shown in panel (c). They were calculated using Indonesia's own prices for sugar and adjusted British cotton shirtings prices, as follows:

*Figure 6*

Other Two-Good Terms of Trade for Indonesia, 1836-1913



Note: The series show the purchasing power of a kilo of raw sugar in terms of square meters of cotton shirtings. In all panels the thick line is the indicated proxy estimate and the thin line is the wholesale estimate. For each panel, the proxy estimates were calculated using the following series from Figure 4:

(a) Wholesale prices of raw sugar in Java and cotton shirtings in Manchester.

(b) 'In bond' price of raw sugar in London and wholesale price of cotton shirtings in Manchester, both adjusted for changes in trade costs. For raw sugar, an Indonesia-to-Europe freight rate index was referenced so that 1908-13 equaled the average gap in prices between sugar in London and Java during this period. The index was then subtracted from the London price of sugar. For cotton shirtings, the freight rate index was referenced in the same way, then added to the price of cotton shirtings in Manchester.

(c) Wholesale prices of raw sugar in Java and cotton shirtings in Manchester, with the latter adjusted as in panel (b).

Sources:

Prices: as in Figure 4.

Freight rate index: Korthals Altes, *Changing Economy*, XV, pp. 159-60.

*Table 2*

Indonesia's Two-Good Terms of Trade, 1836-1913

| | Pearson correlation coefficients | | |
| | Whole | Components* | |
| | | Trend | Cycles |
|---|---|---|---|
| Proxy | 0.15 | -0.19 | 0.61 |
| Part proxy | 0.67 | 0.49 | 0.81 |
| Adjusted proxy | 0.73 | 0.91 | 0.48 |
| Adjusted part proxy | 0.91 | 0.96 | 0.81 |

* The trend and cyclical components were separated using a Hodrick-Prescott Filter, with the smoothing parameter set at 300.

Note: In all cases the coefficients are for the correlation between the wholesale estimate and the estimates from Figures 5 and 6. 1.00 equals perfect positive correlation, -1.00 perfect negative correlation.

$$Adjusted\ part\text{-}proxy\ NBTT = \frac{Domestic\ Px}{Foreign\ Pm + trade\ costs} \qquad 6$$

Panel (c) indicates that such an estimate should give a series that is close to the wholesale estimate.

The results of the two-good test indicate, then, that proxy estimates are misleading and that adjusted estimates are preferable. This is confirmed by the simple statistical analysis in Table 2, in which all the estimates and their trend and cyclical components are correlated with the wholesale estimate during 1836-1913. The coefficients confirm the negative correlation between the trends in the wholesale and proxy estimates, while the cycles in all the estimates are positively correlated with the cycles in the wholesale estimate, although the coefficient is notably lower for the adjusted proxy estimate. The adjusted part-proxy estimate's superiority is clearly seen in the high coefficients for the series as a whole, as well as both its trend and cyclical components. Whenever own-price estimates are not available, therefore, proxy or part-proxy estimates should be adjusted for changes in trade costs.

The problem, however, is that making such adjustments is not easy. Traditionally it has been assumed that trade costs were equivalent to just insurance and freight,[33] yet more recent research on nineteenth-century price convergence has suggested that trade costs should also include 'storage costs, tariffs, taxes, and spoilage', as well as 'exchange rate risk, prevailing interest rates, and/or the

---

33. For example, Pamuk, 'Foreign Trade, Foreign Capital', pp. 187-99; and L. Prados de la Escosura, 'El comercio hispano-británico en los siglos XVIII y XIX: I. Reconstrucción', *Revista de Historia Económica*, 2:2, 1984, pp. 134-37.

risk aversion of agents',[34] while the degree of competition among merchants determined the markups they could charge on their goods. Furthermore, there is the problem of variations in the degree to which trade costs fell for different places. Figure 7 illustrates this by comparing Indonesia's freight-rate index, which was used to adjust the proxy prices in Figure 6, with two other indices. Whereas the Indonesia-to-Europe index fell by 93 percent from the 1840s to the 1900s, the United States-to-Europe index fell by 77 percent, and the Baltic-to-Britain index by 60 percent. Freight rates thus fell by different degrees for different places,[35] and it can be assumed that other trade costs did as well. This suggests that the good results for the adjusted estimates in Figure 6 owe much to the existence of a high-quality freight-rate index for Indonesia, which again reflects the unusually rich data available for that country.[36] Unfortunately, freight-rate indices going back to the first half of the nineteenth century are not currently available for other peripheral countries.

The two-good test using Indonesia's prices thus demonstrates that the downward bias in the trend of proxy estimates is large for the nineteenth century. What is more, it may also be present in the part-proxy estimates that Williamson has gathered, and possibly even in the adjusted proxy estimates if they have had insufficient adjustments made for falling trade costs. It seems certain, therefore, that had it been possible to gather estimates calculated with the peripheral countries' own prices, they would have shown a far longer, greater, and more widespread terms-of-trade boom than Williamson found. The problem is that other countries lack the kind of detailed price history that exists for Indonesia, so historians have instead relied upon proxy estimates. Here the case of India will be used to illustrate why this matters.

## The 'Indian Paradox'

Were Williamson and others using proxy estimates just to test whether the periphery as a whole had experienced a nineteenth-century terms-of-trade boom, the downward bias would be of little importance – indeed, they would be commended for having introduced a bias in favour of their null hypothesis. Unfortunately, however, they have also used these data for other purposes for which they are probably unsuitable.

