

Deindustrialization in 18th and 19th Century India: Mughal Decline, Climate Shocks and British Industrial Ascent*

David Clingingsmith
Weatherhead School of Management
Case Western Reserve University
11119 Bellflower Road, Room 281
Cleveland, Ohio 44106-7235
216-368-4294
david.clingingsmith@case.edu

Jeffrey G. Williamson
Department of Economics
Harvard University
Cambridge MA 02138
and CEPR and NBER
617-495-2438
jwilliam@fas.harvard.edu

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Abstract

India was a major player in the world export market for textiles in the early 18th century, but by the middle of the 19th century it had lost all of its export market and much of its domestic market, primarily to Britain. The ensuing deindustrialization was greatest c1750-c1860. We ask how much of India's deindustrialization was due to local supply-side forces -- such as political fragmentation and a rising incidence of drought, and how much to world price shocks. An open, three-sector neo-Ricardian model organizes our thinking and new relative price database implements the empirical analysis. We find local supply side forces were important from as early as 1700. The size of Indian deindustrialization is then assessed by comparison with other parts of the periphery.

Keywords: India, deindustrialization, globalization, trade, Ricardian model, textiles, 18th century, 19th century.

1. Introduction

The idea that India suffered deindustrialization during the 19th century has a long pedigree. The image of skilled weavers thrown back on the soil was a powerful metaphor for the economic stagnation Indian nationalists believed was brought on by British rule. However, whether and why deindustrialization actually happened in India remains open to debate. Quantitative evidence on the overall level of economic activity in 18th and 19th century India is scant, let alone evidence on its breakdown between agriculture, industry, and services. Most deindustrialization assessments rely on very sparse employment and output data. Price data are more plentiful, and, as a consequence, this paper uses newly compiled evidence on relative prices to offer a new price-dual assessment of deindustrialization in 18th and 19th century India. A simple neo-Ricardian model of deindustrialization links relative prices to employment and output shares. The paper sheds new light on when deindustrialization happened, whether it was more or less dramatic in India than elsewhere, and the relative roles of domestic and foreign forces in explaining it.

The existing literature attributes most of India's deindustrialization to Britain's productivity gains in textile manufacture and to the world transport revolution. Improved British productivity, first in cottage production and then in factory goods, led to declining world textile prices, making production in India increasingly uneconomic (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 much of its domestic market as well. This explanation for deindustrialization was a potent weapon in the Indian nationalists' critique of colonial rule (see e.g. Dutt 1906/1960; Nehru 1947). A second explanation for India's deindustrialization also has its roots in globalization forces: relative to textiles, India's commodity export sector saw its terms of trade improve significantly in the 18th century and drew workers away from textiles.

The historical literature also suggests a third explanation for deindustrialization coming from the supply side, although the connection has been almost ignored. We believe that the economic malaise India suffered following the dissolution of Mughal hegemony in the 18th century ultimately led to aggregate supply-side problems for Indian manufacturing, even if producers in some regions benefited from the new order. In addition, India suffered a profound secular deterioration in climate conditions in the century or so following the early 1700s, events which appear to have added greatly to the slump in agricultural productivity, to the rise in grain prices, and thus to deindustrialization. The paper argues that these explanations are complementary and that each makes a contribution to our overall understanding India's experience.

Before proceeding to our argument and evidence, we first offer a precise definition of deindustrialization and elaborate on its likely causes. We develop some initial intuition using a simple 2-good 3-factor framework. Suppose an economy produces two commodities: agricultural goods, which are exported, and manufactured goods, which are imported. 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. Suppose further 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, deindustrialization can be defined as the movement of labor out of manufacturing and into agriculture, either measured in absolute numbers (what we call *strong deindustrialization*), or as a share of total employment (what we call *weak deindustrialization*).

While deindustrialization is easy enough to define, 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 deindustrialization. One possibility is that a country deindustrializes because its comparative advantage in the agricultural export sector has been strengthened by productivity advance on the land or by increasing openness in the world economy, or both. Under those conditions, GDP

increases in the short-run. If productivity advance on the land is the cause, nothing happens to the terms of trade unless the small country assumption is violated, in which case they deteriorate. If increased openness is the cause, the country enjoys an unambiguous terms of trade improvement as declining world trade barriers raise export prices and lower import prices in the 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 deindustrialization could lead to a growth slowdown and a low-income equilibrium. The possibility that deindustrialization induced by increased openness in the world economy could engender low growth over the long run provides one potential explanation of the divergence in income between countries that characterized the 19th and first half of the 20th centuries (Maddison 2001; Blattman et al. 2007), and accounts for the much of the power that deindustrialization has had in both the politics and the historiography of countries affected by it.

A second possibility is that a country deindustrializes 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 deteriorate, and so does GDP. The economic impact of deindustrialization from this source is unambiguous, and also carries the possibility of a low-growth equilibrium.

