

# **De-Industrialization and Underdevelopment: A Comparative Assessment Around the Periphery 1750-1939**

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## A New Attack on an Old Question

The idea that the periphery suffered de-industrialization during the first global century before 1914 has a long pedigree, and every country writes its own independent history of that shared event. While that literature is immense, it has three shortcomings that are serious enough to invite this new attack on an old question.

The first shortcoming is that the de-industrialization literature rarely makes a comparative statement.<sup>1</sup> Why did India undergo greater de-industrialization than China 1750-1810? Why did China, India, Japan and some parts of Latin America start significant re-industrialization in the late 19<sup>th</sup> century, while Egypt, the Ottoman Empire, and others parts of Latin America did not? All parts of the periphery underwent some form of de-industrialization in the face of superior European productivity advance in manufactures in the century or so before the 1870s, but some were hit earlier, suffered bigger damage, and recovered later. Why the difference? Was it because the size of the globalization shocks (e.g., the induced terms of trade changes) varied across the periphery in both timing and magnitude? Was it because some parts of the periphery had tariff autonomy and used it to defend the import-competing sector, while others did not and could not? Can some part of the variety be explained by differences in supply side conditions at home? Most of the de-industrialization historiography has been written by nationalists, and they have been quick to point to European productivity advance, world transport revolutions and lack of tariff autonomy as the de-industrial villains. Perhaps, but the transport revolutions didn't have the same impact everywhere, demand conditions for the periphery's key commodity exports weren't the same everywhere, and the local supply side environments weren't the same everywhere.

The second shortcoming of the de-industrialization literature is that when it is quantitative, it relies almost entirely on output and employment evidence, while it rarely exploits price and wage data.

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<sup>1</sup> For example, there appears to be only one exception in the Ottoman economic history literature, that of Şevket Pamuk (1987). I have found no exceptions in the Indian economic history literature.

This is unfortunate since most of the assertions about what caused de-industrialization can be assessed by the behavior of relative output and input prices. Different explanations imply different trends in the external terms of trade, the own wage in manufacturing, the relative price of non-tradables, and so on. Furthermore, the archives are usually much more generous with price and wage data than they are for employment and output data. The first part of this paper will illustrate this proposition with evidence from India, but I hope to show the same some time in the very near future for Egypt, the Ottoman Empire, China, Japan, Latin America and other parts of the periphery.

The third shortcoming of the de-industrialization literature is that it *assumes* that de-industrialization causes underdevelopment while industrialization causes development, rather than offering any evidence confirming the connection. True, like 19<sup>th</sup> century classical theory, and like W. Arthur Lewis' famous recasting of that theory in 1954 with his model of economic dualism, most modern theories of economic growth view industry as a major carrier of development. Indeed, my favorite theoretical statement (Krugman and Venables 1990, 1995) is one that includes a role for geography and globalization in accounting for the spectacular divergence between core and periphery that took place after 1820 (Pritchett 1997). Still, the de-industrialization literature should be able to offer far more historical evidence to confirm the connection, and Part 2 of this paper tries to fill that gap.

What follows here is only a report on work in progress. There is much more left to be done.

# **Part 1: Indian De-Industrialization Under British Rule**

## **Indian Historiography on De-Industrialization**

The historiography of Indian de-industrialization under British rule owes its longevity both to the powerful images of skilled artisans thrown back on the soil and to the possibility that it offers an explanation for persistent Indian poverty. The first official report of Indian de-industrialization seems to have come from Sir William Bentinck, Governor-General of India from 1833 to 1835, whose powerful and enduring image of the effect of British mill cloth on the Indian cotton industry was quoted by Karl Marx in *Das Kapital*: “The misery hardly finds a parallel in the history of commerce. The bones of the cotton-weavers are bleaching the plains of India” (1977[1867], vol. 1: 558).

Conventional wisdom attributes India’s de-industrialization to Britain’s productivity gains in textiles and a world transport revolution. Improved British productivity, first in cottage production and then in factory goods, led to a declining world textile price and made production in India increasingly noncompetitive (Roy 2002). These forces were reinforced by declining sea freight rates which served to foster trade and specialization for both Britain and India. As a result, Britain first won over India’s export market and eventually took over its domestic market as well. This explanation for de-industrialization was a potent weapon in the critique of colonial rule, which often notes that Britain kept tariffs in India low and thereby exposed Indian handloom producers fully to declining prices (Dutt 1906/1960, Nehru 1947). But conventional de-industrialization literature tends to ignore another possible explanation for India’s economic malaise, namely, the 18<sup>th</sup> century collapse of the Mughal Empire which caused severe supply-side problems for Indian manufacturing. Given that India’s colonial historiography was forged in the crucible of nationalist politics, it is not surprising that it looks to British productivity advance, transport revolutions, and tariff policy to explain Indian de-industrialization and ignores the role played by the decline of the Mughals.

How do we define de-industrialization? David Clingingsmith and I (2004) have found a simple 2-good 3-factor model useful to develop some initial intuition, although it will be expanded later in this paper. Suppose an economy produces two commodities: agricultural goods, which are exported, and manufactured goods, which are imported. Suppose it uses three factors of production: labor, which is mobile between the two sectors; land, which is used only in agriculture; and capital, which is used only in manufacturing. Further suppose that this economy is what trade economists call a “small country” that takes its terms of trade as exogenous, dictated by world markets. Given these assumptions, de-industrialization can be defined as the movement of labor out of manufacturing and in to agriculture, either measured in absolute numbers (call it *weak de-industrialization*), or as a share of total employment (call it *strong de-industrialization*). While de-industrialization is easy enough to define in this simple 2x3 model, an assessment of its short and long run impact on living standards and GDP growth is more contentious and hinges on the root causes of de-industrialization.

What are the likely causes of de-industrialization? One possible cause is that a country de-industrializes because its comparative advantage in the agricultural export sector has been strengthened by, first, productivity advance on the land, or, second, by increasing openness in the world economy, or both. In the first case, and still retaining the small country assumption, nothing happens to the terms of trade. However, if the small country assumption is violated, then the country suffers a terms of trade deterioration, in that it has to share part of the productivity increase in the agricultural export sector with its trading partners. In the second case, the country enjoys an unambiguous terms of trade improvement as declining world trade barriers raise export prices and lower import prices in every home market. Whether real wages also increase depends on the direction of the terms of trade change and whether the agricultural good dominates workers’ budgets. Whether GDP increases in the long run depends on whether industry generates accumulation and productivity externalities that agriculture does not. If industrialization is a carrier of growth—as most growth theories imply—then de-industrialization could lead to a growth slowdown and low-income equilibrium. The second possible cause is that a country de-

industrializes due to deterioration in home manufacturing productivity and/or competitiveness. In this case, and still retaining the small country assumption, nothing happens to the terms of trade, but real wages and living standards will deteriorate, and so will GDP. The economic impact of de-industrialization from this source is unambiguous. The third possible cause is, as we have argued, that external price shocks induced by events in world markets lower the relative price of manufactures. Such favorable terms of trade shocks clearly raise the primary-product-exporting country's GDP in the short run. Whether it also raises it in the long run depends on its de-industrialization impact.

In order to make this theoretical framework flexible enough to handle these three potential causes of de-industrialization, we have to replace two-sector thinking with three-sector thinking by adding a non-tradable grain sector. The three sectors considered in the rest of the paper are: agricultural commodity exports, which are tradable on world markets and include industrial intermediates such as raw cotton and jute, plus exotic consumer goods such as opium and tea; manufactures, which are primarily textiles and metal products and are also tradable; and grains, which are non-tradable and include rice, wheat and other food staples.

What follows is a brief review of existing attempts to measure India's de-industrialization, followed by a theoretical narrative that accounts for it. A simple Ricardian general equilibrium model of de-industrialization is then presented to formalize our predictions about relative prices. Having done so, we will explore: three price series – commodity agricultural exports ( $p_C$ ), manufactured textiles ( $p_T$ ) and non-tradable grains ( $p_G$ ); three intrasectoral terms of trade series –  $p_C/p_T$ ,  $p_C/p_G$  and  $p_T/p_G$ ; three wage series – the grain wage, the own-wage in the import competing sector, and the own-wage in the export sector; and the external terms of trade. This evidence is then compared with the theoretical narrative. Furthermore, the relative price experience of India is compared with its main competitor, England. Part 1 concludes by comparing India's de-industrializing terms-of-trade shocks with those from other parts of the periphery.

## Measuring Secular De-industrialization in India

As defined, the evidence of de-industrialization in India during the first global century is pretty clear. Some time ago, Paul Bairoch (1982) offered evidence to measure de-industrialization not only in India, but across the whole non-European periphery. Table 1 reports his survey as it was retold by Colin Simmons (1985). In 1750, China and India combined to account for almost 57 percent of world manufacturing output, while India itself accounted for almost a quarter. By 1800, India's world share had already eroded to less than a fifth, by 1860 to less than a tenth, and by 1880 to less than 3 percent. Note that India's share in world manufacturing output declined precipitously in the half century 1750-1800, *before* factory-led industrialization took hold in Britain. Furthermore, per capita manufacturing output fell over the period too (Bairoch 1982: Table 4), so it wasn't just a benign boom in the core at work, but rather a slump in the periphery as well. More evidence supporting the magnitude of de-industrialization is offered by the share of manufacturing exports in total exports: between the mid-late 18<sup>th</sup> century and 1913, that share fell in Asia from about 42 to 21 percent (Findlay and O'Rourke 2003: Tables 1.1 and 1.4). Note too that, according to Table 1, the Indian world manufacturing output share dropped by 4.8 percentage points between 1750 and 1800, when it *rose* in China and dropped only one percentage point in the rest of the periphery. India's share dropped by 6.9 percentage points over the longer period between 1750 and 1830, much bigger than the fall elsewhere (China lost 3 percentage points, and the rest of the periphery lost 2.6 percentage points). Bairoch's data suggest unambiguously that during the century before 1830, well before European factories flooded world markets with manufactures, India suffered much more pronounced de-industrialization than did the rest of the periphery. There must have been some exceptional domestic de-industrialization forces at work in India that complemented the global de-industrialization forces that the whole periphery shared.

Another attempt to measure de-industrialization looks to the early 19<sup>th</sup> century, years which anecdotal evidence has always suggested were ones of most dramatic de-industrialization. Amiya Bagchi

(1976a, b) has examined the data collected between 1809 and 1813 by the East India Company surveyor Buchanan Hamilton on handloom spinning and other traditional industry in Gangetic Bihar. Bagchi compared Hamilton's data with the 1901 Census, and the results are presented in Table 2 using two alternative assumptions. The table suggests a substantial decline in the industrial employment share during the 19<sup>th</sup> century, ranging from 10 to 20 percentage points.

While the employment share in "other industrial" occupations fell over the century as well, Table 3 makes it clear that a very large share of this de-industrialization had its source in the decline of cotton spinning.<sup>2</sup> Since cotton spinning was performed at home using extremely simple technology, it may seem implausible to argue that the demise of cotton spinning in the early 19<sup>th</sup> century destroyed India's platform for modern industrialization. Yet British economic historians assign the same importance to home-based cotton spinning: 17<sup>th</sup> and 18<sup>th</sup> century "proto-industrial" cottage industries are said to have supplied the platform for the factory-based British industrial revolution that followed (Mokyr 1993: chps. 1-3), and employment of women and children was central to the process then too (De Vries 1994).

Finally, in an unpublished study reported by Irfan Habib (1985), Amalendu Guha documents a huge decline in yarn used for Indian handloom production, from 419 million pounds in 1850, to 240 in 1870 and to 221 in 1900. This indirect evidence suggests that the decline in hand spinning documented for Gangetic Bihar in the early 19<sup>th</sup> century was widespread, that it was followed by a decline in hand weaving during the mid-century, and that the decline of both hand spinning and weaving was almost complete by 1870. This latter point is also confirmed by Bairoch's per capita manufacturing output figures (1982: Table 4): somewhere between 1860 and 1928, the index bottoms out and starts to rise for both China and India, while it soars after 1860 for Japan.

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<sup>2</sup> The percent of industrial workers who were spinners fell from 82 to 15 between 1809-13 and 1901.

## A Theoretical Narrative of India's De-industrialization

Our narrative account of India's de-industrialization owes much to Joseph Inikori (2002: Chp. 9) and Irfan Habib (1975, 1985). It embraces the three contending de-industrialization hypotheses in the literature, and traces the roots of de-industrialization well back into the 18<sup>th</sup> century. We begin with the decline of the Mughal empire, which stretched over a long period and began with the costly wars of expansion fought by Aurangzeb in the last decades of the 17<sup>th</sup> century. These wars overextended Mughal resources, and the empire began contracting after the difficult succession that followed Aurangzeb's death in 1707. The political and economic stability the Mughals had provided reached low ebb in the middle of the 18<sup>th</sup> century, after which the East India Company increasingly filled the vacuum. The Mughal decline should have affected manufacturing in several ways. The first and easiest to observe was a reduction in agricultural productivity, an event which should have raised the price of grain (a non-tradable) relative to textiles (a tradable).<sup>3</sup> To the extent that grain was the dominant consumption good for workers and that the grain wage was close to subsistence, this negative productivity shock should have put upward pressure on the nominal wage in cotton spinning and weaving. Cotton textile wages started from a low nominal but high real base in the mid-18th century (Parthasarathi 1998; Allen 2001). Figure 3 illustrates the spectacular drop in grain wages in 18<sup>th</sup> century India (see also Mukerjee 1939), although grain wages tell us more about living standards than productivity. Competitiveness in textiles is negatively related to the own real wage  $w/p_T$ , the nominal wage divided by the price of textiles. Textile prices were declining as the nominal wage rose, which put downward pressure on "profits" from both below and above. If the rise in the own wage in textiles was big enough, it should have taken away much or all of the competitive edge 18<sup>th</sup> century India had relative to its competitors in third-country export markets, such as the booming Atlantic economy. The Mughal decline also disrupted India's major internal trade routes, which

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<sup>3</sup> To repeat, we assume that India was a price taker for textiles and other tradable manufactures. Given this assumption, domestic demand did not matter in determining the performance of Indian industry. Only price and competitiveness on the

should have raised transport costs from the interior to the ports. For these reasons, then, during the mid-late 18th century Britain was already beginning to wrest away India's long-standing leadership in the fastest growing world markets, West Africa, the Americas, and Europe.<sup>4</sup> Even before factory-driven technologies appeared sometime between 1780 and 1820, India was losing its previously dominant grip on the world export market for textiles, especially its cheap calicos.<sup>5</sup>

This is not the first time that the connection between labor productivity in pre-industrial agriculture, nominal wages in manufacturing, and the resulting competitiveness in world markets for manufactures has been exploited. Alexander Gerschenkron (1962) and W. Arthur Lewis (1978: chp. 2) both used the argument to good effect in explaining why low productivity in agriculture helps explain the absence or delay of industrial revolutions. More recently, Prasannan Parthasarathi (1998) has argued that while low nominal wages in pre-colonial and early colonial India gave it the edge in world textile markets, living standards for labor in the south of India were just as high as they were in the south of England. Indian productivity was higher in food grain production, and thus food grain prices were lower. A generation before Parthasarathi, Tapan Raychaudhuri set forth a similar view of Mughal India (Raychaudhuri 1983: 5-6, 16-18, 32).