Williamson, for example, uses his dataset to determine which parts of the periphery experienced improved terms of trade and which did not.[37] Largely

---

34. Jacks, 'Intra- and International Commodity Market', pp. 401-02, fn. 1; also idem, 'What Drove 19th Century Commodity Market Integration?', *Explorations in Economic History*, 43:3, 2006; and Jacks, Meissner, and Novyd, 'Trade Costs'.

35. Mohammed and Williamson, 'Freight Rates'.

36. In panels (b) and (c) of Figure 6 the freight-rate index was used as a proxy for all trade costs by giving it a bigger weight than freights alone would justify. Total trade costs were estimated using the gap in the prices of the two goods in Britain and Java.

37. Williamson, *Trade and Poverty*, pp. 33-43.

*Figure 7*

Freight-Rate Indices, 1800-1913
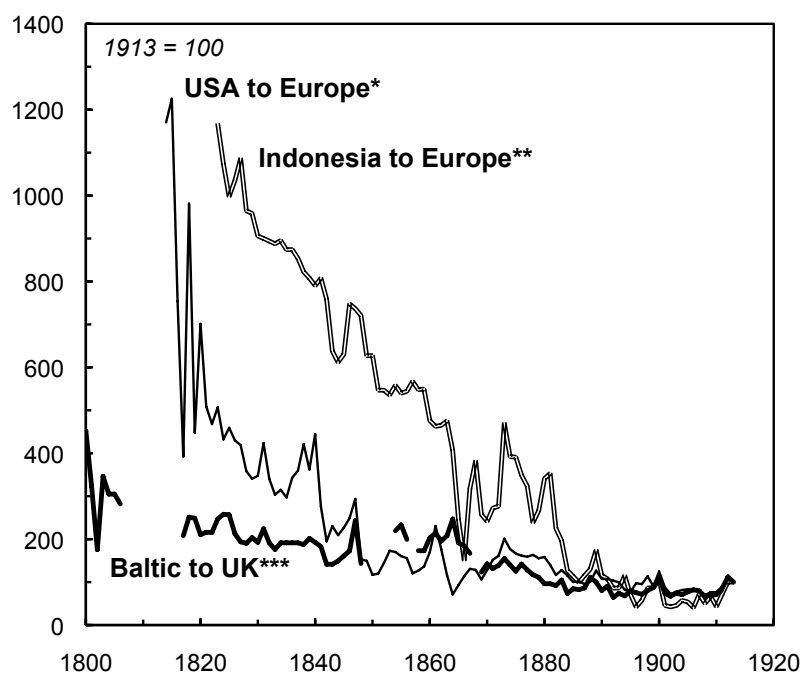


* Freight rates for ashes, bark, cotton, flour, naval stores, rice, timber, tobacco, and wheat.

** Freight rates for sugar and unspecified cargoes.

*** Freights rates for timber and wheat.

Note: All indices represent freight rates in nominal pounds sterling.

Sources:

Baltic: Calculated from C.K. Harley, 'Ocean Freight Rates and Productivity, 1740-1913: The Primacy of Mechanical Invention Reaffirmed', *Journal of Economic History*, 48:4, 1988, pp. 873-75, Table 9; and S.I.S. Mohammed and J.G. Williamson, 'Freight Rates and Productivity Gains in British Tramp Shipping 1869-1950', *Explorations in Economic History*, 41:2, 2004, pp. 179-81, Table 1.

Indonesia: Korthals Altes, *Changing Economy*, XV, pp. 159-60; and van Laanen, *Changing Economy*, VI, pp. 122-26, Table 8.

United States: D.C. North, 'The Role of Transportation in the Economic Development of North America', in Colloque International d'Histoire maritime, ed., *Les grandes voies maritimes dans le monde, XVe-XIXe siècles*, Paris, 1965, p. 236, Table 2; and L.H. Officer, 'Dollar-Sterling Exchange Rates: 1791–1914', in S.B. Carter et al, eds., Historical Statistics of the United States: Earliest Times to the Present: Millennial Edition, New York, 2006, Series Ee618, online at http://hsus.cambridge.org/HSUSWeb/HSUSEntryServlet (accessed 20 November 2013)

based on Indonesia's own-price estimate, he concludes that '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 through 1890 was much greater' than the poor-periphery average.[38] The particularly dramatic improvement in its terms

---

38. Ibid., pp. 41-42.

of trade 'suggests that globalization must have done bigger damage to industry in Indonesia than almost anywhere else in the non-European periphery'.[39] On the other hand, Williamson found 'no growth at all in India's terms of trade between 1800 and 1890',[40] which is surprising, given that India presents by far the most widely discussed case of nineteenth-century deindustrialisation.[41] Williamson is consequently faced by an 'Indian paradox – big de-industrialization but small terms of trade shocks'.[42]

The solution of Williamson and his co-author David Clingingsmith to the Indian paradox is ingenious but largely unconvincing.[43] Tirthankar Roy has described the problems with their account far more comprehensively than the present author can, so his critique is worth quoting at length:

> Williamson's solution to the Indian paradox is war, pestilence, and failure of the monsoon. The disintegration of the Mughal Empire and more frequent droughts caused agricultural productivity to fall and grain prices to rise in India, which ushered in a deindustrialization. The evidence for any of this is 'particularly thin' [Williamson 2011, 80]. The wage and price statistics quoted are not detailed enough for a part of the world where regional differences were large. Historians of India have long known that Mughal collapse and economic dislocation did not go together. For example, the regions that led cotton textile production in the eighteenth century were located near the seaboard or within easy access from it, whereas imperial collapse affected regions that were located hundreds of miles into the interior. Anarchy in Rohilkhand, which is discussed, should not affect the weaver in Bengal. The peninsula by and large did not form a part of the Mughal Empire. In textile producing seaboard states, such as Bengal, which broke away from the Empire about 1715, there was agrarian expansion and clearing of the forests. It is not definitively known if the frequency of droughts did in fact increase; where in India it did; whether the droughts were a random risk or a systemic one; if a systemic one, why environmental change affected only India; and why the failure of rains should reduce land yield permanently.[44]

An alternative solution, in line with this paper's argument, is that the apparent 'Indian paradox' is an illusion produced by Clingingsmith and Williamson's use of a proxy terms-of-trade estimate.[45] Their series is mainly calculated from British and US prices and appears to have a distinct downward bias in the trend when compared to an own-price estimate for 1861-1913, as was

39. Ibid., p. 42.
40. Ibid., p. 41.
41. I. Habib, 'Studying a Colonial Economy – Without Perceiving Colonialism', *Modern Asian Studies*, 19:3, 1985, pp. 359-64; T. Roy, *Rethinking Economic Change in India: Labour and Livelihood*, London and New York, 2005, ch. 5; and P. Parthasarathi, 'Historical Issues of Deindustrialization in Nineteenth-Century South India', in G. Riello and T. Roy, eds., *How India Clothed the World: The World of South Asian Textiles, 1500-1850*, Leiden, 2009.
42. Williamson, *Trade and Poverty*, p. 41.
43. Williamson, 'Globalization and the Great Divergence'; also idem, *Trade and Poverty*, ch. 6.
44. Roy, 'Review of *Trade and Poverty*'.
45. Williamson, 'Globalization and the Great Divergence', pp. 231-32.

seen in Figure 2. Prior to 1861 too, there is every reason to expect that India experienced a similar terms-of-trade boom to Indonesia. Both began the nineteenth century dominated by European trading companies that effectively exercised monopolies over their foreign trade. Liberalisation occurred at different rates, but in both countries the bargaining power of merchants was reduced with the relaxing and abolition of the European trade monopolies, which resulted in lower commercial markups on both exports and imports. The transport revolution should then have positively impacted upon both countries' terms of trade to similar degrees. What is more, both countries imported similar manufactured goods, which were being produced ever more cheaply by the core's industrial revolution. There is every reason to expect, therefore, that India's terms of trade also improved dramatically.

Definitive proof of India's nineteenth-century terms-of-trade boom awaits a more complete reconstruction of the country's price history, although the data that are emerging strongly suggest that they improved. Hence, recent research into India's nineteenth-century price history has found that it experienced a similar degree of price convergence as Indonesia,[46] which should have led to improved terms of trade. Williamson probably should not, therefore, have trusted a proxy estimate enough to draw any conclusions about there being an 'Indian paradox'. This is one example of why these methodological issues matter.

## Conclusion

To reiterate, the analysis presented in this paper strongly reinforces Williamson's claim that the periphery experienced a terms-of-trade boom in the nineteenth century. Indeed, were more own-price or correctly adjusted proxy estimates available, the periphery's terms-of-trade boom would appear considerably longer, greater, and more widespread than Williamson supposes.

The problems arise, however, when Williamson uses his dataset to go beyond simply testing his null hypothesis of there being no terms-of-trade boom. He uses his dataset, for example, to assess the evolution of the boom over time, concluding that it peaked around 1860, from when the periphery's terms of trade deteriorated somewhat, as illustrated by Figure 1. Yet this finding is likely to be incorrect, given that the downward bias in the trend of proxy estimates can be sufficient to make improving terms of trade appear like they were deteriorating, as was shown in Figure 2. It seems probable, therefore, that the apparent 1860 peak and subsequent deterioration in the poor periphery's terms of trade is due to Williamson's use of proxy estimates. More likely, the boom continued for considerably longer, possibly up to the First World War.

Williamson also uses his dataset to determine the geographic extent of the terms-of-trade boom. Looking at an own-price estimate for Indonesia, he con-

---

46. Chilosi and Federico, 'Asian Globalizations', pp. 13-16.

cludes that its terms-of-trade boom was massive, while a proxy estimate leads him to conclude that India experienced no boom. Other regions can be added. Hence, based on a proxy estimate, he states that 'China did not undergo a terms of trade boom over the century before 1913',[47] whereas an own-price estimate leads him to claim that Japan 'underwent the biggest 19th-century terms of trade boom by far'.[48] The analysis presented in this paper suggests that these apparent historical facts could well just be artifacts of methodological error.

Williamson and his co-authors have also used a mixture of own-price and proxy terms-of-trade estimates to test other hypotheses. They have, for example, been used to determine whether the terms of trade affected growth rates and the direction of British overseas investment.[49] Given that, as has been demonstrated in this paper, the downward bias in the trend of proxy estimates can be sufficient to give them the incorrect sign, it would seem desirable to reexamine some of these questions with a better quality dataset.[50]

Williamson is, then, to be commended for having revisited the issue of the periphery's terms of trade, and his grand narrative is compelling and has been greatly reinforced by this paper. The devil, however, is in the details. Williamson appears to have placed too much faith in his dataset, which has mainly been constructed from proxy estimates of peripheral countries' terms of trade. Given the price convergence that occurred in the nineteenth century, the result is a major downward bias in the trend of these estimates, which makes his dataset unsuitable for the other purposes to which he puts it, such as determining exactly when and where the boom occurred, and what its effects were. Future research should go beyond the use of proxies by measuring the periphery's terms of trade in peripheral countries' own prices. More reconstructions of their price records are therefore required.