In order to make this theoretical framework flexible enough to handle the causes of deindustrialization that we believe were most important, a non-tradable grain sector needs to be added. 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) and high-value consumer goods (such as opium and tea); manufacturing, which is dominated

by textiles and metal products and is also tradable; and grains, which are non-tradable and include rice, wheat and other food staples.¹

We build our account of India's deindustrialization as follows. In Section 2 we present a theoretical narrative of India's deindustrialization experience, drawing on evidence from the historical literature. Section 3 reviews existing attempts to measure India's deindustrialization. We then present a simple, neo-Ricardian, general equilibrium model of deindustrialization in Section 4 to formalize our predictions about relative prices and their relationship to employment shares. Section 5 presents three price series – commodity agricultural exports, manufactured textiles and non-tradable grains, three wage series – the grain wage, the own-wage in the import competing sector, and the own-wage in the export sector, the intersectoral terms of trade between export agricultural commodities and textiles, and the external terms of trade. This evidence is then assessed in relation to the theoretical narrative. This relative price experience is also compared with India's primary competitor during this period, England. Section 6 compares India's deindustrializing terms-of-trade shocks with those from other parts of the periphery, and section 7 concludes.

2. A Narrative Account of India's Deindustrialization

Our narrative account of India's deindustrialization embraces the three contending deindustrialization hypotheses, and traces the roots of deindustrialization well back into the 18th century. Two continent-wide political changes ground our understanding of India's 18th century: The dissolution of the Mughal empire into a constellation of small successor states was followed, after a time, by the initial phase of reintegration of these states under the East India Company.

¹ Grains became tradable commodities throughout Asia in the late 19th century, but for the 18th and early 19th century, it is more accurate to treat them as non-tradables.

Mughal hegemony extended over almost the entire subcontinent in the early 18th century, and historians have long thought that India underwent an overall economic decline following its collapse. This proposition has recently become controversial, and we will stake out our position in favor of it below. We believe the political fragmentation of the 18th century engendered a rise in grain prices that was reinforced by a devastating climatic shift, a steep upward trend in the frequency of droughts.² We start with the Mughal collapse hypothesis, and then turn to the climate hypothesis.

The Mughal Collapse Hypothesis

The dissolution of Mughal hegemony could have affected manufacturing through several channels. The first is a reduction in overall agricultural productivity through an increased rent burden, shifting of settlement owing to insecurity, and warfare. Reduced agricultural productivity would be reflected in an increase of the price of grain, the key non-tradable, and therefore in the relative price of non-tradeables to tradables (such as textiles).³ 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. Indeed, East India Company officials in Surat were already complaining in

² Some have argued that deteriorating weather conditions helped precipitate the collapse of the Mughal Empire (Grove and Chappell 2000: 15), but the alleged connection is not central to our analysis.

³ We assume that India was a price taker for textiles and other manufactures. Given this assumption, domestic demand did not matter in determining the performance of Indian industry. Only price and competitiveness on the 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).

the 1720s that rising foodgrain and raw cotton prices were putting upward pressure on the prime cost of textiles they were sending to England (Chaudhuri 1978, pp. 299-300). Cotton textile wages started from a low nominal but high real base in the mid-18th century (Parthasarathi 1998; Allen 2005; Prakash 2004: 268, 383). Competitiveness in textile manufacturing is negatively related to the own real wage, the nominal wage divided by the price of textiles. Declining textile prices and rising nominal wages put downward pressure on “profits” from both below and above. An increase in the own wage in textiles would have hurt the edge India had relative to its 18th century competitors in third-country export markets, such as the booming Atlantic economy.⁴ A decline in 18th century agricultural productivity in India would suggest that even before factory-driven technologies appeared between 1780 and 1820, Britain was already beginning to wrest away from India its dominant grip on the world export market for textiles.⁵

⁴ English merchants and English ships were the main suppliers to the Atlantic trade, a lot of it the so-called re-export trade. While the share of Indian textiles in the West African trade was about 38 percent in the 1730s, it had fallen to 22 percent in the 1780s and 3 percent in the 1840s (Inikori 2002: 512-3 and 516). By the end of the 17th 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 18th century, long before the industrial revolution.

⁵ To make matters worse, India, which had captured a good share of the English market in the 17th 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). It should be stressed that India also had a technological edge over England in the early 18th century (Prakash 2004: 268-9). Before the machines of Hargraves,

We are not the first to exploit the connection between labor productivity in pre-industrial agriculture, nominal wages in manufacturing, and the resulting competitiveness in world markets for manufactures. Alexander Gerschenkron (1962), W. Arthur Lewis (1978: chp. 2) and even Adam Smith all used the argument to good effect in explaining why low productivity in agriculture helps explain the absence or delay of industrial revolutions. More recently, Prasanna 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 that in the south of England. Indian productivity was higher in food grain production, and thus food grain prices were lower.

Our evidence for an overall 18th century economic decline begins with an examination of unskilled wages in grain units, which are a good measure of the overall level of economic activity in a largely agricultural economy. Figure 1 presents three grain-wage series, two for North India and one for South India, from Radhakamal Mukerjee (1939) and Stephen Broadberry and Bishnupriya Gupta (2005). This figure documents a long-run decline in grain wages beginning in the last decades of the 17th century and continuing until late in the 18th century. The wage data for India in 17th and 18th century India is particularly thin and must be treated cautiously, with only 14 wage observations over this period. Nevertheless, they provide us with one of the few indicators of the condition of ordinary people and the aggregate economy that is easily compared across time.