What high productivity in Mughal agriculture gave, the demise of the Mughal empire took away. There is plenty of evidence of economic decay in India across the 18<sup>th</sup> century, and given the huge size of agriculture in all pre-industrial societies,<sup>6</sup> the decay must have had its main source there. The most

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supply side mattered. Thus, we ignore as irrelevant any argument which appeals to a rise in the demand for cloth as per capita income rose (Harnetty 1991: 455, 506; Morris 1983: 669).

<sup>4</sup> English merchants and English ships were the main suppliers to the Atlantic trade, a lot of it the so-called re-export trade. The share of Indian textiles in the West African trade was about 38 percent in the 1730s, 22 percent in the 1780s and 3 percent in the 1840s (Inikori 2002: 512-3 and 516). By the end of the 17<sup>th</sup> century, Indian calicos were a major force in European markets (Landes 1998: 154). For example, the share of Indian textiles in total English trade with southern Europe was more than 20 percent in the 1720s, but this share fell to about 6 percent in the 1780s and less than 4 percent in the 1840s (Inikori 2002: 517). India was losing its world market share in textiles during the 18<sup>th</sup> century, long before the industrial revolution.

<sup>5</sup> To make matters worse, India, which had captured a good share of the English market in the 17<sup>th</sup> century, had -- as an English defensive response -- already been legislated out of that market by Parliamentary decree between 1701 and 1722 (Inikori 2002: 431-2), thus protecting local textile producers. But Parliament kept the Atlantic economy as a competitive free trade zone. Of course, the large Indian Ocean market was also a free trade zone, and India had dominated this for centuries (Chaudhuri 1978; Landes 1998: 154).

<sup>6</sup> Agriculture employed 68 percent of the Indian labor force even as late as 1901 (Roy 2002: 113).

obvious source of a negative shock to agricultural productivity and food supplies is the economic fragmentation that ensued as the Mughals collapsed:<sup>7</sup>

“At its height the Mughal empire had imposed on the greater part of the Indian sub-continent a fair measure of political unity. Centralized administration, a uniform revenue policy, a network of inland trade fostered by Mughal peace and active encouragement to an expanding overseas commerce created [prosperity] ... By the middle years of the eighteenth century the empire lay in ruins ...” (Raychaudhuri 1983: 3).

A weak and crumbling empire invited invasion from without and war within, and labor productivity in agriculture underwent a decline along with the empire. The economics is familiar to development economists, economic historians and observers of modern agrarian backwardness. The effective rent burden was raised by rapacious revenue farmers who stepped in as the state contracted. Revenue farming had always been present in India, and even the Mughal rulers were unable to erase it entirely, but by the mid-18<sup>th</sup> century its resurgence had served to raise the effective rent share to at least half, “in contrast to China’s 5 to 6 per cent, [and thus] the Indian peasant had little incentive to invest labour or capital” (Raychaudhuri 1983: 17). To make matters worse, war, political instability and potential expropriation raised uncertainty and further suppressed incentives to accumulate or innovate. This environment would have hurt manufacturing indirectly by higher labor costs and directly by deterring investment. In addition, war and increased internal tolls must have suppressed regional trade and specialization within the subcontinent. Thus, districts that had specialized in textiles and other manufactures, and had satisfied their excess food requirements by grain imports from surplus districts, must have found the price of grains rising for additional reasons.

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<sup>7</sup> Since we take grain to have been non-tradable internationally, any secular tendency for domestic demand to outpace domestic supply would have raised grain prices. An exogenous acceleration of population growth would have lowered labor productivity on the land, reduced food supply relative to demand, and thus raised the price of food. However, population grew at only 0.26 percent per annum between 1700 and 1820, and this was only a trivial increase over what preceded it (Moosvi 2000: 322).

The demise of the Mughal empire created “a scarcity of grains in all parts, [and] the wages of labour [were] greatly enhanced” (Holwell 1766-1767, cited in Raychaudhuri 1983: 6). Such a rise in nominal wages would have eroded the long-standing source of Indian competitiveness in foreign textile markets, long before Britain flooded those markets with factory-made products, and declining agricultural productivity in India would have been at the heart of it.

Even if we had good data on Indian employment and output in the 18<sup>th</sup> century, de-industrialization effects would be hard to see before 1810 because textile exports were a relatively small share of total Indian textile production. They would also be hard to see because between 1772 and 1815 there was a huge net financial transfer from India to Britain. Indian textiles were at this time an important vehicle by which the financial transfer to Britain was converted to a real transfer. Javier Cuenca Esteban estimates these net financial transfers from India to Britain reached a peak of £1,014,000 annually in 1784-1792 before declining to £477,000 in 1808-1815 and -£77,000 in 1816-1820 (Cuenca Esteban 2001: Table 1, line 20). Thus, the real transfer boom 1772-1815 should have served to forestall de-industrialization since the demand for Indian textiles in Britain should have boomed on that account as well. However, at their peak in 1784-1792, these net Indian transfers still amounted to less than 2 percent of British industrial output (Deane and Cole 1967: Table 37, 166, using 1801 “manufacture, mining, building”). As a share of Indian industrial output, these net transfers were probably about the same.<sup>8</sup> Thus, while a secular fall in the “drain” after the 1784-1792 peak must have served to speed up the pace of de-industrialization in early 19<sup>th</sup> century India by reducing the external demand for Indian textiles, the effect could not have been big. Between 1750 and 1820, the ‘drain’ should not have been an influence at all. Over the long run, other fundamentals were doing the work.

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<sup>8</sup> Maddison (2001: 184 and 214) estimates that in 1820 the GDP of the India (including present-day Bangladesh and Pakistan) was about three times that of the United Kingdom, but the industrial share must have been a lot smaller in India. The text assumes that these offsetting forces were roughly comparable.

## **External Price Shocks and Indian De-industrialization**

The most popular de-industrialization hypotheses being considered here is the one associated with what economists now call globalization shocks. Jawaharlal Nehru's classic *Discovery of India* argued that India became progressively ruralized in the 19<sup>th</sup> century owing to the destruction of artisan employment in the face of British factory-made goods. Furthermore, he thought that the appalling poverty of the Indian people was of recent origin and that it could be blamed on anti-industrial colonial policy (Nehru 1947: 247-53). Similar arguments can be found in the work of pioneering Indian economic historian R. C. Dutt (1906/1960) and others. The economic logic underlying this hypothesis is that rapid productivity advance in European manufacturing lowered the relative price of textiles, metal products and other manufactures in world markets. After the French Wars, British factory-made yarn and cloth took away India's local market from her own producers, and India experienced de-industrialization over the half century following 1810 as the terms of trade moved in its favor. This relative price movement is illustrated best by trends in Britain's terms of trade which fell by 40 percent over the four decades between 1801-1810 and 1841-1850 (Mitchell and Deane 1962: 331). Thus, the price of British exports (manufactures) fell dramatically compared with that of its imports (primary products). India's textile producers faced a big negative price shock on that score alone. Failing to keep up with the factory-based productivity growth achieved abroad, the Indian textile industry took the price hit, became less profitable, and de-industrialization ensued. As if this were not enough, trade barriers between Britain and India also declined, particularly due to the world transport revolution (Shah Mohammed and Williamson 2004). Having defeated India in export markets, "after 1813 Lancashire invaded India as well" (Moosvi 2002: 341): the import-competing sectors slumped, the export sectors boomed, and de-industrialization was reinforced.

The decline in world textile prices contributed to a secular rise in India's intersectoral terms of trade between textiles and agricultural commodity exports, but it was reinforced by a booming world demand for Indian agricultural commodities. The most important agricultural commodities for India in the

first half of the 19<sup>th</sup> century were opium, raw cotton, raw silk, and sugar, and they were a growing fraction of India's exports. By 1811, they accounted for 57% of India's exports by value compared to 33% for cotton piece goods (Chaudhuri 1983). The role played by the terms of trade in reallocating resources to commodity agriculture is noted in the literature on the commercialization of Bengali agriculture in the late 18<sup>th</sup> century (Chowdhury 1964), but it has not been a part of the de-industrialization debate. It should be.

In sum, the sources of India's secular de-industrialization lay with globalization-induced price shocks due to European productivity advance in manufacturing, the induced demand for industrial intermediates, and the transport revolution, plus the negative productivity shocks to Indian agriculture induced by the Mughal decline. These foreign and domestic effects were not competing, and each had its most important influence in different epochs.

### **Real Wages and Indian De-industrialization**

Models of de-industrialization such as that of Paul Krugman and Anthony Venables (1995) suggest that it should be accompanied by a long run decline in real wages. The evidence for 18<sup>th</sup> and 19<sup>th</sup> century India is not yet of high quality, but what we have does document a secular deterioration.

Parthasarathi (1998) argues that real wages in mid-late 18<sup>th</sup> century southern India were comparable to those in southern England, and thus that the rising living standard gap between the two was a late 18<sup>th</sup> and 19<sup>th</sup> century phenomenon. Robert Allen (2001) computes the real wage in 1595 Agra, then the capital of the Mughal empire, and compares it to that of 1961, based on a common market basket of consumer goods. Allen documents a fall in the real wage by about 23 percent over those 366 years, and if Parthasarathi is correct, most of that fall must have taken place in the last 166 years, not the first 200. However, the most telling evidence of real wage performance, *and its timing*, comes from Mukerjee (1939: 54) who reports 1600-1938 real wages in northern India (nominal wage rates deflated by a food market basket that includes barley, wheat, jowar, bajra and gram) starting with the same 1595 benchmark used by Allen. Mukerjee documents a much bigger secular decline for the real wage (51%) than does

Allen (23%), but the former offers useful information about timing that the latter does not. According to Mukerjee, by 1850 unskilled real wages had already undergone 48 of the total 51 percentage point fall which took place between 1600 and 1938. Indeed, they had already fallen by 30 of the 51 percentage points by 1807.

Thus, it appears that the vast majority of the real wage and living standards fall took place before 1850, or even before 1807, not after. Was de-industrialization responsible for the fall, and was it more powerful before 1850, or even before 1807, than after?

### **A Model of De-industrialization**

In order to formalize our intuitions about de-industrialization, we develop a simple Ricardian model that relies on the classic contribution of Ronald Jones (1971). Consider a perfectly competitive economy in which there are three sectors: textiles (T), grain (G), and agricultural commodity exports (C). Grain is not traded. Agricultural commodity exports include nonfood items such as opium, tea, indigo, jute, and raw cotton. Textiles and agricultural commodities are traded in the world market and sell for the world prices  $p_T$  and  $p_C$ , respectively. Labor (L) is mobile between all three sectors, is the only factor of production, and receives the nominal wage  $w$ . We abstract from capital and land for simplicity, but in any case reliable information on these factors and their returns are difficult to obtain for India, and we do not need them to make our point.

To create a link between agricultural productivity and wages in the textile sector, we follow Lewis (1954, 1978) in assuming that the real wage in grain units is constant. This reflects the assumption that in a poor country the supply of labor will be unlimited as long as the wage assures subsistence. Any lower wage leaves laborers unable to sustain the physical capacity for work. The Lewis assumption implies the possibility of unemployment, so L represents employment rather than the population, which we denote by P.

Suppose output in each sector is produced according to a Cobb-Douglas production function:

$$Y_G = GL_G^\alpha \quad (1)$$

$$Y_C = CL_C^\beta \quad (2)$$

$$Y_T = TL_T^\gamma \quad (3)$$

$G$ ,  $C$ , and  $T$  are technology parameters and the elasticities  $\alpha$ ,  $\beta$ , and  $\gamma$  are all less than 1.<sup>9</sup> The labor market is such that each individual will supply one unit of labor as long as the grain wage  $w/p_G$  is at or above the reservation price of 1. We assume that there is no rationing of labor, so that  $L = L_G + L_C + L_T < P$ . Perfect competition in each sector ensures through zero-profit conditions that labor demand will be given by:

$$L_G = (p_G G/w)^{(1/1-\alpha)} = G^{(1/1-\alpha)} \quad (4)$$

$$L_C = (p_C C/w)^{(1/1-\beta)} \quad (5)$$

$$L_T = (p_T T/w)^{(1/1-\gamma)} \quad (6)$$

If we assume that there is no technical change, the growth rates of labor demand are

$$L_G^* = 0 \quad (7)$$

$$L_C^* = -(1/1-\beta)(w^* - p_C^*) \quad (8)$$

$$L_T^* = -(1/1-\gamma)(w^* - p_T^*) \quad (9)$$

Since the nominal wage is equal to the price of grain, employment in the grain-producing sector is fixed. Growth in the own wage in either commodity agriculture or textiles leads to a decline in employment there. Thus, *weak de-industrialization results from an increase in the own wage in textiles*. The own wage could increase due to a decline in the world price for its output, or due to a rise in the price of grain, for example from a negative productivity shock in agricultural production.