## Appendix: 21 Terms-of-Trade Estimates, 1750-1913

The following is a survey of the sources of each of the 21 estimates used by Williamson to measure the periphery's terms of trade in the nineteenth century. The results of this survey were summarised in Table 1. To reiterate, the 'net barter terms of trade' (NBTT) are calculated as export prices (Px) divided by import prices (Pm). What will be described here is the methodology used to calculate Px and Pm in each of the 21 estimates used by Williamson. For nine

---

47. Williamson, *Trade and Poverty*, p. 33.

48. Ibid., p. 34.

49. Respectively, Blattman, Hwang, and Williamson, 'Winners and Losers'; and M.A. Clemens and J.G. Williamson, 'Wealth Bias in the First Global Capital Market Boom, 1870-1913', *Economic Journal*, 114:495, 2004.

50. Blattman, Hwang, and Williamson's finding that 'terms of trade effects were asymmetric between Core and Periphery' ('Winners and Losers', p. 156) appears of particular concern, given that their sample of the core's terms of trade are predominantly own-price estimates, whereas they use proxy estimates for the periphery.

countries, the calculations were predominantly done by Williamson and his co-authors, while Williamson gathered the remaining 12 series from various sources. To understand how the series were calculated, it proved necessary to consult all of those sources, as well as Williamson's own work, resulting in the survey given here.[51]

Using the vocabulary developed above, Williamson's database includes just two series that can be considered 'own-price' terms of trade, although even one of those comes with some caveats:

1. Indonesia. For 1825-1913, both Px and Pm are chained Laspeyres indices calculated from wholesale prices from Java.[52]
2. Japan. For 1857-1865, NBTT were interpolated between figures for 1857, 1860, and 1865, apparently drawn from domestic sources.[53] For 1866-75, geometric interpolation by Williamson.[54] For 1876-1913, Px and Pm are chained implicit Paasche indices calculated from unit values taken from Japan's trade statistics. Pm is not strictly an own-price series because prior to 1903 imports were recorded FOB and not CIF. However, considerable effort has been made by the series authors to adjust the FOB figures to CIF using a freight-rate index, so they can be taken as reasonably accurate representations of domestic prices, although strictly speaking the result is an 'adjusted part-proxy' estimate during 1876-1903.[55]

By contrast, the database contains 12 series that were predominantly calculated as 'proxy' terms of trade (that is, calculated mainly using prices drawn from the core countries):

1. Argentina. For 1811-70, Px is a Paasche index; Pm is a geometric mean of two Laspeyres indices; both were calculated using wholesale prices and unit values drawn from several core countries.[56] For 1871-85, Px is a chained Laspeyres index calculated from British commodity prices; Pm is a reweighted US wholesale price index.[57] For 1886-1913, Williamson gives

---

51. The references given in survey are to the pages in the sources where the methodology is described.
52. Korthals Altes, *Changing Economy*, XV, pp. 158-60.
53. M. Miyamoto, Y. Sakudō, and Y. Yasuba, 'Economic Development in Preindustrial Japan, 1859-1894', *Journal of Economic History*, 25:4, 1965, p. 553.
54. Williamson, 'Globalization and the Great Divergence', p. 390.
55. Yamazawa and Yamamoto, *Estimates of Long-Term Economic Statistics*, XIV, pp. 169-70, 193, 197; for the adjustments, see M. Baba and M. Tatemoto, 'Foreign Trade and Economic Growth in Japan: 1858-1937', in L. Klein and K. Ohkawa, eds., *Economic Growth: The Japanese Experience since the Meiji Era*, Homewood, 1968, p. 193.
56. Newland, 'Exports and Terms of Trade', pp. 413-15; for the underlying data, see idem, 'Puramente animal: Exportaciones y crecimiento en Argentina 1810-1870', mimeo, 1990.
57. Blattman, Hwang, and Williamson, 'Winners and Losers'.

Blattman, Hwang, and Williamson as his source, but from his underlying database it would appear that Px is a chained Laspeyres index originally calculated by Alec Ford from a mixture of Argentine and British price series;[58] while Pm is a Laspeyres index calculated from British wholesale prices and unit values. It should be noted that Ford's estimates are not proxy estimates, as they combine domestic wholesale prices for exports with adjusted proxy prices for other exports and imports. However, given that only the end of the whole series used by Williamson has been calculated in this way, it is predominantly a proxy estimate. Also worth noting is that Ford's original work was undermined by Guido di Tella and Manuel Zymelman,[59] when they attempted to chain two of his series for Px. Rather than ratio splicing them, di Tella and Zymelman simply jumped from one series to the other in 1892, resulting in an artificial increase. Unfortunately, other scholars, including Williamson, have tended to use the di Tella and Zymelman version, rather than Ford's original.[60]

2. Ceylon. For 1782-1913, Px is a chained Laspeyres index calculated from British and US wholesale prices and unit values; Pm is an index of British export prices.[61]