[Figure 1 about here]

Historians traditionally viewed India's 18th century as a dark era of warfare, political chaos, and economic decline sandwiched between the stable and prosperous Mughal and British

Arkwright and Crompton, Indian spinners were the only ones capable of producing yarn strong enough for the warp, and thus could produce pure cotton cloth. European spinners could not do this, and thus could only produce a mixed cotton-linen cloth.

hegemonies. This view has been vigorously challenged by the most recent generation of Indian historians, who have emphasized the continuities between the earlier Mughal and later British states and the constellation of small successor states that emerged with the ebbing of Mughal power (e.g. Alam 1986; Bayly 1983; Marshall 1987). The largest of these successor states were the former Mughal provinces of Bengal, Awadh, Benaras, and Hyderabad. There were many smaller ones as well. Their rulers were former provincial governors, Mughal officials, and other men powerful enough to assert *de facto* sovereignty. They collected the land revenue, sometimes using a modification of the old Mughal system, but submitted less and less of it to Delhi in favor of building up their own armies and courts.

While it has been widely accepted that the successor states provided a greater degree of political continuity and stability than was previously thought to have existed, no consensus has been reached about the implications of this fact for overall course of the continental Indian economy in the 18th century. Peter Marshall (2003) brings together contributions from the contending scholars and provides a useful overview. Where the 18th century economy is concerned, some see the literature on the successor states as a useful corrective but believe the overall picture is one of decline. Others believe the traditional view to be fully overturned and view the 18th century as a period of continued growth, despite the ebbing of Mughal hegemony. Two key differences between these views concern, first, the implications of the new political order for the principal towns and middle classes of the successor states, and second, the degree of centralization and stability provided by the Mughal regime before its collapse, and thus the relative effect of the subsequent decentralization of power.

We favor the position that sees an aggregate economic decline following the dissolution of a strong empire into contending states. We believe that the more optimistic narrative tends to place too much emphasis on the prosperity of a few areas and groups, such as the towns of the successor states and their middle classes, and too little emphasis on the evidence for decline in the rural areas and peripheries of these states. Even in an era of aggregate economic decline, we

would expect local booms to result from the diversion of land revenue flows from Delhi to the big towns of the successor states, where the new rulers and their revenue farmers lived. Moreover, agriculture overwhelmingly dominated the 18th century Indian economy,⁶ so it is the economic performance of that sector which largely dictated the course of the overall economy, not what happened in the towns.⁷ The optimistic narrative also seems to overly discount the strength of the Mughal empire and the economically favorable stability it brought. The Mughal state shows evidence of having achieved a high level of centralization and control of revenue sources. Revenue realization per cultivated acre was as high in remote provinces as in the center. Examination of the careers of Mughal revenue officials shows that provincial postings were of virtually the same duration (about two and a half years) all over the empire, suggesting that remote provinces were well integrated into the imperial machinery (Habib 2003). There do not appear to have been many Mughal officials who were in reality local potentates. An imperial regime powerful enough to extract 40 percent of the economic surplus from distant provinces must have also insured peace and security, which were in turn favorable for agricultural investment and productivity.

We find Christopher Bayly's view of 18th century north India particularly compelling, as it shows how urban prosperity coexisted with aggregate agricultural decline (Bayly 1983). A

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

⁷ 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). Thus, we believe other forces would have to explain any observed rise in the relative price of grains.

number of features of the transition of political authority from the Mughal empire to the successor states provide further evidence supporting an overall economic decline, one that resulted from reduced agricultural productivity. As central Mughal authority waned, the state resorted increasingly to revenue farming, and the practice became even more widespread in the successor states. This served to raise the effective rent share to 50 percent or more, greater than the 40 percent maximum said to have been extracted by the Mughal state (Raychaudhuri 1983: 17; Bayly 1983: 10). “With revenue assessment geared to 50 per cent or more, in contrast to China’s 5 to 6 per cent, the Indian peasant had little incentive to invest labour or capital” (Raychaudhuri 1983: 17). The economics is familiar to development economists, economic historians, and observers of modern agrarian backwardness: The lower the share of output received by the peasant, the less incentive he has to be productive, to carefully monitor the crop, to invest in land, and to remain in place rather than fleeing. Scattered evidence suggests that the rent burden may have been quite extreme in some locations (Bayly 1983: 42). In the Rohilla state north of Delhi, cultivators were stripped of their land rights entirely and reduced to direct dependence. Under the *savak* system in north Awadh, cultivators received as little as one sixth of the produce and their wives and children were required for *corvée* for a large part of the year. The Sayyids of Moradabad employed the *batai* system in which they “appropriated all 'save a bare subsistence' from the cultivators and invaded the villages for several months a year with bullock teams, armed retainers, and weighmen to secure the best portion of the crop.” Productivity must have suffered as a result of the increased rent burden. Tapan Raychaudhuri claims the grain prices “increased by 30 percent or more in the 1740s and 1750s” as a result (Raychaudhuri 1983: 6). There is no reason to believe that when the British became rulers of the successor states the revenue burden declined. Initially at least, British revenue officials saw slack in the existing system, and more often than not, increased the revenue burden.

Rulers of the successor states also engaged in territorial disputes, and it is possible the increased rent burden reflected military expenses. These wars drew key resources out of agriculture and also led to the destruction of capital:

“Endemic local warfare ... and the collapse of local aristocracies had effects which were inimical to agricultural production ... Cultivation was driven back from the roads by the passage of marauding armies who sometimes deliberately destroyed walls and irrigation tanks” (Bayly 1983: 70).