The growth rate of the share of textile workers in total employment, our measure of *strong de-industrialization*, is:

$$L_T^* - L^* = \frac{-1}{(1-\beta)(1-\gamma)} \left( \left[ (1-\beta)(1-\theta_{TL})(w^* - p_T^*) \right] - \left[ (1-\gamma)\theta_{CL}(w^* - p_C^*) \right] \right) \quad (10)$$

The shares of textiles and commodity agriculture in total employment are given by  $\theta_{TL}$  and  $\theta_{CL}$ , respectively. Thus, *strong de-industrialization will result whenever the own wage in textiles is growing sufficiently fast compared to the own wage in agricultural commodity exports*. Moreover, holding employment shares constant, strong de-industrialization will be most severe when the difference in own wage growth rates is largest. More formally, the condition that must be satisfied for strong de-industrialization is

$$w^* - p_T^* > \frac{(1-\gamma)\theta_{CL}}{(1-\beta)(1-\theta_{TL})}(w^* - p_C^*) \quad (11)$$

Given that both commodity agriculture and textile sectors are small shares of total employment in late 18<sup>th</sup> and early 19<sup>th</sup> century India, the ratio on the right-hand side is likely to be less than one.<sup>10</sup> This implies that own wage growth in agricultural commodity exports would have to be even higher to counteract the strong de-industrialization effect of own wage growth in textiles. In short, we expect to see strong de-industrialization whenever own wage growth in textiles is positive, unless own wage growth in agricultural commodity exports is much greater. Own wage growth in agricultural commodity exports dampens the strong de-industrialization effect because it reduces  $L_C$ , which is in the denominator of our strong de-industrialization measure. As the share of the labor force employed in agricultural commodities increases, the greater growth in the own wage in textiles needs to overcome growth of the own wage in agricultural commodities and for de-industrialization to ensue. We can also rewrite condition (11) to relate nominal wage growth to the terms of trade between textiles and commodity agriculture.

$$\frac{(1-\gamma)\theta_{CL} + (1-\beta)(1-\theta_{TL})}{(1-\beta)(1-\theta_{TL})} w^* > p_T^* - p_C^* \quad (11')$$

Strong de-industrialization results when nominal wage growth, which deters production in both non-grain sectors, is sufficiently greater than the growth of the terms-of-trade favoring textiles, which encourages

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<sup>9</sup> Constraining the elasticities to be less than one ensures that labor demand is finite. It also implies decreasing returns to scale. Adding specific factors to each sector would allow for constant returns, but would not change the intuitions we wish to draw from the model.

production in textiles over agricultural commodities. Thus, *strong de-industrialization should have been most severe when nominal wage growth was strongest and when the terms of trade were shifting most strongly in favor of agricultural commodities.*

### **The Terms of Trade, Relative Prices, and the Own-Wage in Indian Manufactures 1750-1913**

Indian de-industrialization between 1750 and 1913 forms three distinct epochs.

The first epoch, approximately 1750-1810, was one during which India lost its significant share of world textile markets to Britain. What was an important export sector in India at the beginning of the epoch became an important import-competing sector at the end. While that result can be explained by increasing cost competitiveness favoring Britain, superior factory technology was not yet the main force at work. Instead, it looks like it was the demise of the Mughal empire that mattered most, a force which lowered agricultural productivity in India, raised grain prices there, and thus—in a relatively stable real wage subsistence economy—pushed up nominal wages economy-wide. Hence, the own-wage rose in both tradable sectors, damaging cost competitiveness in both textiles and commodity production.<sup>11</sup> Textiles would experience weak de-industrialization. To the extent that the price of textiles relative to commodities fell, the effect of reduced agricultural productivity would have fallen more heavily on textiles than commodities, leading to strong de-industrialization.

The second epoch, approximately 1810-1860, was one during which India lost much of its domestic textile market to Britain. This result can be explained by the combined influence of relatively rapid factory-based productivity advance in Britain and by increased world market integration, the latter driven by declining transport costs between the two trading partners, and by a free trade commitment (although as the colony, India had little choice in the matter). The terms of trade moved to favor India and

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<sup>10</sup> For example, if  $\beta = \gamma$ ,  $\theta_{TL} = 0.15$ , and  $\theta_{CL} = 0.1$ , then the ratio is 0.12. Under these plausible assumptions, strong de-industrialization would occur if own wage growth in textiles was about 0.12 times greater than own wage growth in agricultural commodities.

thus penalized import competing manufacturing there. The effects of the demise of the Mughal empire were pretty much only a memory, and the induced decline in Indian grain productivity had about ceased.

After about 1860, a third epoch evolved during which the rate of de-industrialization slowed down and eventually turned around to become re-industrialization. This result could be explained by a slow down in the rate of unbalanced productivity advance favoring European manufacturing, in a slow down in the growth in the derived demand for intermediates, in the cessation in the decline in sea borne freight rates, or in rising protection in the core. The terms of trade no longer moved in India's favor and thus no longer served to penalize import competing manufacturing.

These predictions are confirmed by the new relative price and terms-of-trade evidence plotted in Figures 2-6. A full description of the sources of the data underlying these figures can be found elsewhere (Clingingsmith and Williamson 2004: Appendix). The focus of what follows is the first two epochs.

Figure 2 documents that between 1765 and 1810 the price of textiles relative to grains fell at a spectacular rate: by 1805-1810, it was less than 20 percent of its 1765-1770 level. The decline continued after 1810, but at a much slower rate. Why the spectacular fall in  $p_T/p_G$  in the late 18<sup>th</sup> century, especially compared with the early 19<sup>th</sup> century? The answer is that grain prices, while volatile in the short run, soared upwards in the long run. However, this did not serve to reduce real wages ( $w/p_G$ ). Figure 3 shows that the grain wage did not fall at all between 1729 and 1807. Rather, it confirms Mukerjee's stable-grain-wage claim for roughly the same years, between the 1720s and the 1810s. Nominal wages were thus driven up at roughly the same rate as grain prices.

While it exhibited great short-run volatility, long run real wage stability is confirmed for the first epoch. Thus, grain price increases were translated into nominal wage increases, and the own-wage in Indian manufacturing (Figure 4:  $w/p_T$ ) more than doubled between 1765 and 1810! We take this evidence as powerful support for the thesis that the demise of the Mughal empire can indeed explain much of

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<sup>11</sup> If this formal "cost competitiveness" and "own-wage" language seems awkward when applied to household spinners and weavers, think instead of the grain that could be bought with nominal earnings in those households.

India's pre-1810 de-industrialization and loss of world markets.<sup>12</sup> India lost much of its cost competitiveness as the own-wage in home manufacturing underwent that spectacular rise, and it was the rise in the price of non-tradable grains that pushed the nominal wage up to such high levels. Most of the secular rise in grain prices stopped after around 1810, and the upward pressure on nominal wages began to ease. The relative price  $p_T/p_G$  still fell (Figure 2), the own-wage  $w/p_T$  still rose (Figure 4), and de-industrialization continued – but now those trends were driven mainly by world market forces.

Now let us consider strong de-industrialization across the first two epochs, recalling that it will be more intense when the own-wage in textiles is growing faster *and* when the intersectoral terms of trade is shifting most strongly in favor of agricultural commodities. Figure 4 shows  $w/p_T$  doubling between 1770 and 1810 and more than doubling between 1810 and 1850. Thus, own-wage growth was slightly stronger in the second epoch. Conversely, the terms of trade shift appears to be strongest in the first epoch. Figure 6 documents India's external terms of trade (unfortunately starting only in 1800). It shows two big spikes in the second epoch, the first over the decade of the 1810s and the second over the decade of the 1850s. When the series is smoothed, the measured trend in the terms of trade favoring India (and thus penalizing the import competing sector) is very modest. In contrast, during the first epoch the intersectoral terms of trade between textiles and agricultural commodities (Figure 2:  $p_T/p_C$ ) underwent a very sharp decline. By 1810 it was only 20% of its 1780 level, causing the productivity effect of the Mughal decline to fall *much* more heavily on textiles than on agricultural commodities. This pattern suggests that strong de-industrialization may well have been greater in the first epoch than in the second. In the first epoch, textiles shed labor as the nominal wage soared and it was pulled into agricultural commodity exports which underwent a very favorable shift in its terms of trade. In the second epoch, textiles shed labor mainly due to falling world textile prices.

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<sup>12</sup> There is no qualitative evidence suggesting significant productivity advance in Indian textiles and other manufacturing activities that might have pushed up wages during this epoch. In any case, since agriculture was so huge, it must have dominated nation-wide labor scarcity conditions, not manufacturing. Manufacturing is more likely to have taken nominal wages as exogenous.

If the own-wage is a critical indicator of cost competitiveness, then the own-wage in Indian textiles should have risen faster than that of England, its main competitor in world markets. Of course, the cards are stacked against England in this comparison: a measured increase in the ratio of Indian to English  $w/p_T$  will understate the role of own-wage inflation if English productivity growth performance was superior to India even before the great factory boom. Our source for England is Gregory Clark (2004), whose data allow us to construct the price of clothing relative the grain ( $p_T/p_G$ ) 1705-1865 and the own-wage in textiles ( $w/p_T$ ). Figure 5a plots an index of the ratio of English  $p_T/p_G$  to Indian  $p_T/p_G$ . The Indian series uses decadal averages due to the volatility of  $p_G$  in India, and thus starts in 1775, the end of the first decade for which we have data. The price of textiles relative to grains fell in both economies 1765-1850, but it fell *five times faster* in India due to the much bigger  $p_G$  boom there. The index of British relative to Indian  $p_T/p_G$  rose from 100 in 1775 to 228 by 1815, and again to 421 by 1845. Grain prices rose almost four times faster in India than England, an event which must have put much greater upward pressure on wage costs in India than England, thus lowering the English own-wage in textiles relative to India. Indeed, the ratio of  $w/p_T$  in England relative to India fell from 100 in 1775, to 56 in 1815, and to 26 in 1845 (Figure 5b). More than half of that fall was completed by 1805, before the great flood of factory-produced textiles hit Indian markets in the second de-industrialization epoch. But even after 1810, it appears that some part of Indian de-industrialization can still be explained by poor productivity performance in grains: after all,  $p_T$  was pretty much equalized between India and Britain, so the faster decline in India's  $p_T/p_G$  implies a poorer productivity performance in grains there, and perhaps even compared with the rest of the periphery. If Indian data for 1705-1765 were available, we think it would extend these trends backwards. After all, English  $p_T/p_G$  declined only modestly between 1705 and 1765,<sup>13</sup> and  $w/p_T$  hardly changed at all. Our guess is that  $p_T/p_G$  fell sharply in India given that  $p_G$  about doubled between 1704-1706 and 1764-1766.

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<sup>13</sup> Furthermore, the English terms of trade *rose* over those sixty years (Mitchell and Deane 1962: Table 14, 330).

### Meanwhile, What about the Rest of the Periphery?

Did 19<sup>th</sup> century India face a big or a small de-industrializing global price shock compared with other parts of the periphery? If it was “small,” then domestic de-industrialization forces must have been more important in India than they were elsewhere in the periphery.

Over the half century between 1800-1804 and 1855-1859, India’s terms of trade rose “only” 28.6 percent, or less than 0.5 percent per annum. No doubt this was a significant secular price shock, but it was far smaller than what happened in other parts of the periphery. For example, the Egyptian terms of trade rose by two and a half times between 1820-1824 and 1855-1859, or 2.7 percent per annum (Figure 7), *more than five times* that of India; the Ottoman terms of trade increased by two and a half times between 1815-1819 and 1855-1859, or 2.4 percent per annum (Figure 8), *almost five times* that of India; the Indonesian terms of trade increased 2.7 times between 1825-1829 and 1865-1869, or 2.5 percent per annum (Korthals Altes 1994: 159-60), *more than five times* that of India; and the Latin American terms of trade increased by 1.7 times between 1820-1824 and 1855-1859, or 1.7 percent per annum (Figure 9), *more than three times* that of India. Finally, over the fifteen years following Japan’s emergence from isolation in 1858, its terms of trade rose 3.5 to 4.9 times (Williamson 2004: 24), or about 10 percent per annum, *twenty times* that of India!<sup>14</sup>

External price shocks facing India were quite modest compared to the rest of the periphery. Indian historians may complain the most about their contribution to de-industrialization, but domestic supply side conditions *must* have played a far more important role in accounting for de-industrialization there than elsewhere. Furthermore, it can hardly be a coincidence that re-industrialization started in much of the periphery after the 1860s when the secular rise in their terms of trade slowed down, stopped, and then fell (e.g. Figures 10 and 11). There is plenty of evidence of manufacturing booms after the 1860s in

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<sup>14</sup> Of course, Japan was land and resource scarce, and exported labor-intensive manufactures after it opened up. Thus, the massive post-1858 price shock served to stimulate industrialization, not suppress it (Williamson 2002).

Brazil, Mexico, the Bombay Presidency, greater Shanghai, Japan, and the European periphery (Bairoch 1982; Ma 2004).

For regions in the periphery exporting primary products, a secular improvement in the terms of trade penalized the import competing sector and suppressed industrialization, while a secular deterioration did the opposite. But what did it do to GDP growth?

## **Part 2: Terms of Trade Impact: Secular Trend and Volatility**

### **Prebisch, Singer and the Secular Terms of Trade Deterioration Debate**

Debate over trends in the terms of trade between primary products and manufactures, their causes and their impact has dominated the trade and development literature for more than a century. Classical economists claimed that the relative price of primary commodities should improve over time, since “land” was in inelastic supply while capital and labor were not. As we have seen, the experience over the century before 1860 proved them right: the relative price of manufactures underwent a spectacular decline, while that of primary products soared. In the early 1950s, however, Hans Singer and Raoul Prebisch challenged the classical view by alleging that the terms of trade of the primary-product-producing Third World had deteriorated since the late 19<sup>th</sup> century, and that it would continue to deteriorate as long as the Third World specialized in primary products. Prebisch (1950) calculated that only 63 percent of the finished manufactures which could be bought with a given quantity of primary products in the 1860s could be purchased in the 1930s. These secular trends also implied a long run stimulus to import-competing manufacturing in the periphery, but Prebisch worried more about short run economic damage since the periphery was so committed to primary product exports. Indeed, in 1890-1909 Latin America devoted 97 percent of its exports to primary products, Asia and the Middle East 90 percent, while the European industrial core devoted only 30 percent of their total exports to primary products (Table 4, col. 6).