3. China. For 1782-1913, as for Ceylon, with Indian opium wholesale prices added to the British export prices for Pm.[62]

4. Cuba. For 1826-1884, Px and Pm are chained Fisher ideal indices calculated using unadjusted unit values from British, French, and US trade statistics.[63]

5. India. For 1800-1913, Px is a chained Laspeyres index calculated from British wholesale prices and unit values, supplemented by opium wholesale prices from India itself; Pm is a reweighted US wholesale price index.[64]

6. Italy. For 1817-1913, Px and Pm were calculated from British wholesale prices and unit values; the types of indices are unclear.[65]

7. Malaya. For 1882-1913, Px and Pi are Laspeyres indices calculated from British, Thai, and US wholesale prices and unit values.[66]

---

58. A.G. Ford, 'Export Price Indices for the Argentine Republic, 1881-1914', *Inter-American Economic Affairs*, 9:2, 1955.

59. G. di Tella and M. Zymelman, *Las etapas del desarrollo económico argentino*, Buenos Aires, 1973, p. 56, Table 10.

60. Most notably, O.J. Ferreres, *Dos siglos de economía argentina, 1810-2004: Historia argentina en cifras*, Buenos Aires, 2005, p. 658.

61. Williamson, 'Globalization and the Great Divergence', p. 391.

62. Ibid., p. 391.

63. L.K. Salvucci and R.J. Salvucci, 'Cuba and the Latin American Terms of Trade: Old Theories, New Evidence', *Journal of Interdisciplinary History*, 31:2, 2000.

64. Clingingsmith and Williamson, 'Deindustrialization in 18th and 19th Century India', pp. 231-32; and Blattman, Hwang, and Williamson, 'Winners and Losers'.

65. Glazier, Bandera, and Berner, 'Terms of Trade', p. 43.

8. Mexico. For 1750-1800, silver price in Mexico for Px; Pi is an arithmetic mean of various series of wholesale prices of textiles in Spain. For 1801-28, silver price for Px; Pm is an index of British export prices.[67] For 1829-76, silver for Px; Pm is a chained Laspeyres index calculated from US trade statistics.[68] For 1876-1913, Px is a chained Laspeyres index calculated from British commodity prices; Pm is a reweighted US wholesale price index.[69] In the source for 1750-1828, the treatment of silver prices is unclear – it could be that this period is a part-proxy estimate. For 1829-76, the silver price appears to come from the United States, although again it is somewhat unclear.

9. The Philippines. For 1782-1913, Px is a chained Laspeyres index calculated using British wholesale prices and unit values, as well as US food prices (!) as a proxy for copra; Pm is an index of British export prices.[70]

10. Russia. For 1782-1913, Px is a chained Laspeyres index calculated using British and US commodity and wholesale prices; Pm is an index of British export prices.[71]

11. Siam. For 1782-1913, as for Russia.

12. Venezuela. For 1830-1913, the exact sources and methodology underlying both Px and Pi are unclear, but they appear to be based on foreign prices.[72]

Williamson also uses two 'adjusted proxy' estimates, which were mainly calculated using prices from the core that have been adjusted to make them better reflect prices in the periphery:

1. Ottoman Turkey. For 1800-54, Px is a Laspeyres index calculated using British CIF prices for silk and wool, US wholesale prices of tobacco and raisins, Indian wholesale prices of opium, and Turkish wholesale prices of wheat, with the silk, wool, and raisins prices adjusted for changes in freight rates; Pm is an unadjusted index of British export prices.[73] For

66. G. Huff and G. Caggiano, 'Globalization and Labor Market Integration in Late Nineteenth- and Early Twentieth-Century Asia', *Research in Economic History*, 25, 2008, p. 345; also see W.G. Huff, 'Boom-or-Bust Commodities and Industrialization in Pre-World War II Malaya', *Journal of Economic History*, 62:4, 2002, p. 1095, Table 4.

67. R. Dobado González, A. Gómez Galvarriato, and J.G. Williamson, 'Mexican Exceptionalism: Globalization and Deindustrialization, 1750-1877', *Journal of Economic History*, 68:3, 2008, p. 802.

68. R.J. Salvucci, 'The Origins and Progress of U.S.-Mexican Trade, 1825-1884: "Hoc opus, hic labor est"', *Hispanic American Historical Review*, 71:4, 1991, pp. 706, 730-31; and Salvucci and Salvucci, 'Cuba and the Latin American Terms of Trade', pp. 221-22.

69. Blattman, Hwang, and Williamson, 'Winners and Losers'.

70. Williamson, 'Globalization and the Great Divergence', p. 391.

71. Ibid., p. 391.

72. A. Baptista, *Bases cuantitativas de la economía venezolana 1930-1995*, 2nd ed., Caracas, 1997, pp. 269-70.

73. Ş. Pamuk and J.G. Williamson, 'Ottoman De-Industrialization 1800-1913: Assessing the

1854-1913, both Px and Pm are annually chained Fisher ideal indices calculated from unit values taken from Austrian, British, French, German, and US trade statistics, all adjusted using indices for insurance and freight rates from the United States.[74] These adjustments are probably inadequate because they do not take into account other trade costs.

2. Spain. For 1750-1913, Px and Pm are both chained Fisher ideal indices calculated from British and Dutch wholesale prices and unit values, adjusted by indices for Belgian, British, and Spanish freight and insurance rates.[75] Again, other trade costs may need to be considered to make the adjustment correctly.