Areas at the edges of successor states were particularly prone to agricultural decline, perhaps because these were most affected by territorial disputes, both between states and between local strongmen, who in remote areas were relatively free to plunder their neighbors. This led to population shifts as cultivators retreated to more secure areas. Bayly describes “large penumbras of agricultural decline, particularly in the northwest” (1983, 76). However, he believes that increases in input prices were even more significant than the withdrawal of some areas from cultivation:

“More important, warfare withdrew both men and animals from agriculture ... Recruitment into armies, the consolidation of population into defensive centers, and general migration ... contributed to a patchy and local decline in cultivated area. Draught animals determined the extent of cultivation even more than human labor, and there is scattered evidence of a great dearth of animal power in north central India” (Bayly 1983: 70-1).

A dearth of animal power would certainly have led to less efficient cultivation techniques and increased prices. Cultivators who relied on the bullocks owned by others would have been particularly vulnerable to fluctuations in their availability due to warfare. To cite an example, when Ahmed Shah Durrani invaded India from the northwest in 1759, bullock hire rates between Benares and Patna, a route nearly 600 km from the furthest extent of the fighting, increased by 500 percent (Bayly 1983: 68). This suggests the agricultural economy was operating on very

inelastic regions of the supply and/or demand curves for these key inputs, which is suggestive of a shortage. Political fragmentation and warfare also disrupted India's major internal trade routes, and likely increased transport costs and insurance. Since most long distance transport was by bullock, the scarcity of bullock power resulting from warfare would have increased transport costs. Irfan Habib (2003) also presents fragmentary evidence that insurance rates may have gone up during the 18th century.

We therefore find credible Holwell's claim that the dissolution of the Mughal empire led to "a scarcity of grains in all parts, [and] the wages of labour [were] greatly enhanced," even if other aspects of the traditional view of 18th century India have been discredited (Holwell 1766-1767, cited in Raychaudhuri 1983: 6). This presumed rise in nominal wages would have slowly 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 must have been at the heart of it. After 1800, Indian "textile exports ... could not withstand the competition of English factory-produced cottons in the world market" (Moosvi 2002: 341).

The Mughal collapse probably had direct disruptive effects on the Indian textile sector in addition to increasing wages. Evidence for these effects is even more fragmentary. Many spinners and weavers depended on cash advances from merchants to purchase raw materials. This was particularly true in the export sector, where the quality of raw materials was higher. The cash advance system was disrupted when conflict engulfed a region. This happened in Surat in the 1730s and in Bengal and the northwest in the 1740s and 1750s (Chaudhuri 1978). East India Company officials noted that weaver defaults had increased and that merchants were less inclined to advance cash to them. Maratha raids into Bengal in the 1740s targeted looms for destruction.

Climate, El Niño and Agricultural Crisis

There was another force at work that may also have served to lower agricultural productivity and raise grain prices in 18th and early 19th century India – El Niño, the periodic rise in Pacific sea surface temperature that can cause India’s monsoon rains to fail. Charles Darwin stressed the influence of climate in *The Origin of the Species*: “Climate plays an important part in determining the average numbers of a species, and periodical seasons of extreme cold or *drought seem to be the most effective of all checks*” (1972: 72, italics added). Indeed, for some time now, climate historians have developed evidence documenting frequent and deep droughts in South Asia over the late 18th and 19th century (e.g. Grove 1997; Grove, Damodaran and Sangwan 1998; Grove and Chappell 2000) and modern Indian data clearly document the powerful role of rainfall on grain yields (Kapusinski 2000).

Figure 2 plots the occurrence of drought in India between 1525 and 1900. It includes archive-based drought data reported in Richard Grove and John Chappell (2000: Table 1) and culled from various sources (Habib 1977; Dyson 1989; and 19th century publications). The pattern is striking. The average likelihood of a drought occurring was 0.34 for the period 1525-1649, or about one drought year every three (Figure 2, panel B). The average then fell to 0.18, or about one drought year every six, for the long century from 1650 to 1774. Indeed, there were two fifteen year spans without a single drought between 1720 and 1765 (Figure 2, panel A). However, drought incidence increased substantially from 1775, reaching a devastating likelihood of 40 percent for the years 1785 to 1825. Moreover, the five-year drought of 1788-1793 surpassed in severity any drought of the previous century (Grove and Chappell 2000: 18). The monsoon failed to arrive for three years straight in southeast India, and annual rainfall was less than 40 percent of the pre-drought level.