In Part 1, we saw that the terms of trade for primary product exporting regions rose to the 1860s or 1870s, a secular rise that covered at least a half century and probably even more. On average, it rose by much less between the 1870s and World War I, and it even fell for parts of the periphery. It fell *everywhere* in the periphery afterwards, and the subsequent fall to the 1930s erased any secular post-1870 gains. The secular decline in the terms of trade of primary products between the 1870s and the 1930s alleged by Prebisch and Singer is confirmed by the large country sample underlying Figures 10 and 11:

for Asia, the fall from its 1870s peak to its 1930s trough was 29 percent; for Latin America, the fall from its 1885-1895 peak to its 1930s trough was 40 percent. This secular decline was used to support the move towards Third World autarky in the 1940s, 1950s and 1960s, a highly interventionist industrialization strategy which eventually came to be called import substitution. While Hans Singer also advocated this anti-global strategy, he noted that if the post-1950 relative price of primary products ever improved, it would reduce industrialization incentives in the periphery (Singer 1950: 482). Thus, while a post-1950 improvement in the primary product exporter's terms of trade might augment incomes in the short run, a good thing, it was also likely to suppress industrialization in the long run, a bad thing.

Many modern economists have reached Singer's conclusion, but for different reasons. Some have argued that resources are a "curse" to development, such that while an improvement in the terms of trade facing primary product exporters would increase the value of the resource base being exploited, poor growth would result. Jeffrey Sachs and Andrew Warner (2001) have confirmed the correlation, but economists have not yet agreed on how the "resource curse" works. Some favor crowding-out and Dutch disease, as does this paper. Others argue that resource abundant poor countries have undeveloped property rights such that terms of trade booms get translated into capital flight (a transfer of rents for safe keeping in rich countries: Tornell and Velasco 1992). Still others have made the case for growth-suppressing rent-seeking (Krueger 1974). Earlier work with Yael Hadass (Hadass and Williamson 2003) found that where the terms of trade improved between 1870 and World War I for a small sample of primary product exporters, poor growth *did* ensue, lending support to resource curse theories.

Others have argued for the more benign classical view where an increase in the price of the primary product export raises the expected rate of return on investment in that sector, thus augmenting accumulation and growth economy-wide. Using a cross-country panel of 40 countries from 1970 to 1991, Enrique Mendoza (1997) did indeed find that an increase in the growth rate of the terms of trade by 1 percent raised the growth rate of consumption by 0.2 percent, although most of the developing countries

in his sample were exporting labor-intensive manufactures by the end of the period.<sup>15</sup> Still, Michael Bleaney and David Greenaway (2001) used Mendoza's model to analyze sub-Saharan Africa between 1980 and 1995, where primary product exports still dominated, finding that both GDP per capita growth and investment increased as the terms of trade improved.

The Prebisch-Singer primary-product-terms-of-trade-deterioration thesis has not survived the half century since they wrote, since we now think that structural breaks, serially correlated residuals, and unit roots may explain the 20<sup>th</sup> century patterns we see. Thus, Enzo Grilli and Maw Cheng Yang (1988) analyzed 20<sup>th</sup> century commodity price data and found evidence of periodic structural breaks, but no trend. Bleaney and Greenaway (1993) contested this finding, but were able to document only a modest downward trend. Furthermore, and to repeat, most of the periphery was little damaged by this modest secular deterioration since by the 1990s the majority had shifted out of the export of primary-products and in to the export of labor-intensive manufactures. Thus, from the vantage point of 2004, the Singer-Prebisch secular deterioration hypothesis, and its implied negative impact, can be rejected. It is *not* clear, however, that it should be rejected from the vantage point of 1950 when Singer and Prebisch were looking backward to the 1870s. Nor has the modern literature told us what the impact of the terms of trade deterioration had on long run GDP per capita growth in the periphery.

The jury is still out. What we need is a larger sample of periphery countries, and we need it for the period that motivated the Prebisch-Singer debate in the first place. It will prove difficult to construct the necessary data base for the pre-1860 century, but we *can* do it for the post-1860 century. When the terms of trade of primary products deteriorated between the 1860s and the 1940s, what was its economic impact on the periphery? The answer hinges on two additional questions: After the 1870s, when and where in the periphery did the terms of trade deteriorate? When it *did* deteriorate, and thus when the

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<sup>15</sup> Industrial manufactures have been a rapidly rising share of Third World output and exports. For example, for all developing countries, manufactures rose from only 17.4 percent of commodity exports in 1970 to 64.3 percent by 1994. Enough of the Third World is now labor-abundant and natural-resource-scarce so that a fall in the relative price of primary products helps it to industrialize. The classic image of Third World specialization in primary products has been obsolescing recently, and fast. See Lindert and Williamson (2003: 249).

relative price of import competing manufactures fell, was long run GDP growth stimulated by induced industrialization enough to overcome the short run effect?

### **Terms of Trade Volatility, Terms of Trade Growth, and Economic Performance**

Between 1860 and 1970, most countries in the periphery specialized in the export of just a handful of commodities (Table 4, cols. 3, 7 and 11). In the 1920s, for example, the top two exports were 82 percent of all exports from the average Third World country. Some of these commodities enjoyed more favorable price trends than others. Furthermore, some of these commodities were more volatile than others, and those countries with more volatile primary product prices have grown more slowly than the industrial leaders or even other primary product exporters. Figure 12 charts income per head in 1939 against volatility in the terms of trade for 35 countries between 1870 and 1939.<sup>16</sup> Volatility is measured as the standard deviation of departures from a slow-moving trend.<sup>17</sup> The figure clearly depicts a negative correlation between terms of trade volatility and subsequent level of development, not just in the total sample but also within the subset of primary product-specialized countries in the periphery. Figure 13 charts 1939 income per head against the secular trend in the terms of trade. Within both the periphery and the core, we see a positive correlation between growth in the terms of trade and subsequent level of development. These correlations are reminiscent of what Carlos Diaz-Alejandro (1984) called the commodity lottery. He argued that each country's exportable resources were determined in large part by geography (plus the previous century's experience with global market integration), and that differences in subsequent economic development were a consequence of the economic, political and institutional attributes of each commodity.

So far, this paper has focused on secular terms of trade movements and their implications for industrialization and de-industrialization, but could it be that the exogenous price volatility of primary products also mattered by generating internal instability, reduced investment, and diminished economic

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<sup>16</sup> The World War I years are omitted.

growth? Observers regularly point to terms of trade shocks as a key source of macroeconomic instability in commodity-specialized countries, but they pay far less attention to the long run growth implications of such instability.<sup>18</sup> Most theories stress the investment channel in looking for connections between terms of trade instability and growth. Indeed, the development literature offers an abundance of 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 (Rosenweig and Wolpin 1993). Furthermore, severe cuts in health and education seem to 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 consumption and investment in the face of shocks because they are rationed in credit and insurance markets. Poor governments also find it difficult to borrow internationally, especially at cheap rates, making it hard to smooth public investment and expenditure in the face of terms of trade shocks.<sup>19</sup> Garey and Valerie Ramey (1995) examined the macroeconomic volatility and growth correlation using data from 92 developing and developed economies between 1962 and 1985. They found government spending and macroeconomic volatility to be inversely related, and that countries with higher volatility had lower mean growth. Domestic and foreign investment should respond to such volatility. Likewise, higher volatility in the terms of trade should reduce investment and growth in the presence of risk aversion. What is true of the modern era was probably even *more* true of the pre-modern era when undeveloped financial institutions and a limited tax base made it even harder for poor households and poor governments to smooth expenditures.

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<sup>17</sup> This trend was calculated using a Hodrick-Prescott filter.

<sup>18</sup> For important exceptions, see Mendoza (1997), Deaton and Miller (1996), Kose and Reizman (2001), Bleaney and Greenway (2001), and Hadass and Williamson (2003).

## **The Impact of Secular Trend and Volatility in Periphery Terms of Trade 1870-1939**

There are 35 countries in the historical sample that Chris Blatmann, Jason Hwang and I (Blattman, Hwang and Williamson 2004) used recently to explore these issues: 14 in the core and 21 in the periphery, although when the core-periphery allocation is varied the results are robust. Table 4 lists the 35 by GDP per capita, the dominance of primary products in exports, export concentration and export shares in GDP. The impact of secular change and volatility in the terms of trade are presented in Table 5. Results are displayed for the full seven decades (1870-1939) as well as for two sub-periods: the first global century from 1870 to 1909 and the interwar autarchic disaster from 1920 to 1939.<sup>20</sup> The World War I decade is omitted throughout.

The results are reported separately for the core and periphery, making it possible to test for the presence of asymmetry between them. Asymmetry is predicted by the following reasoning. Consider secular impact first, the focus of Part 1. To the extent that the periphery specializes in primary products, and to the extent that industry is a carrier of development, then positive price shocks reinforce specialization in the periphery and cause de-industrialization there, offsetting the short run gains from the terms of trade improvement. There is no offset in the core, but there is reinforcement, since specialization in industrial products is reinforced there by an improvement in terms of trade. Thus, the prediction is that while a terms of trade improvement raises growth in the industrial core, it does not in the periphery. I expect the same asymmetry with respect to terms of trade volatility to the extent that “insurance” is cheaper and more widely available in the core. For example, to the extent that core governments have a much wider range of tax sources, their tax revenues should be more stable in response to terms of trade shocks than should be true of periphery governments which rely instead on tariffs and export taxes. The induced macro-instability should have suppressed accumulation in risk adverse periphery countries.

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<sup>19</sup> 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.

Table 5 also reports results with and without a term interacting TOT Trend Growth with export share of GDP to see whether the terms of trade impact was contingent upon the level of openness and export dependence. It seems reasonable that more export-oriented countries would respond more forcefully to external shocks. Export shares are taken from the first year of the decade to avoid problems of endogeneity.

The top half of Table 5 reports the regression estimates and hypothesis testing for the terms of trade effects. The bottom half reports the quantitative and economic importance of these terms of trade effects. Thus, the bottom half shows the sample means and standard deviations of the independent variables, as well as their marginal impact. The latter is measured as the predicted change in output growth from a marginal increase in the independent variable. For terms of trade volatility, the marginal impact is just the coefficient estimate. Marginal impact is defined the same way for trend growth when there is no interaction term. When the interaction term is introduced, marginal impact is the sum of the coefficient estimates on TOT Trend Growth by itself and the interaction term, the latter multiplied by the mean export share. Finally, the last rows of Table 5 show the predicted change in output from a one-standard-deviation increase in either the growth or volatility of the terms of trade, thus showing how a plausible change in either independent variable would have influenced output. The word “plausible” applies to the years covered by the sample, namely 1870-1939. The change may *not* be quite so plausible when applied outside the sample, namely 1750-1870, when the terms of trade for primary products soared, as we have seen in Part 1. We will return to this issue below.

Columns (1) and (2) strongly support the asymmetry hypothesis. A greater secular improvement in the terms of trade was significantly and positively associated with long run output growth in the core, but not in the periphery. Greater volatility had a significant negative influence on output growth in the periphery, but not in the core. This asymmetry between core and periphery continues to hold when an

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<sup>20</sup> The periphery consists of 21 countries. Data exist for every country and every decade, except for one country-decade observation, yielding a sample of 125 (=21x6-1). There are a few more missing observations from the interwar core, leaving 79 observations instead of the 84 (=14x6) that would be available in a complete dataset.

interaction term between TOT Trend Growth and export share is introduced in columns (3) and (4). The net effect of trend growth will be sorted out below in the marginal impact calculations, but it is interesting to note the signs. The negative sign on the linear term for the periphery implies that terms of trade improvements reduced output growth there in that decade. However, the positive sign on the interaction term suggests that the negative effect was mitigated, perhaps entirely undone, by having a more open economy exporting a larger share of output. An increase in export share, holding constant concentration, may have acted as a foil to rent-seekers, or exerted a positive influence on output growth through various channels, such as efficiency gains or the development of better institutions. Including the interaction term also improves the statistical significance on volatility.

The main findings continue to receive strong support for the pre-World War I years in columns (5) through (8). Secular improvements in the terms of trade raised long run output growth in the core, but not in the periphery, while greater volatility diminished growth in the periphery, but not in the core. The interwar years – reported in columns (9) through (12) – involve a much smaller sample and, as a result, the standard errors are large and the statistical significance is low, but the point estimates are generally consistent with those found for the pre-war era. It seems reasonable, therefore, to conclude that the same forces were at work both before and after the war.

The economic effects were very big. A one-standard-deviation increase in TOT Trend Growth was associated with a 0.45 percentage point increase in the average annual growth rate of per capita GDP in the core -- a big number given that the average annual per capita growth rate in the core was just 1.4 percent. The economic effect of TOT Volatility in the periphery was even bigger—a one-standard-deviation increase lowered output growth by nearly 0.6 percentage points (the magnitudes being very similar with and without the interaction term). To illustrate the impact in the periphery, consider that per capita income in Canada grew faster than in Indonesia by about 1 percent per annum. The difference in terms of trade volatility between the two countries was just under one half of one standard deviation. The

estimates in Table 5 imply that if, through better fortune, Indonesia had experienced Canada's smaller terms of trade volatility, then its GDP per capita would have grown faster by about 0.3 percentage points, reducing the growth rate gap between them by a third.

These magnitudes suggest that terms of trade shocks were an important force behind the big divergence in income levels between core and periphery, a core-periphery gap that started to open up so dramatically in the 19<sup>th</sup> century. The gap in per capita income growth rates between core and periphery in our sample was 0.4 percentage points. If the periphery had experienced the same terms of trade volatility as the core (leaving the secular trend unchanged), 0.2 percentage points would have been added to average GDP per capita growth rates there. This alone erases half of the output per capita growth gap. If, in addition, the core had experienced no secular improvement in the terms of trade, instead of the observed 0.36 percent per annum growth rate, this would have reduced output growth there by 0.15 percentage points. Combined, these two counterfactuals would have eliminated nearly the entire gap in growth rates between core and periphery (e.g.  $0.15+0.2=0.35$  versus 0.4).

We have reconstructed nearly a century of terms of trade experience from 1870 to 1939 and assessed its impact on the economic performance of the industrial core and the primary-product producing periphery. Secular trend and volatility in the terms of trade varied spectacularly across the periphery, everything depending on commodity specialization. These terms of trade movements were an important determinant of country-specific growth performance. They were especially important in the periphery where terms of trade volatility was particularly damaging to economic growth. The analysis suggests that had volatility been reduced by one standard deviation in the periphery, it would have raised per capita income growth there by 0.5 percentage points per annum, erasing most of growth gap between core and periphery. These results are robust to the use of alternative periphery allocations, terms of trade growth and volatility measures, and time period.<sup>21</sup>

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<sup>21</sup> See the Appendix tables in Blattman, Hwang and Williamson (2004).