Three series were 'part-proxy' estimates that used local prices for exports but unadjusted core prices for imports:

1. Brazil. Px is a Paasche index calculated using unit values from Brazil's trade statistics; Pm is an index of British export prices.[76]
2. Egypt. For 1796-1913, Px is wholesale cotton prices in Alexandria up to 1899, then US wholesale cotton prices; Pm is an index of British export prices.[77]
3. The Levant. For 1839-1913, Px is an unknown type of index, apparently calculated using local wholesale prices; Pm is an index of British export prices.[78]

Neither of the two remaining series inspires great confidence:

1. Portugal. The series used by Williamson was calculated using unit values from Portugal's trade statistics, but comes with the major caveat that '[g]iven that the valuation of exports in the official Portuguese statistics cannot be considered reliable, the results of the export price and terms of trade indices of Portuguese foreign trade will be presented here without any attempt to interpret them'.[79]
2. Chile. For 1810-1913, based on an assortment of sources for different periods, collated by Oscar Braun and his co-authors.[80] For 1810-44, Px is a con-

Magnitude, Impact, and Response', *Economic History Review*, 64:S1, 2011, pp. 182-84.

74. Pamuk, 'Foreign Trade', pp. 187-89, 253-76; cf. idem, *Ottoman Empire*, pp. 168-71.
75. Prados de la Escosura, 'Comercio hispano-británico', pp. 121-23, 133-40; and idem, 'Relaciones reales de intercambio', pp. 129-31, 151.
76. N.H. Leff, *Underdevelopment and Development in Brazil*, I, London, 1982, p. 82, Table 5.2.
77. Pamuk and Williamson, 'Ottoman De-Industrialization, 1800-1913', p. 35.
78. C. Issawi, *The Fertile Crescent, 1800-1914: A Documentary Economic History*, New York and Oxford, 1988, pp. 147-49.
79. P. Lains, 'Exportações portuguesas, 1850-1913: A tese da dependência revisitada', *Análise Social*, 22:91, 1986, p. 388, author's translation.
80. Compiled by J. Braun, M. Braun, I. Briones, J. Díaz, R. Lüders, and G. Wagner, 'Economía

sumer price index from Lima (!); Pm is British export prices. For 1845-61, a part-proxy estimate is used, as Px is calculated using unit values from Chile's trade statistics; Pm is an index of British export prices.[81] For 1862-1900, both Px and Pm are Paasche indices calculated using unit values from Chile's trade statistics.[82] For 1900-13, the sources are unknown as there is no series for Chile's terms of trade in the reference given by Braun et al.[83] The use of Chile's trade statistics for import unit values is dubious because they were based on fixed 'tariff values'.[84] Taken as a whole, then, Braun et al's series is problematic, particularly for the first half of the nineteenth century.

# References

Baba, M., and M. Tatemoto, 'Foreign Trade and Economic Growth in Japan: 1858-1937', in L. Klein and K. Ohkawa, eds., *Economic Growth: The Japanese Experience since the Meiji Era*, Homewood, 1968, pp. 162-96.

Bairoch, P., *The Economic Development of the Third World since 1900*, London, (1977) 2006.

Baptista, A., *Bases cuantitativas de la economía venezolana 1930-1995*, 2nd ed., Caracas, 1997.

Blattman, C., J. Hwang, and J.G. Williamson, 'The Impact of the Terms of Trade on Economic Development in the Periphery, 1870-1939: Volatility and Secular Change', NBER Working Paper 10600, 2004.

_____, 'Winners and Losers in the Commodity Lottery: The Impact of Terms of Trade Growth and Volatility in the Periphery 1870-1939', *Journal of Development Economics*, 82:1, 2007, pp. 156-79.

Braun, J., M. Braun, I. Briones, J. Díaz, R. Lüders, and G. Wagner, 'Economía chilena 1810-1995: Estadísticas históricas', Documento de Trabajo 187, Instituto de Economía, Pontificia Universidad Católica de Chile, 2000.

Chilosi, D., and G. Federico, 'Asian Globalizations: Market Integration, Trade and Economic Growth, 1800-1938', Economic History Working Paper 183, London School of Economics and Political Science, 2013.

Clavel, C., 'Los términos de intercambio en el largo plazo, 1860-1900', paper presented at the Encuentro Anual de Economistas de Chile, 1990.

---

chilena 1810-1995: Estadísticas históricas', Documento de Trabajo 187, Instituto de Economía, Pontificia Universidad Católica de Chile, 2000, pp. 93-94.

81. Both from J.G. Palma, 'Growth and Structure of Chilean Manufacturing Industry from 1930-1935: Origins and Development of a Process of Industrialization in an Export Economy', PhD diss., Oxford University, 1979, p. 76, fn. 1, and Appendices 5, 6, 7, 16, and 18.

82. From C. Clavel, 'Los términos de intercambio en el largo plazo, 1860-1900', paper presented at the Encuentro Anual de Economistas de Chile, 1990, pp. 5-10.

83. ECLA, *Economic Survey of Latin America 1949*, New York, 1951, p. 17, Table 2A.

84. A. Llona, 'On the Accuracy of Chilean Foreign Trade Statistics During the Nitrate Boom: 1870-1935', paper presented at the Conference on Trade, Poverty and Growth in History, Fundación Ramón Areces, Madrid, 17-18 May 2012, pp. 10-11, online at http://www.uc3m.es/portal/page/portal/instituto_figuerola/home/research/poverty_growth2012/participants/A.LL.pdf (accessed 10 May 2013).