[Figure 2 about here]

Thus, India experienced a historically low rate of drought during the long century 1650-1774, years which saw the Mughal Empire’s golden age under Shah Jahan, its overextension and collapse under Aurangzeb, and the rise of competing successor states. Shah Jahan’s reign was at

the height of Mughal opulence, during which he built the Taj Mahal at Agra and the Lal Quila at Delhi. Aurangzeb by contrast was austere, and preferred to use the agricultural surplus for conquest rather than luxury (Wolpert 1989). The Mughals increased the territory under their control by about half during the reigns of Shah Jahan and Aurangzeb, moving deep into southern and western India. The Empire reached its territorial maximum at around the end of the 17th century, when only the very southern tip of the subcontinent was excluded (O'Brien 1999). The last decades of Aurangzeb's life were spent trying to subdue the tenacious Marathas in western India, at great cost in both blood and treasure. During the fractious succession following Aurangzeb's death in 1707, the Marathas surged out of their Deccan strongholds, extending their control across almost a third of India by 1757. The low drought occurrence during these years must have augmented agricultural productivity and thus the resources available for territorial conquest. But these unusually good climatic conditions soured at the end of the 1760s, when India was politically fragmented and conflict widespread, thus making a bad agricultural situation worse.

This evidence suggests that a worsening climate reinforced the impact of the Mughal Empire's decline on agricultural productivity. The combined influence of drought and the disintegration of the Mughal Empire on diminishing grain yields in the second half of the 18th and early 19th century can be inferred from various fragmentary sources. For example, the evidence documenting deserted villages in rural Tamil Nadu in southern India (Lardinois 1989: 34-43) reveal very high rates between 1795 and 1847, but they were more than twice as high in 1795-1814 (21.4 percent) than 1816-1847 (10.1 percent). Indeed, the worst El Niño episode in written history was probably 1791:

“Already devastated by a famine in 1780 the Circars of the Madras Presidency were again very badly affected by drought in 1789-1792 and many villages in the Godavery delta were entirely depopulated. [One observer] later reported that ‘owing to a failure of rain ... one half of the inhabitants in the Northern Circar had perished in famine and the

remainder were so feeble and weak that on report of rice coming up from the Malabar coast five thousand people left Rajahmundry and very few of them reached the seaside, although the distance is only fifty miles” (Grove 1997: 134).

This evidence certainly suggests low and falling agricultural productivity in the second half of the 18th and the early 19th century, but we think that the best evidence of poor agricultural conditions in India was the soaring relative price of grains, evidence which we will discuss at length later in this paper.

A Deindustrialization Offset: The Financial Drain

Even if we had good data on Indian employment and output in the late 18th and early 19th centuries, deindustrialization might still be difficult to discern since, between 1772 and 1815, there was a huge net financial transfer from India to Britain in the form of Indian goods. The “drain resulting from contact with the West was the excess of exports from India for which there was no equivalent import” (Furber 1948: 304), including “a bewildering variety of cotton goods for re-export or domestic [consumption], and the superior grade of saltpeter that gave British cannon an edge” (Esteban 2001: 65). Indian textiles were at this time an important vehicle by which Britons repatriated wealth accumulated in India to England, increasing demand for them. Javier Cuenca Esteban estimates these net financial transfers from India to Britain to have 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 (Esteban 2001: Table 1, line 20). 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.⁸ Thus, while a

⁸ 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

secular fall in the “drain” after the 1784-1792 peak must have served to speed up the pace of deindustrialization in early 19th century India by reducing demand for Indian textiles, the effect could not have been big. In any case, the fall in the “drain” after 1784-1792 was equivalent to the rise in the “drain” before, thus implying little effect on deindustrialization over the full half century 1750-1810. There must have been other fundamentals at work that mattered far more.

The 19th Century Globalization Hypothesis: Britain Did It

Around the beginning of the 19th century, the fundamental economic dynamic underlying deindustrialization in India changed from agricultural productivity decline to globalization shocks. Globalization has long been the most popular explanation for India’s deindustrialization, and it is an important component of the historiography of colonial India constructed by the Indian nationalists. For example, Jawaharlal Nehru’s classic *Discovery of India* (1947) argued that India became progressively ruralized in the 19th century owing to the destruction of artisanal employment by British factory-made goods. Nehru laid the blame squarely on colonial economic policy, which almost entirely eschewed tariff protection and did nothing to help nurture Indian industry (Nehru 1947: 247-53). Similar arguments can be found in the work of the 19th century nationalist Dadabhai Naoroji, pioneering Indian economic historian R. C. Dutt, and the Marxist historian D. D. Kosambi.

The economic logic underlying the deindustrialization-through-globalization hypothesis is that rapid productivity advance in European manufacturing—led by Britain—lowered the relative price of textiles, metal products and other manufactures in world markets. The European industrial leaders shared those productivity gains with consumers around the globe as augmented world supplies of manufactures lowered world prices. Having first defeated India in its export

must have been a lot smaller in India. The text assumes that these offsetting forces were roughly comparable.

markets, “after 1813 Lancashire invaded India as well” (Moosvi 2002: 341). Cheap British factory-made yarn and cloth took away India’s local market from her own producers. India experienced deindustrialization over the half century following 1810 due to terms-of-trade shocks in its favor. The relative price impact of the unbalanced productivity performance is best illustrated by trends in Britain’s external terms of trade. According to Albert Imlah, they fell by 40 percent over the four decades between 1801-1810 and 1841-1850 (Mitchell and Deane 1962: 331). That is, the price of British exports (manufactures) fell dramatically compared with that of its imports (industrial intermediates, food and other primary products). India’s textile producers faced a big negative price shock on that score alone. To make matters worse, newly independent Latin America, the United States, Australia, Canada and New Zealand raised their tariffs on imported manufactures to enormous heights (Williamson 2005). Failing to keep up with European factory-based productivity growth, facing new high tariffs in old “open” export markets, and unable to defend their own markets with tariffs, the Indian textile industry became less profitable, and deindustrialization ensued. As if this were not enough, the foreign-productivity-induced negative price shock was reinforced by another powerful global event, the transport revolution (Shah Mohammed and Williamson 2004). Thus, the relative supply price of manufactures in India was driven down still further, and it was driven down even more compared with Indian commodity exports, since overseas transport improvements served to raise export prices in the home market. These world market integration trends served to create Dutch disease effects in India: The import-competing sectors slumped, the export sectors boomed, and deindustrialization was reinforced.