What is especially notable about these results is the persistent asymmetry between core and periphery. Where terms of trade volatility was present, it created a significant drag on output growth in the periphery but not in the core. While the core benefited greatly from a small but positive secular improvement in its terms of trade, positive improvement in the periphery—when it made a rare appearance—did not translate in to more growth, but less. Moreover, when one channel of terms of trade impact is investigated—the flow of investment funds from Britain—it appears that capital inflows were negatively influenced by terms of trade volatility in the periphery, but not in the core (Blattman, Hwang and Williamson 2004).

The pre-modern era was characterized by asymmetric terms of trade effects between core and periphery. Asymmetry with regards to secular trends is easier to explain than volatility: The core benefited from a secular increase in its terms of trade since it reinforced comparative advantage there, helped stimulate industrialization, thus augmenting growth-induced spillovers. The fact that the periphery, in contrast, did not benefit when the terms of trade rose over the long-term, or suffer when it fell, appears to support de-industrialization and resource curse effects. But what accounts for the asymmetry between the core and periphery response to terms of trade volatility? Exactly what kind of insurance did the industrial core take out that allowed it to escape the damaging consequences of terms of trade instability, insurance that was not, apparently, available to primary product exporters in the periphery? Did the industrial core simply have better-developed institutions, policies and tax mechanisms by which to insure against adverse shocks?

## The Agenda

Where the data are far better, 1870-1939, they show that a secular increase in the terms of trade gave the manufactures-specializing core a short run GDP gain. It *also* provoked more industrialization and more growth there. In contrast, when the terms of trade improved for the primary-product-specializing periphery, it got a short run GDP gain. But it also provoked de-industrialization and less growth.

One question still on the agenda is whether these findings would apply to the period 1750-1870 when the globalization-induced de-industrialization forces in the periphery were most powerful. It will be a challenge since the requisite data are so much scarcer.

Another question still on the agenda is whether domestic supply side forces were as important for the rest of the periphery as they were for India. It took the fall of the Mughal Empire to induce a big enough productivity decline in Indian agriculture, to raise nominal wages enough, thus to erode and eventually erase Indian competitiveness in manufacturing. Were there similar ‘decaying empire’ problems in Egypt and the Ottoman Empire, or in Latin America as it fought for independence and then had to defend their young republics? Did these regions undergo negative productivity shocks in their non-tradable grain sectors anything like the magnitude that India did? If so, when, where and why? Were these forces absent in Japan and the European periphery? Did they do better in fending off the core’s challenge to their manufactures because they did not have to cope with declining labor productivity in food production and thus with upward pressure on nominal wages, and finally with the erosion of competitiveness in manufacturing? And how does China stack up against the Indian de-industrialization experience? Does agriculture hold the key to explaining why de-industrialization in China was less dramatic than India? In any case, now that the size of the price shocks have been isolated for the whole periphery 1750-1870, perhaps the Indian decomposition can be replicated for the rest of the periphery as well.

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**Table 1**

**World Manufacturing Output 1750-1938**  
(in percent of total)

Year	India	China	Rest of the Periphery	Developed Core
1750	24.5	32.8	15.7	27.0
1800	19.7	33.3	14.7	32.3
1830	17.6	29.8	13.3	39.5
1880	2.8	12.5	5.6	79.1
1913	1.4	3.6	2.5	92.5
1938	2.4	3.1	1.7	92.8

*Source:* Simmons (1985), Table 1, p. 600, based on Bairoch (1982), Tables 10 and 13, pp. 296 and 304. *Note:* India refers to the total sub-continent.

**Table 2**

**Population Dependent on Industry**  
**In Gangetic Bihar**  
(in percent of total)

	1809-1813	1901
Assumption A	28.5	8.5
Assumption B	18.6	8.5

*Source:* Bagchi (1976b): Tables 1-5.

*Note:* Under Assumption A, each spinner supports only him or herself, and under Assumption B, each spinner also supports one other person. Under both assumptions, non-spinners are assumed to support the survey's modal family size (5).

**Table 3**

**Percentage of Total Population of Gangetic  
Bihar Dependent on Different Occupations**  
(in percent of total)

	1809-1813	1901
Spinners	10.3	} 1.3
Weavers	2.4	
Other Industrial	9.0	7.2
TOTAL	21.6*	8.5

*Source:* Bagchi (1976b): Tables 1-5.

\* Bagchi reports 18.6%, but this appears to be a mistake.

Table 4  
Profile of the Core and Periphery

	1870-1889				1890-1909				1920-1939			
	GDP per capita	Primary Products as a % of Exports	Top 2 Exports as a % of Top 5 Exports	Exports as a % of GDP	GDP per capita	Primary Products as a % of Exports	Top 2 Exports as a % of Top 5 Exports	Exports as a % of GDP	GDP per capita	Primary Products as a % of Exports	Top 2 Exports as a % of Top 5 Exports	Exports as a % of GDP
<b>PERIPHERY</b>												
<b>European "Frontier" Offshoots</b>												
Australia	4,442	97%	98%	15%	4,394	97%	84%	20%	5,268	96%	76%	15%
Canada	1,822	95%	96%	12%	2,801	91%	68%	15%	3,993	74%	51%	19%
New Zealand	3,668	99%	100%	16%	4,295	96%	89%	23%	5,232	99%	69%	25%
	3,311	97%	98%	15%	3,830	95%	81%	19%	4,831	89%	65%	20%
<b>Latin America</b>												
Argentina	1,676	100%	87%	15%	2,823	99%	58%	19%	3,912	99%	47%	14%
Brazil	755	100%	86%	17%	749	100%	91%	21%	1,087	100%	92%	9%
Chile	1,185	99%	100%	22%	1,923	99%	100%	19%	2,800	100%	100%	12%
Colombia	1,113	99%	100%	4%	1,034	99%	100%	6%	1,486	99%	100%	7%
Cuba	1,647	80%	a	49%	1,825	83%	100%	41%	1,440	96%	100%	41%
Mexico	835	100%	99%	4%	1,183	100%	86%	5%	1,463	99%	62%	7%
Peru	497	99%	74%	24%	802	99%	55%	10%	1,451	100%	67%	12%
Uruguay	1,676	100%	74%	22%	2,823	100%	72%	19%	3,912	100%	85%	18%
	1,173	97%	89%	20%	1,645	97%	83%	17%	2,194	99%	82%	15%
<b>Asia &amp; the Middle East</b>												
Burma (Myanmar)	628	91%	100%	14%	622	86%	93%	12%	751	98%	83%	45%
Ceylon (Sri Lanka)	730	98%	100%	11%	932	98%	100%	13%	1,114	98%	100%	15%
China	565	98%	73%	1%	648	93%	66%	1%	769	85%	43%	1%
Egypt	369	93%	100%	29%	487	96%	100%	25%	650	97%	100%	18%
India	660	98%	55%	4%	723	96%	51%	5%	1,083	97%	59%	6%
Indonesia	581	91%	.	3%	629	86%	60%	4%	651	75%	54%	4%
Japan	800	71%	100%	1%	1,108	70%	99%	4%	1,948	44%	89%	7%
Philippines	955	96%	81%	5%	1,086	95%	90%	4%	1,527	91%	81%	5%
Siam (Thailand)	751	99%	100%	2%	811	99%	100%	6%	815	98%	87%	7%
Turkey	831	99%	50%	6%	941	97%	59%	9%	936	92%	72%	5%
	834	92%	83%	4%	987	90%	87%	6%	1,307	81%	82%	6%
<b>CORE</b>												
<b>Industrial Leaders</b>												
France	2,119	43%	b	13%	2,739	40%	b	15%	4,100	35%	b	10%
Germany	2,184	38%	b	9%	3,007	33%	b	9%	4,001	24%	b	11%
United Kingdom	3,598	12%	b	14%	4,419	17%	b	14%	5,112	22%	b	12%
United States	2,952	86%	b	6%	4,126	80%	b	6%	5,969	57%	b	5%
	2,713	45%	.	10%	3,573	43%	.	11%	4,795	35%	.	9%
<b>European Industrial Latecomers</b>												
Austria/Austria-Hungary	1,108	35%	b	9%	1,545	41%	b	9%	3,211	35%	b	10%
Denmark	2,105	96%	a	14%	2,913	96%	88%	22%	4,791	90%	91%	20%
Italy	1,516	87%	b	6%	1,784	74%	b	7%	2,888	48%	b	5%
Norway	1,446	90%	100%	13%	1,763	74%	94%	18%	3,126	64%	100%	20%
Sweden	1,875	85%	b	9%	2,483	75%	b	12%	3,722	58%	b	15%
	1,610	79%	.	10%	2,098	72%	.	13%	3,548	59%	.	14%
<b>European Periphery</b>												
Greece	1,343	94%	a	7%	1,487	90%	73%	7%	2,321	96%	86%	4%
Portugal	1,151	96%	75%	6%	1,348	92%	73%	7%	1,562	75%	85%	7%
Russia/USSR	976	97%	79%	4%	1,178	96%	73%	4%	1,593	85%	48%	1%
Serbia/Yugoslavia	852	96%	73%	6%	944	96%	77%	7%	1,225	92%	64%	5%
Spain	1,588	73%	64%	5%	2,009	75%	46%	7%	2,557	80%	a	4%
	1,182	91%	73%	5%	1,393	90%	69%	6%	1,852	86%	71%	4%

Sources: Blattman, Hwang, and Williamson (2004), Table 1.

a: No data available for this period.

b: Data for the Industrial Leaders and most European Latecomers not available in standard secondary sources.

Table 5  
GDP Growth and the Terms of Trade, 1870-1939

**Dependent Variable:** Decadal Average GDP per capita growth

**TOT Growth Measure:** Decadal growth in a Hodrick-Prescott filtered trend

**TOT Volatility Measure:** Decadal standard deviation of annual departures from trend

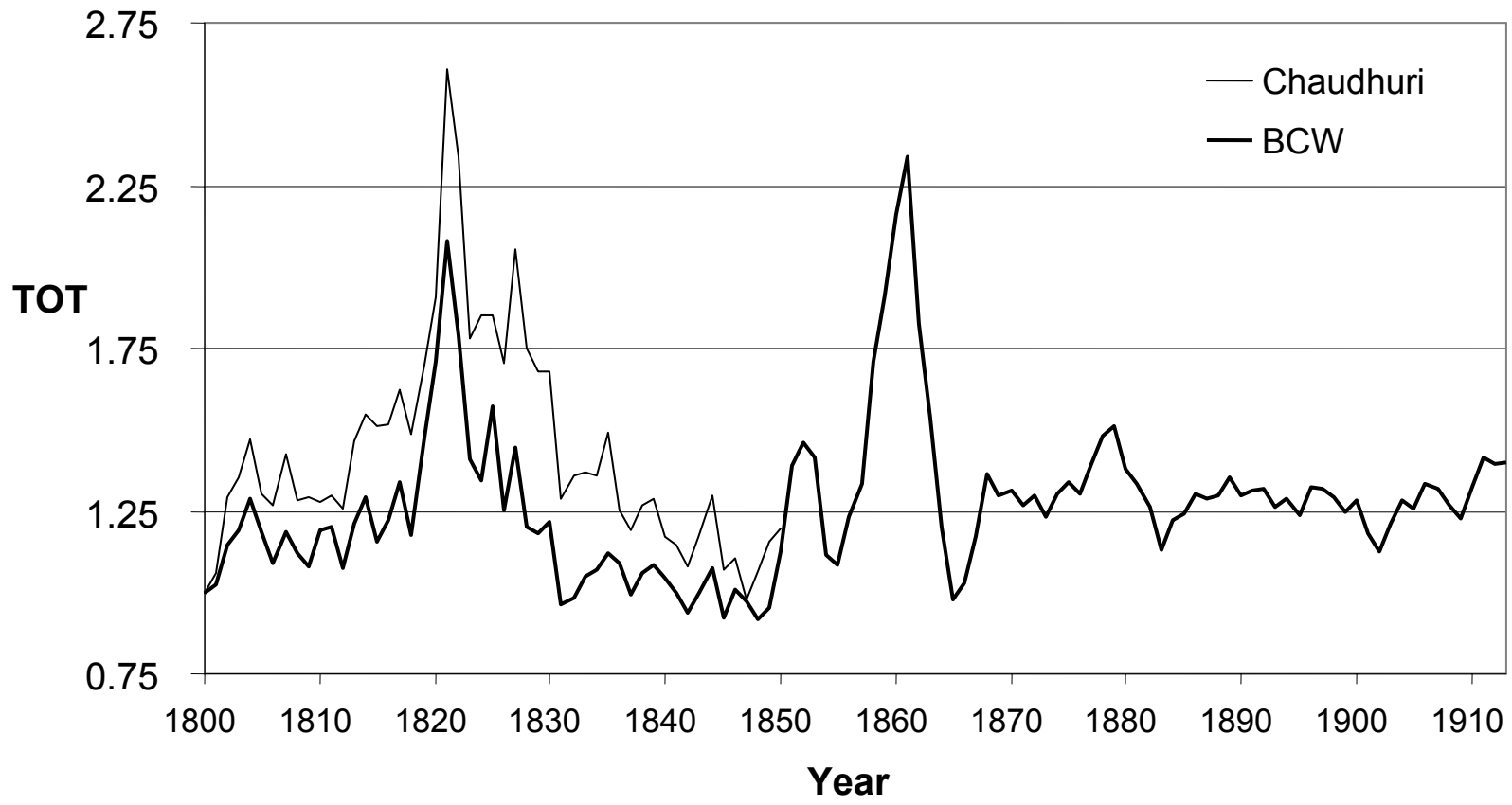
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	1870-1939 (1910-1919 excluded)				1870-1909				1920-1939			
	Core	Periph	Core	Periph	Core	Periph	Core	Periph	Core	Periph	Core	Periph
TOT Trend Growth	0.411 [0.181]**	-0.041 [0.135]	0.735 [0.319]**	.378 [0.153]**	0.409 [0.141]***	-0.009 [0.147]	0.978 [0.307]***	-0.204 [0.147]	0.958 [0.484]*	-0.100 [0.306]	1.271 [0.997]	-0.309 [0.323]
TOT Volatility	0.015 [0.036]	-0.105 [0.042]**	0.017 [0.036]	-0.100 [0.038]***	0.071 [0.036]*	-0.109 [0.054]**	0.076 [0.036]**	-0.122 [0.049]**	0.001 [0.126]	-0.166 [0.126]	0.068 [0.184]	-0.155 [0.105]
(TOT Growth) x (Exports/GDP)			-3.366 [2.093]	2.382 [0.897]***			-7.489 [3.291]**	2.176 [0.995]**			-5.061 [4.024]	1.687 [1.520]
Exports/GDP			-1.237 [4.424]	7.531 [3.811]*			7.165 [4.992]	15.361 [7.790]*			-10.444 [11.482]	10.358 [7.235]
Constant	1.154 [0.764]	3.119 [0.443]**	1.280 [0.824]	1.898 [0.700]***	0.498 [0.573]	3.42 [0.613]**	0.185 [0.605]	1.205 [1.048]	-1.052 [3.847]	2.079 [1.764]	-2.293 [4.647]	0.208 [1.892]
Observations	79	125	79	125	56	84	56	84	23	41	23	41
R-squared	0.45	0.34	0.48	0.42	0.57	0.36	0.63	0.49	0.63	0.73	0.70	0.77
Decade Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<b>Mean Values [Std Dev]:</b>												
GDP Growth	1.38 [1.28]	0.99 [1.79]	1.38 [1.28]	0.99 [1.79]	1.13 [0.76]	1.13 [1.70]	1.13 [0.76]	1.13 [1.70]	1.87 [1.85]	0.72 [1.96]	1.87 [1.85]	0.72 [1.96]
TOT Growth	0.36 [1.09]	-0.49 [1.53]	0.36 [1.09]	-0.49 [1.53]	0.31 [0.86]	-0.01 [1.36]	0.31 [0.86]	-0.01 [1.36]	0.50 [1.54]	-1.48 [1.38]	0.50 [1.54]	-1.48 [1.38]
TOT Volatility	7.67 [5.56]	9.46 [5.52]	7.67 [5.56]	9.46 [5.52]	5.98 [3.91]	8.59 [5.63]	5.98 [3.91]	8.59 [5.63]	11.79 [6.80]	11.25 [4.90]	11.79 [6.80]	11.25 [4.90]
(TOT Growth) x (Exports/GDP)			0.03 [0.13]	-0.09 [0.35]			0.03 [0.07]	0.00 [0.22]			0.03 [0.20]	-0.27 [0.48]
Exports/GDP			0.10 [0.06]	0.14 [0.12]			0.09 [0.05]	0.13 [0.11]			0.11 [0.09]	0.16 [0.14]
<b>Marginal Impact</b>												
TOT Trend Growth	0.41	-0.04	0.41	-0.04	0.41	-0.01	0.31	0.08	0.96	-0.10	0.70	-0.04
TOT Volatility	0.02	-0.11	0.02	-0.10	0.07	-0.11	0.08	-0.12	0.00	-0.17	0.07	-0.16
<b>Impact of a 1 Std Dev Increase</b>												
TOT Trend Growth	0.45	-0.06	0.45	-0.06	0.35	-0.01	0.27	0.11	1.47	-0.14	1.08	-0.05
TOT Volatility	0.08	-0.58	0.09	-0.55	0.28	-0.61	0.30	-0.69	0.01	-0.81	0.46	-0.76