Clemens, M.A., and J.G. Williamson, 'Wealth Bias in the First Global Capital Market Boom, 1870-1913', *Economic Journal*, 114:495, 2004, pp. 304-37.

Clingingsmith, D., and J.G. Williamson, 'Deindustrialization in 18th and 19th Century India: Mughal Decline, Climate Shocks and British Industrial Ascent', *Explorations in Economic History*, 45:3, 2008, pp. 209-34.

Crafts, N.F.R., 'Book Review Feature: *Trade and Poverty: When the Third World Fell Behind*', *Economic Journal*, 123, 2013, pp. F193-97.

Diakosavvas, D., and P.L. Scandizzo, 'Trends in the Terms of Trade of Primary Commodities, 1900-1982: The Controversy and Its Origins', *Economic Development and Cultural Change*, 39:2, 1991, pp. 231-64.

Di Tella, G., and M. Zymelman, *Las etapas del desarrollo económico argentino*, Buenos Aires, 1973.

Dobado González, R., A. Gómez Galvarriato, and J.G. Williamson, 'Mexican Exceptionalism: Globalization and Deindustrialization, 1750-1877', *Journal of Economic History*, 68:3, 2008, pp. 758-811.

Economic Commission for Latin America (ECLA), *Economic Survey of Latin America 1949*, New York, 1951.

*Economist*, 'Commercial History', supplement, various years.

Ellsworth, P.T., 'The Terms of Trade Between Primary Producing and Industrial Countries', *Inter-American Economic Affairs*, 10:1, 1956, pp. 47-65.

Federico, G., S. Natoli, G. Tattara, and M. Vasta, *Il commercio estero italiano 1862-1950*, Rome, 2011.

Federico, G., and M. Vasta, 'Was Industrialization an Escape from the Commodity Lottery? Evidence from Italy, 1861-1940', Dipartimento di Economia Politica Quaderno 573, Università degli Studi di Siena, 2009.

Ferreres, O.J., *Dos siglos de economía argentina, 1810-2004: Historia argentina en cifras*, Buenos Aires, 2005.

Ford, A.G., 'Export Price Indices for the Argentine Republic, 1881-1914', *Inter-American Economic Affairs*, 9:2, 1955, pp. 42-54.

Francis, J.A., 'The Terms of Trade and the Rise of Argentina in the Long Nineteenth Century', PhD diss., London School of Economics and Political Science, 2013.

Glazier, I.A., V.N. Bandera, and R.B. Berner, 'Terms of Trade Between Italy and the United Kingdom 1815–1913', *Journal of European Economic History*, 4:1, 1975, pp. 5-48.

Jacks, D., 'Intra- and International Commodity Market Integration in the Atlantic Economy, 1800-1913', *Explorations in Economic History*, 42:3, 2005, pp. 381-413.

_____, 'What Drove 19th Century Commodity Market Integration?', *Explorations in Economic History*, 43:3, 2006, pp. 383–412.

Jacks, D., C.M. Meissner, and D. Novyd, 'Trade Costs in the First Wave of Globalization', *Explorations in Economic History*, 47:2, 2010, pp. 127–41.

Korthals Altes, W.L., *Changing Economy in Indonesia: A Selection of Statistical Source Material from the Early 19th Century up to 1940*, XV, *Prices (Non-Rice) 1814–1940*, Amsterdam, 1994.

Habib, I., 'Studying a Colonial Economy – Without Perceiving Colonialism', *Modern Asian Studies*, 19:3, 1985, pp. 359-64.

Harley, C.K., 'Ocean Freight Rates and Productivity, 1740-1913: The Primacy of Mechanical Invention Reaffirmed', *Journal of Economic History*, 48:4, 1988, pp. 851-76.

Ho, F.L., *Index Numbers of the Quantities and Prices of Imports and Exports and of the Barter Terms of Trade in China, 1867-1928*, Tientsin, 1930.

Hou, C., *Foreign Investment and Economic Development in China 1840-1937*, Cambridge, MA, 1965.

Huff, W.G., 'Boom-or-Bust Commodities and Industrialization in Pre-World War II Malaya', *Journal of Economic History*, 62:4, 2002, pp. 1074-115.

Huff, G., and G. Caggiano, 'Globalization and Labor Market Integration in Late Nineteenth- and Early Twentieth-Century Asia', *Research in Economic History*, 25, 2008, pp. 285-347.

Issawi, C., *The Fertile Crescent, 1800-1914: A Documentary Economic History*, New York and Oxford, 1988.

Lains, P., 'Exportações portuguesas, 1850-1913: A tese da dependência revisitada', *Análise Social*, 22:91, 1986, pp. 381-419.

Leacy, F.H., *Historical Statistics of Canada*, 2nd ed., Ottawa, 1983.

League of Nations, *Industrialization and Foreign Trade*, Geneva, 1945.

Leff, N.H., *Underdevelopment and Development in Brazil*, I, London, 1982.

Llona, A., 'On the Accuracy of Chilean Foreign Trade Statistics During the Nitrate Boom: 1870-1935', paper presented at the Conference on Trade, Poverty and Growth in History, Fundación Ramón Areces, Madrid, 17-18 May 2012, pp. 10-11, online at http://www. uc3m.es/portal/page/portal/instituto_figuerola/home/research/poverty_growth2012/participants/A.LL.pdf (accessed 10 May 2013).