The decline in world textile prices caused by British productivity advance made textile production in India less attractive relative to Britain. It also contributed to a shift in the terms of trade between India’s own textiles and commodity export sectors, a shift reinforced by booming world demand for Indian commodity exports. This shift alone would have caused a decline in the relative employment in textiles. The most important export commodities for India in the first half

of the 19th 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 percent of India's exports by value, compared to 33 percent for cotton piecegoods (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 18th century (Chowdhury 1964), but it has not yet been a part of the deindustrialization debate.

In sum, our view is that the long run sources of India's deindustrialization were both the globalization price shocks due to European productivity advance in manufacturing (and the induced demand for industrial intermediates such as cotton and indigo) plus the negative productivity shocks to Indian agriculture induced by the earlier Mughal decline and deteriorating climate conditions.⁸ We do not see these foreign and domestic effects as competing. They were both at work, and they reinforced each other, although each had its most important influence in different epochs.

3. Measuring India's Deindustrialization

Inputs, Outputs, and Deindustrialization

Despite its importance for Indian historiography, owing to the dearth of statistical sources there have been only four attempts to directly measure India's 19th century deindustrialization by trying to construct employment shares. As far as we know, this paper is the first to apply relative price evidence to the deindustrialization question, and by doing so the first to offer evidence,

⁸ Peter Harnetty would appear to agree, although he was speaking of the Central Provinces in the 1860s, after our century of interest starting roughly with 1750. Harnetty says (1991: 460): "The combination of high food prices and cheap cloth imports had a depressing effect on the local industry."

tentative though it may be, about deindustrialization in the 18th and early 19th century. Tirthankar Roy (2000) offers a useful survey of the existing direct evidence, starting with this big fact: It seems likely that the share of the work force engaged in industry was quite a bit higher in 1800 (probably 15-18 percent) than it was in 1900 (about 10 percent). In the strictest sense, therefore, what we call *weak deindustrialization* appears to have taken place over the 19th century. However, the literature insists on some qualifications to this big deindustrialization fact. First, many workers who gave up industry over the century were working only part-time. Second, the import of machine-made goods only helps explain the demise of textiles. Finally, cheaper imported cloth would have benefited consumers. All of these qualifications make good sense.⁹ In addition, the literature stresses that there was a rise in employment in indigo, opium, and saltpeter, but these became major commodity exports, not industrial goods.

The first evidence supporting weak deindustrialization was offered more than a half century ago by Colin Clark (1950). Clark published tabulations of the 1881 and 1911 Census of India showing that the share of the Indian workforce in manufacturing, mining, and construction declined from 28.4 to 12.4 percent from 1881 to 1911, implying dramatic deindustrialization in the late 19th century. Daniel Thorner (1962) re-examined the Census data and convincingly argued that the tabulations used by Clark were misleading. His revised estimates show that the sectoral employment structure was stationary after 1901, with only a very small decline in male non-agricultural employment between 1881 and 1901. Thorner used these revisions to make two important points. First, if there was a major shift out of industry and into agriculture, it occurred before 1881, not after. Indeed, Om Prakash (2005: 28) reports that Indian textile employment fell

⁹ The literature also argues that cheaper imported yarn would have reduced the production costs facing handloom weavers, thus making them more competitive. Since cheaper European factory-produced yarn would have lowered the production costs not just for Indian handloom weavers but for weavers the world around, it is not clear how this made Indian weavers more competitive with imported cloth.

by 3.6 million between 1850 and 1880. Second, if deindustrialization occurred after 1881, it was on a very modest scale, and all of it took place before 1901.

The third attempt to measure deindustrialization looks to the early 19th century, closer to the years which anecdotal evidence has always suggested were those of most dramatic deindustrialization.¹⁰ Amiya Bagchi (1976a, 1976b) examined evidence on handloom spinning and other traditional industry in Gangetic Bihar, an area of eastern India, collected between 1809 and 1813 by the East India Company surveyor Dr. Francis Buchanan Hamilton.¹¹ Bagchi compared Hamilton's data with the 1901 Census estimates of the population dependent on industry for the same area. His findings are presented in Table 1. The population dependent on industrial employment requires an estimate of family size, and Bagchi makes two estimates using alternative assumptions. 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 (five). He also removes commercial workers from the 1901 data to make them consistent with the 1809-13 data. Spinners in Gangetic Bihar were almost exclusively women who spun in the afternoons (Dutt 1960: 232-5). Hamilton's estimates show that women earned about Rs. 3.25 annually at spinning, while a male day laborer who worked 200 days would earn about Rs. 8 annually, all of which suggests

¹⁰ Among the most well known examples is the powerful image 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). Marx attributed this quote to the Governor-General of India in 1834-1835, who was Lord William Bentinck. However, Morris D. Morris has pointed out that the quoted words do not appear in Bentinck's report of that year or in his papers (Morris 1969: 165, n.152). The true source of this first report of deindustrialization remains a mystery.