Source: Blattman, Hwang and Williamson (2004), Table 2.

Robust standard errors in brackets

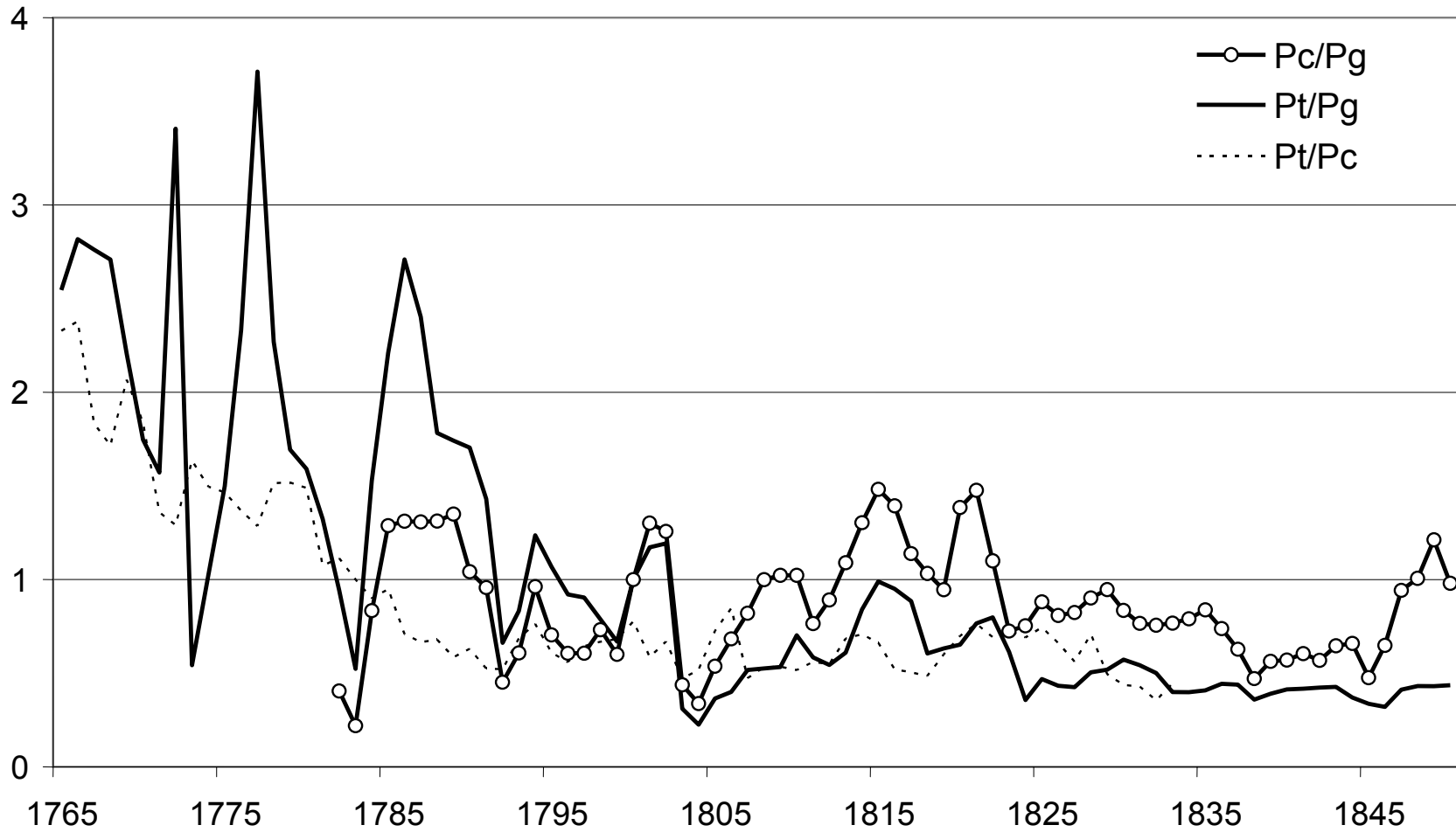
\* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%

**Figure 1**  
**India's TOT 1800-1913**



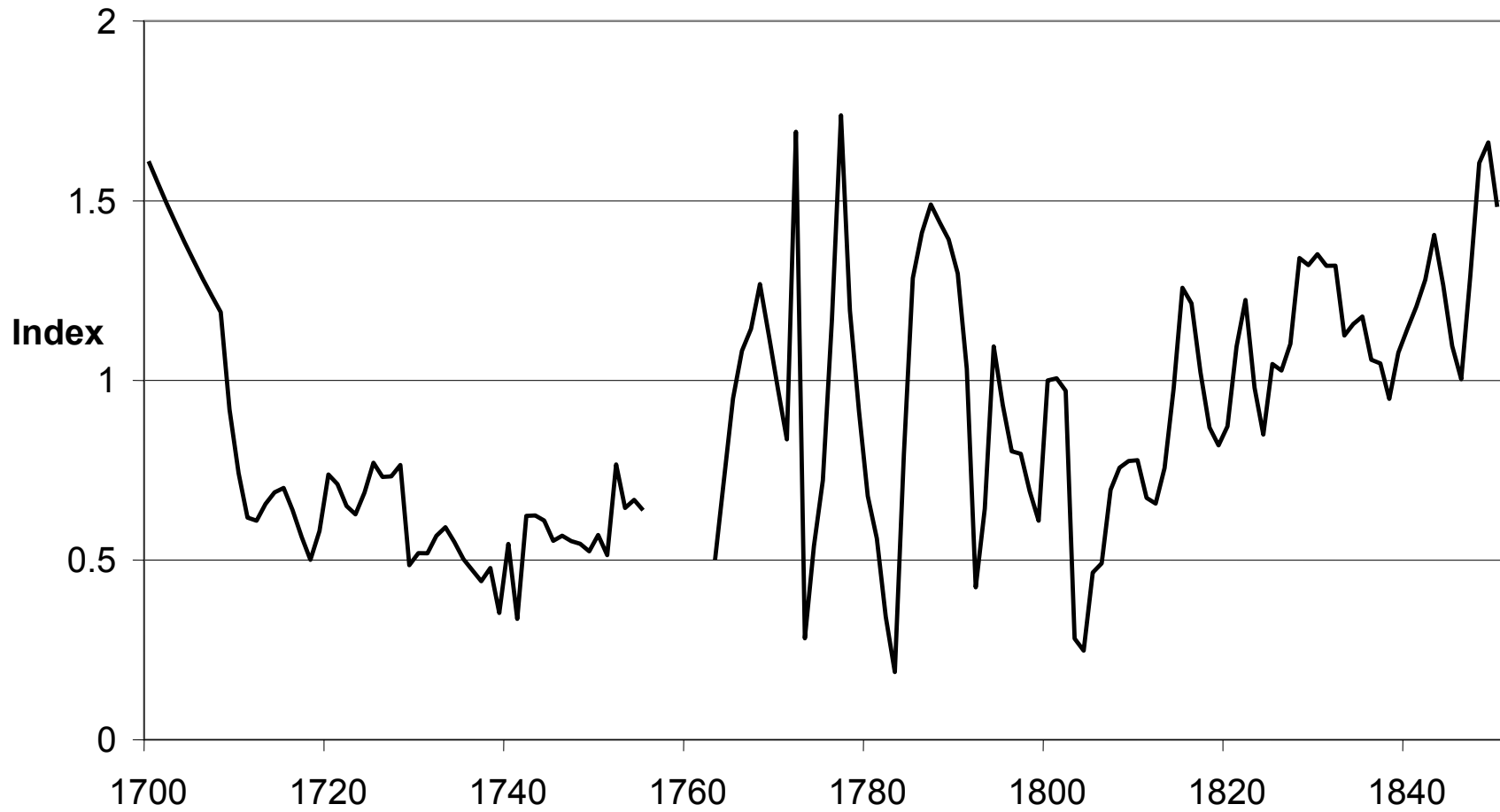
Source: Clingingsmith and Williamson (2004).

**Figure 2**  
**Relative Prices of Tradeables (1800=1)**

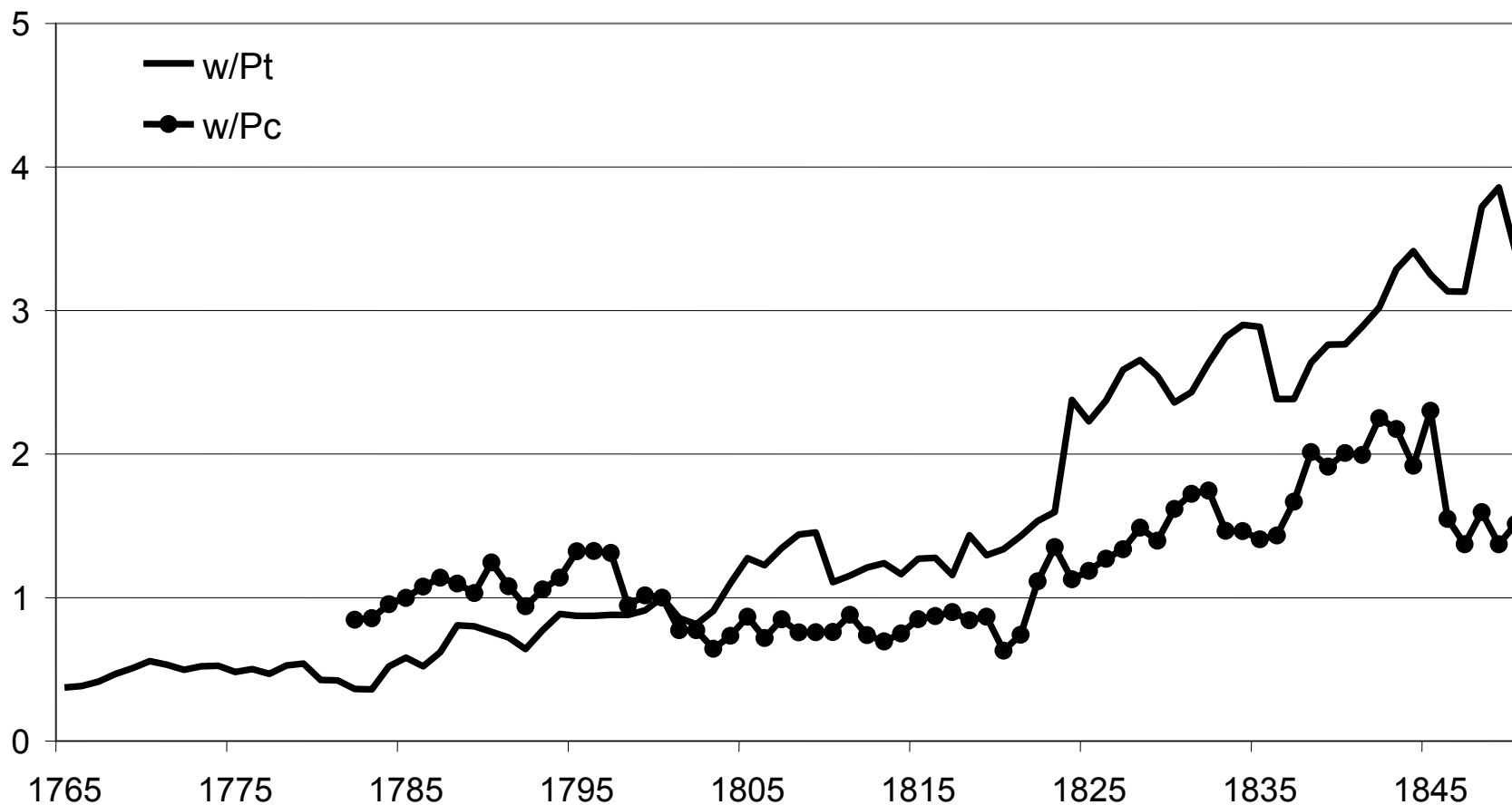


Source: Clingingsmith and Williamson (2004).