Miyamoto, M., Y. Sakudō, and Y. Yasuba, 'Economic Development in Preindustrial Japan, 1859-1894', *Journal of Economic History*, 25:4, 1965, pp. 541-64.

Mohammed, S.I.S., and J.G. Williamson, 'Freight Rates and Productivity Gains in British Tramp Shipping 1869-1950', *Explorations in Economic History*, 41:2, 2004, pp. 172-203.

Newland, C., 'Puramente animal: Exportaciones y crecimiento en Argentina 1810-1870', mimeo, 1990.

_____, 'Exports and Terms of Trade in Argentina, 1811-1870', *Bulletin of Latin American Research*, 17:3, 1998, pp. 409-16.

North, D.C., 'The Role of Transportation in the Economic Development of North America', in Colloque International d'Histoire maritime, ed., *Les grandes voies maritimes dans le monde, XVe-XIXe siècles*, Paris, 1965, pp. 209-46.

Ocampo, J.A., and M.A. Parra, 'The Continuing Relevance of the Terms of Trade and Industrialization Debates', in E. Peréz Caldentey and M. Vernengo, eds., *Ideas, Policies and Economic Development in the Americas*, London, 2007, pp. 157-82.

Officer, L.H., 'Dollar-Sterling Exchange Rates: 1791–1914', in S.B. Carter, S.S. Gartner, M.R. Haines, A.L. Olmstead, R. Sutch, and G. Wright, eds., *Historical Statistics of the United States: Earliest Times to the Present: Millennial Edition*, New York, 2006, online at http://hsus.cambridge.org (accessed 19 November 2013).

O'Rourke, K.H., and J.G. Williamson, 'When Did Globalisation Begin?', *European Review of Economic History*, 6:1, 2002, pp. 23-50.

Palma, J.G., 'Growth and Structure of Chilean Manufacturing Industry from 1930-1935: Origins and Development of a Process of Industrialization in an Export Economy', PhD diss., Oxford University, 1979.

Pamuk, Ş., 'Foreign Trade, Foreign Capital and the Peripheralization of the Ottoman Empire', PhD diss., University of California, 1978.

_____, *The Ottoman Empire and European Capitalism, 1820-1913: Trade, Investment and Production*, Cambridge, 1986.

Pamuk, Ş., and J.G. Williamson, 'Ottoman De-Industrialization 1800-1913: Assessing the Magnitude, Im

Parthasarathi, P., 'Historical Issues of Deindustrialization in Nineteenth-Century South India', in G. Riello and T. Roy, eds., *How India Clothed the World: The World of South Asian Textiles, 1500-1850*, Leiden, 2009, pp. 415-35.

Prados de la Escosura, L., 'El comercio hispano-británico en los siglos XVIII y XIX: I. Reconstrucción', *Revista de Historia Económica*, 2:2, 1984, pp. 113-62.

_____, 'Las relaciones reales de intercambio entre España y Gran Bretaña durante los siglos XVIII y XIX', in P.M. Aceña and L. Prados de la Escosura, eds., *La nueva historia económica en España*, Madrid, 1985, pp. 119-65.

Prebisch, R., 'The Economic Development of Latin America and Its Principal Problems', *Economic Bulletin for Latin America*, 7:1, (1950) 1962, pp. 1-22.

Roy, T., *Rethinking Economic Change in India: Labour and Livelihood*, London and New York, 2005.

_____, 'Review of *Trade and Poverty: When the Third World Fell Behind*', EH.net, 2012, online at http://eh.net/book_reviews/trade-and-poverty-when-the-third-world-fell-behind (accessed 7 October 2012).

Salvucci, L.K., and R.J. Salvucci, 'Cuba and the Latin American Terms of Trade: Old Theories, New Evidence', *Journal of Interdisciplinary History*, 31:2, 2000, pp. 197-222.

Salvucci, R.J., 'The Origins and Progress of U.S.-Mexican Trade, 1825-1884: "Hoc opus, hic labor est"', *Hispanic American Historical Review*, 71:4, 1991, pp. 697-735.

Schlote, W., *British Overseas Trade: From 1700 to the 1930s*, Oxford, 1952.

Singer, H.W., 'The Distribution of Gains Between Investing and Borrowing Countries', *American Economic Review*, 40:2, 1950, pp. 473-85.

Spraos, J., *Inequalising Trade? A Study of Traditional North/South Specialisation in the Context of Terms of Trade Concepts*, New York, 1983.

Taylor, K.W., and H. Michel, *Statistical Contributions to Canadian Economic History*, II, Toronto, 1931.

United Nations, *Relative Prices of Exports and Imports of Under-Developed Countries: A Study of Post-War Terms of Trade Between Under-Developed and Industrialized Countries,* Lake Success, 1949.

Van Laanen, J.T.M., *Changing Economy in Indonesia*, VI, *Money and Banking 1816-1940*, The Hague, 1980.

Williamson, J.G., 'Globalization and the Great Divergence: Terms of Trade Booms, Volatility and the Poor Periphery, 1782-1913', *European Review of Economic History*, 12:3, 2008, pp. 355-91.

_____, *Trade and Poverty: When the Third World Fell Behind*, Cambridge, MA, 2011.

Yamazawa, I., and Y. Yamamoto, *Estimates of Long-Term Economic Statistics of Japan since 1868*, XIV, *Foreign Trade and Balance of Payments*, Tokyo, 1979.