¹¹ Hamilton spent nearly \$20 million (2005 US\$) on the survey, and his information appears to be of high quality (Martin 1838).

that Assumption B is more likely to be true. In either case, Bagchi's evidence suggests a substantial decline in the industrial employment share during the 19th century from more than 21 percent to less than 9 percent. When the Bagchi and Thorner evidence is combined, it suggests that most 19th century deindustrialization took place during its first half, and that it was big.

[Tables 1 and 2 about here]

While the employment share in "other industrial" occupations fell over the century as well, it is important to note that the largest component of deindustrialization was the decline of cotton spinning.¹² Table 2 rearranges Bagchi's original numbers, making the contribution of cotton spinning to overall deindustrialization more transparent. Of the 12.7 percent of the population that depended on cotton weaving and spinning in 1809-1813, more than 80 percent depended on spinning. Since cotton spinning was performed part-time by women at home using extremely simple technology, it may seem implausible to argue that the demise of cotton spinning in the early 19th century destroyed India's platform for modern industrialization. Yet British economic historians assign the same importance to home-based cotton spinning: 17th and 18th century proto-industrial cottage industries are said to have supplied the platform for the factory-based British industrial revolution that followed in the late 18th century (Mokyr 1993: chps. 1-3). Furthermore, employment of women and children was central to the process then too (de Vries 1994).

Finally, in an unpublished study reported by Habib (1985), Amalendu Guha calculated the amount of cotton yarn available for Indian handloom production by subtracting the quantity used in local machine production from total local yarn production and imports. The result documents a huge decline in yarn used for 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 19th century was widespread, that it was

¹² The percent of industrial workers who were spinners fell from 82 to 15 between 1809-13 and 1901.

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. These facts are consistent with Peter Harnetty's summary characterization of Indian handloom weaving in the 19th century:

“At the opening of the century, the handloom weavers had supplied all the textile requirements of the country and had maintained a flourishing export trade, notably to Britain [e.g. re-exports]. This reached its peak in value in 1800 and in volume in 1802, thereafter, imports of Indian piece goods to Britain declined sharply in face of competition from the growing British cotton industry.” “From about 1840 ... British imports entered the [local] market in strength.” “At the turn of the [20th] century, India was absorbing more than 40 per cent of total British cloth exports to the world” (Harnetty 1991: 472).

As we have argued, the trouble actually started over the half century *before* the 1800 peak with Britain's challenge to India's dominant presence in foreign markets.

Paul Bairoch (1982) used evidence similar to that reviewed above to assess deindustrialization not only in India, but across the non-European periphery. Table 3 reports Bairoch's estimates, which contain some speculations and should be treated cautiously. In 1750, China and India together accounted for 57 percent of world manufacturing output, while India itself accounted for about 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. Bairoch's investigation found that India's share in world manufacturing output declined precipitously in the half century 1750-1800, *before* factory-led industrialization took hold in Britain and consistent with our hypothesis that deindustrialization took place in the 18th century. Furthermore, India's experience was different than that of China or the rest of the periphery. Between 1750 and 1830 India's world manufacturing output share dropped by 6.9 percentage points from a base of 24.5 percent, much bigger than the fall elsewhere (China lost 3 percentage points, and the rest of the periphery lost 2.4 percentage points). Bairoch's data suggest that during the century before 1830, well

before European factories flooded world markets with manufactures, India suffered much more pronounced deindustrialization than did the rest of the periphery. This fact must be explained by domestic conditions in India, not shared by the rest of the periphery, fully consistent with our agricultural productivity hypothesis.

[Table 3 about here]

World output shares can also change due to different rates of output growth across countries. The economic implications of faster growth abroad are much more benign than those of slow growth at home. Anticipating this criticism, Bairoch (1982: Tables 6 and 9) also documented that per capita levels of industrialization in India fell from an index of 7 in 1750 to 3 in 1860 and 2 in 1913. In contrast, Britain's per capita industrialization index rose from 10 in 1750 to 64 in 1860 to 115 in 1913.

Real Wages and Deindustrialization

Models of deindustrialization 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 18th and 19th century India is not yet of high quality, but it does document a secular deterioration (Figure 1).

Parthasarathi (1998) argues that real wages in mid-late 18th century South India were comparable to those in the south of England, and thus that the rising living standard gap between the two was a late 18th and early 19th century phenomenon. Robert Allen (2005) uses Mughal manuscript sources to compute the real wage in 1595 Agra, then the capital of the Mughal Empire. He compares it to the real wage in 1961, based on a common market basket of consumer goods. Allen's evidence 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 after the mid-late 18th

century.¹³ While based on sparse data, the most telling evidence of real wage performance, *and its timing*, to date comes from Mukerjee (1939) and Broadberry and Gupta (2005), reproduced in Figure 1. Mukerjee reports 1600-1938 real wages in northern India of unskilled and skilled labor (nominal wage rates deflated by grain prices) starting with the same 1595 benchmark used by Allen. Broadberry and Gupta offer grain wages for both north and south India, with the most resolution in the 17th and 18th centuries. According to this evidence, by 1789 real wages had fallen 30-44 percent from their 1600 level. By 1875, real wages were at only 25-50 percent of the 1600 level.