**Figure 3**  
**Grain Wage in India 1700-1850 (1800=1)**

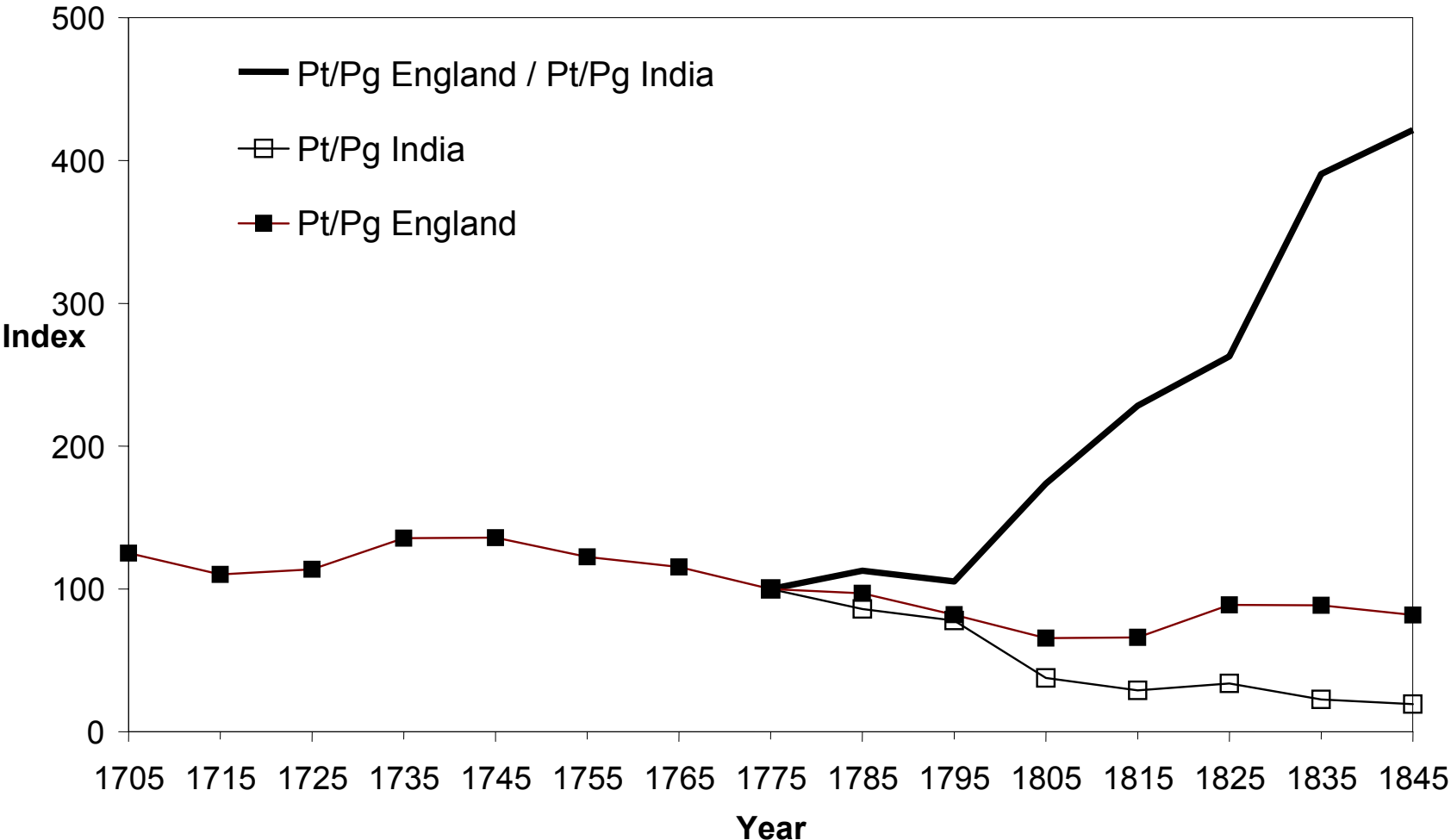


**Figure 4**  
**Indian Own Wages in Textiles and Agricultural**  
**Commodities (1800=1)**

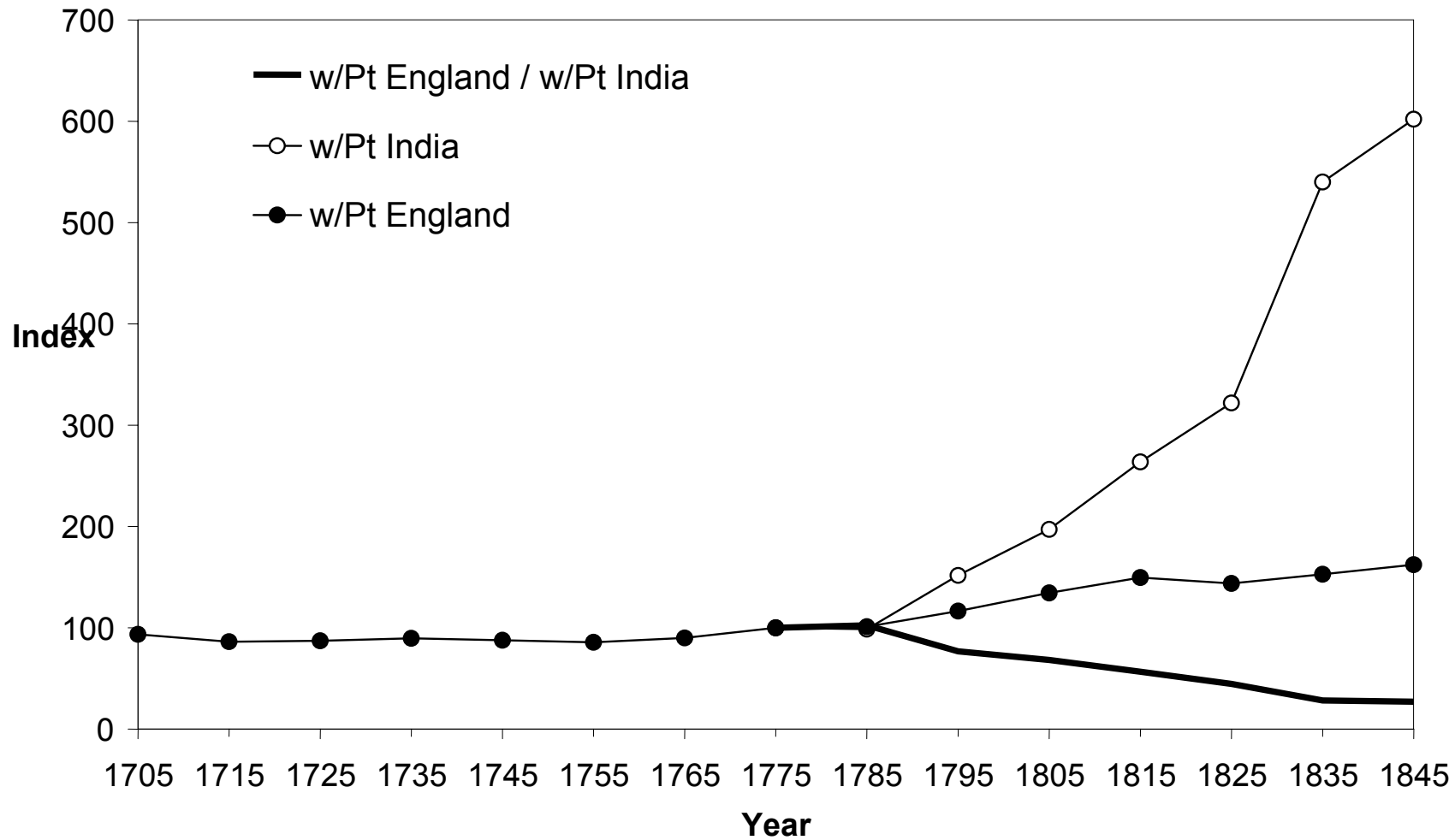


Source: Clingingsmith and Williamson (2004).

**Figure 5**  
**Grain Price of Textiles in England and India (1775=100)**

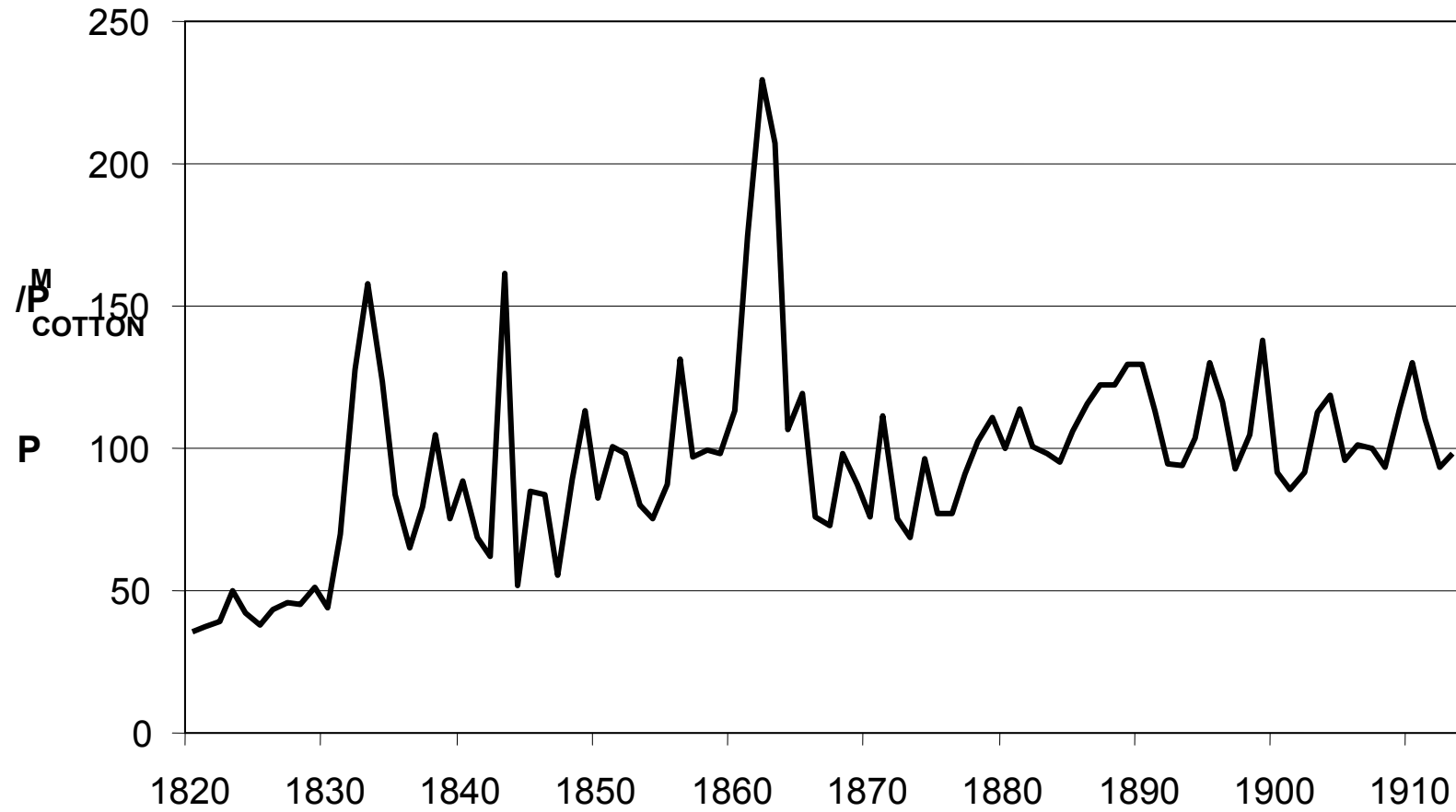


**Figure 6**  
**Textile Own Wages in England and India (1775=100)**

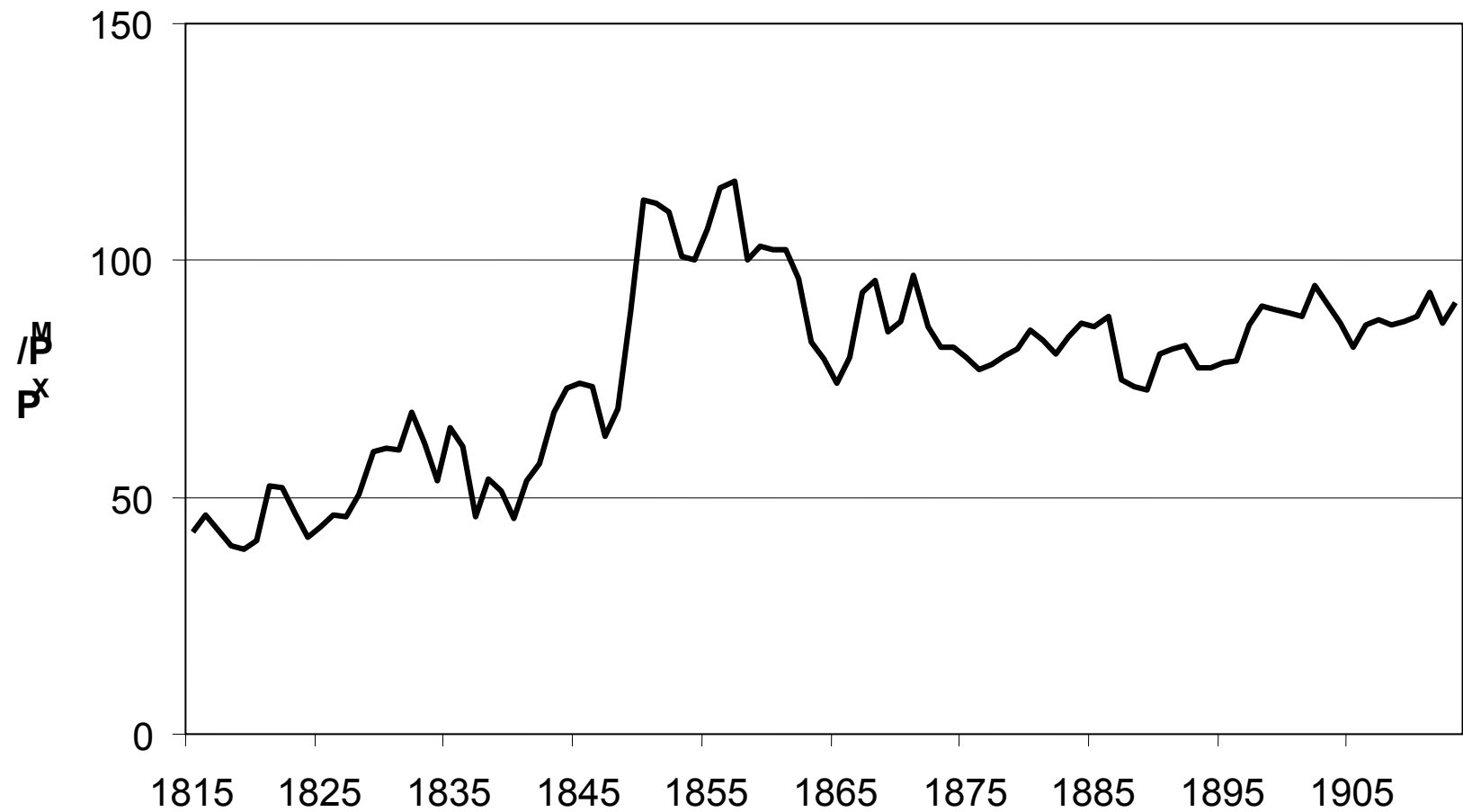


Source: Clingingsmith and Williamson (2004).

**Figure 7**  
**Egypt's Terms of Trade 1820-1913 (1880=100)**

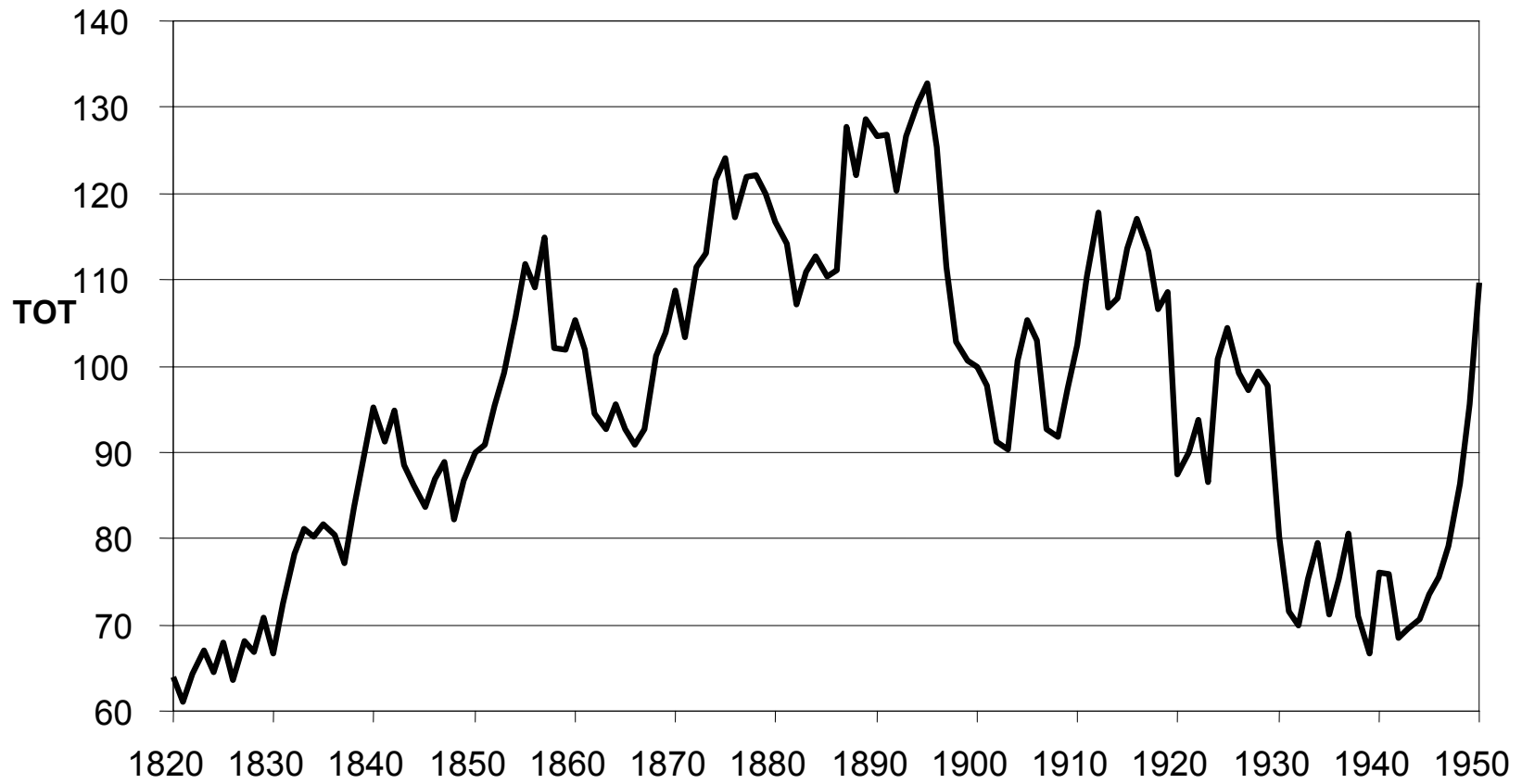


**Figure 8**  
**Ottoman Terms of Trade 1815-1913 (1858=100)**



Source: Clingingsmith and Williamson (2004).

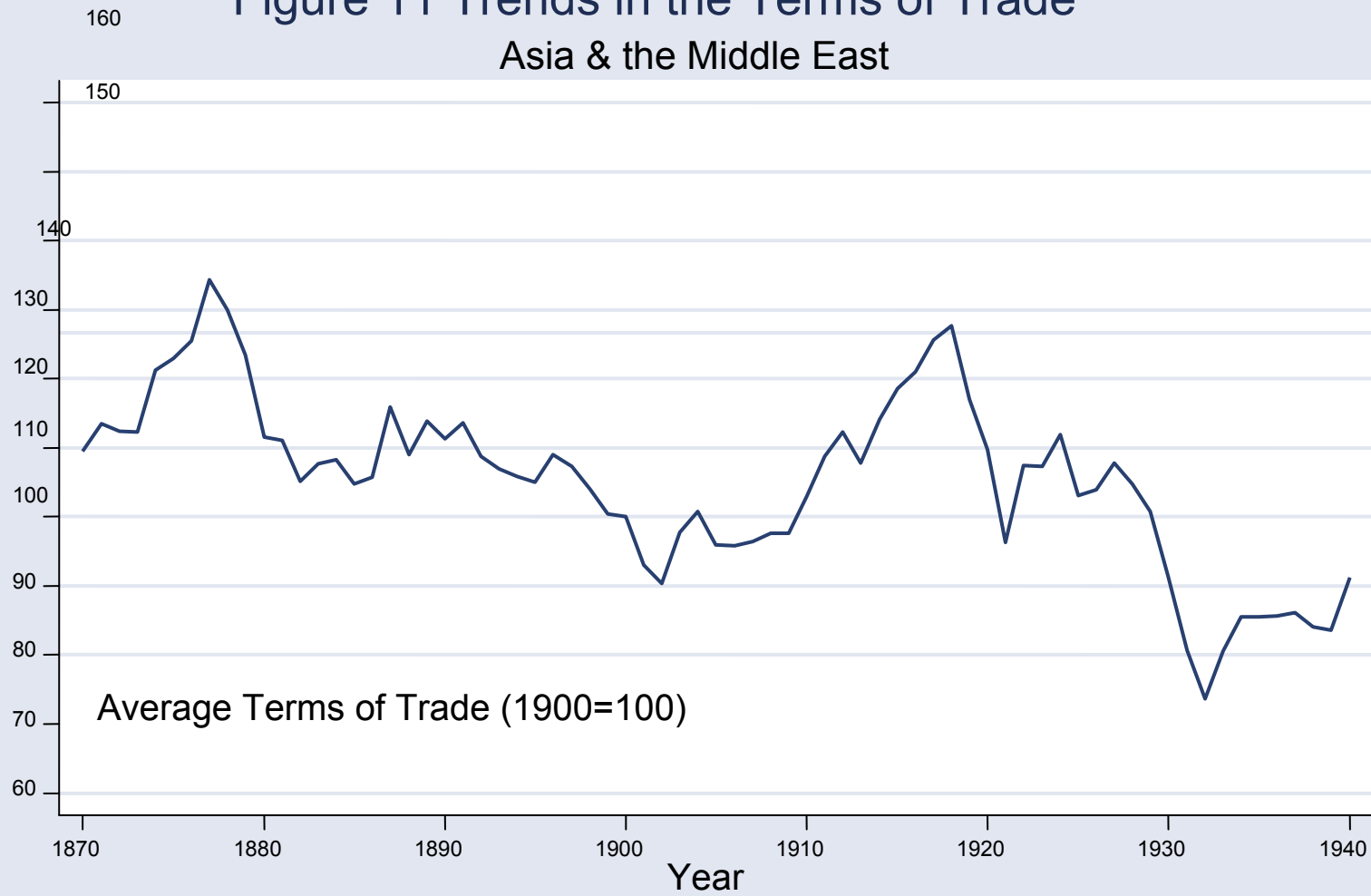
**Figure 9**  
**Latin American Terms of Trade 1820-1950**



# Figure 10 Trends in the Terms of Trade Latin America



Figure 11 Trends in the Terms of Trade  
Asia & the Middle East



# Figure 12

## 1939 GDP per capita and Terms of Trade Volatility 1870-1939

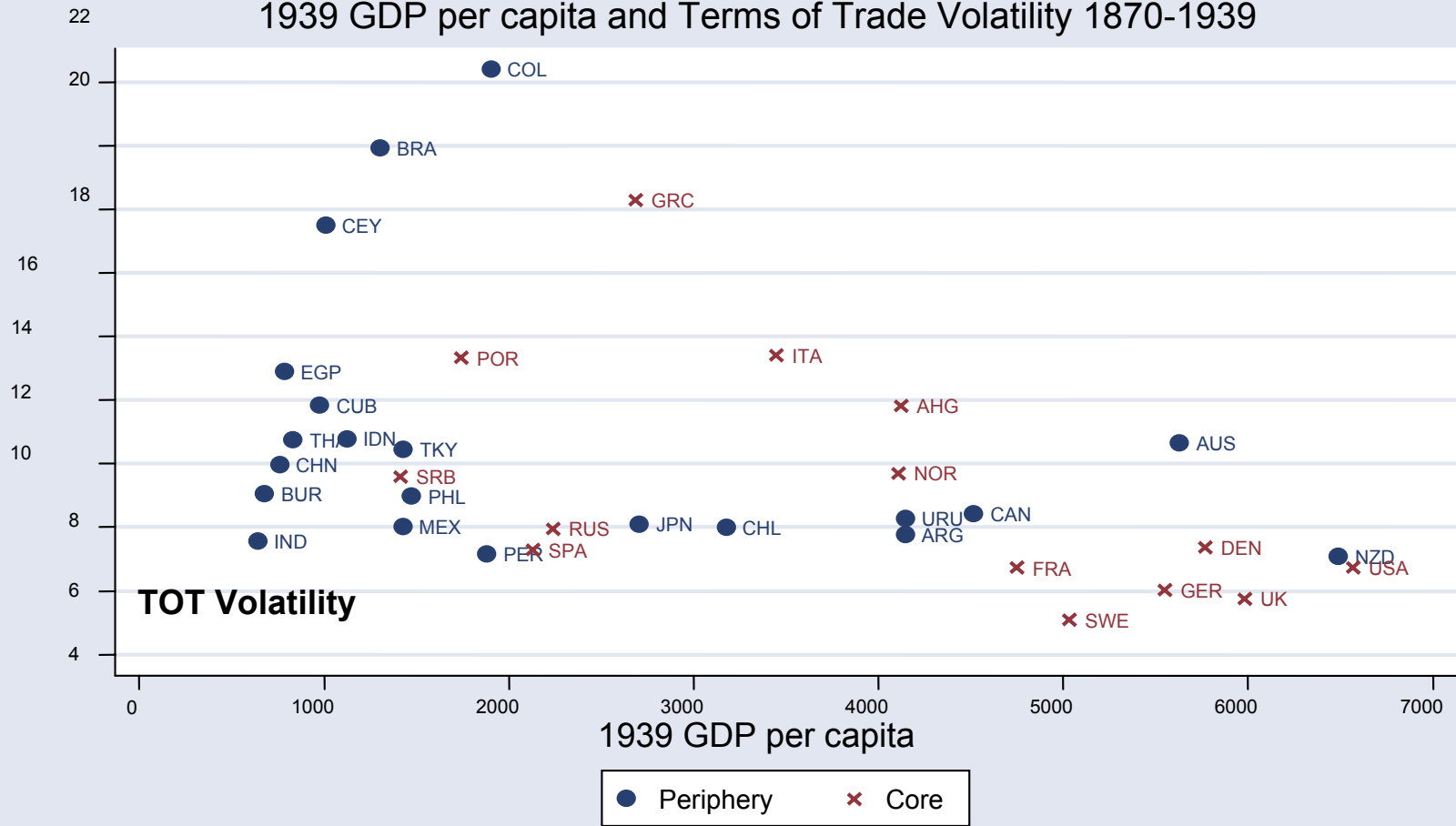


Figure 13