This evidence suggests that the vast majority of the real wage and living standards fall took place before 1850, or even before 1825, not after. Was deindustrialization responsible for the fall, and were the deindustrialization forces more powerful before 1850, or even before 1807, than after? The sparse data on employment and output shares suggests deindustrialization was an important force in the Indian economy during the 19th century. This account can be supplemented and pushed back into the 18th century with much richer relative price data, but before doing so we need to model the relationship between relative prices and deindustrialization.

4. A Neo-Ricardian Model of Deindustrialization

In order to formalize our intuitions about the relationship between relative prices and deindustrialization, we develop a simple neo-Ricardian model that relies on the formal contribution of Ronald Jones (1971), and the economic insights of Adam Smith, Alexander Gerschenkron (1962) and W. Arthur Lewis (1954, 1978). Consider a perfectly competitive economy in which there are three sectors: textiles (T), grain (G), and agricultural commodity

¹³ Anthropometric evidence on south Indian indentured workers suggests that living standards stagnated during the last half of the 19th century (Brannan et al. 1994).

exports (C). Grain is not traded.¹⁴ Agricultural commodity exports include non-grain 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 costs nominal wage w per unit. We abstract from capital and land for simplicity,¹⁵ but in any case we do not need them to make our point.

To create a link between agricultural productivity and wages in the textile sector, which we believe was a key driver in India's loss of competitiveness in the 18th century world textile market, we follow Lewis (1954, 1978) in assuming that the real wage in grain units is constant. This reflects the Malthusian 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 of perfectly elastic labor supply requires that there be 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:

$$Y_G = GL_G^\alpha \tag{1}$$

$$Y_C = CL_C^\beta \tag{2}$$

$$Y_T = TL_T^\gamma \tag{3}$$

¹⁴ This is a reasonable assumption until the latter half of the 19th century. Note that when grain is not traded a country cannot exploit the comparative advantage it gains in other sectors when grain declines.

¹⁵ For our period, reliable information on these factors and their returns are difficult to obtain for India.

G, C, and T are technology parameters and the elasticities α , β , and γ are all less than 1.¹⁶ 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 the absolute number of workers employed there. Thus, *strong deindustrialization results from an increase in the own wage in textiles*. The own wage in either sector could increase due to a decline in the world price for its output. It could also increase if the price of grain rose, 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 *weak deindustrialization*, is:

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

¹⁶ 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.

The shares of textiles and commodity agriculture in total employment are given by θ_{TL} and θ_{CL} , respectively. Thus, *weak deindustrialization 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, weak deindustrialization will be most severe when the difference in own wage growth rates is largest. More formally, the condition that must be satisfied for weak deindustrialization 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 18th and early 19th century India, the ratio on the right-hand side is likely to be less than one.¹⁷ This implies that own wage growth in agricultural commodity exports would have to be even higher to counteract the weak deindustrialization effect of own wage growth in textiles. In short, we expect to see weak deindustrialization 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 weak deindustrialization effect because it reduces L_C , which is in the denominator of our weak deindustrialization measure. As the share of the labor force employed in agricultural commodities increases, the greater growth in the own wage in textiles needs to be to overcome growth of the own wage in agricultural commodities and for deindustrialization to ensue. We can also rewrite condition (11) to relate nominal wage growth to the terms of trade between textiles and commodity agriculture.

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

¹⁷ For example, let $\beta = \gamma$ and following Table 2 set $\theta_{TL} = 0.15$. If we assume $\theta_{CL} = 0.1$, then the ratio is 0.12. For strong deindustrialization to occur, own wage growth in textiles must be about 0.12 times greater than own wage growth in agricultural commodities.

Weak deindustrialization 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 production in textiles over agricultural commodities. Thus, *weak deindustrialization 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.*

In summary, the predictions of the model are: *strong deindustrialization*, defined as a decrease in L_T , will result if the own wage in textiles increases; and *weak deindustrialization*, defined as a decrease in L_T/L , will result if own wage growth in textiles increases sufficiently faster than the own wage growth in agricultural commodities.

5. The Terms of Trade, Relative Prices, and the Own-Wage in Manufactures 1750-1913

We divide the Indian deindustrialization experience over the two centuries between 1700 and 1913 into four distinct epochs. Our interpretation of the fundamentals explaining deindustrialization within each of these epochs implies predictions regarding changes in Indian relative prices.

The first epoch ran from about 1700 to 1760 and it was India's high water mark as a global manufacturing powerhouse. Indian textiles clothed tens of millions of Indians, southeast Asians, the fashionable men and women of Europe, American slaves and peons, Africans and others throughout the Middle East. This success rested in part on the high productivity of Indian agriculture, which was supported during this epoch by unusually reliable monsoons. However, political fragmentation and warfare following the collapse of the Mughal empire must have absorbed much of the agricultural surplus, resulting in no fall in grain prices in spite of the unusually favorable climate.

The second epoch, about 1760 to 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 partly explained by increasing cost competitiveness favoring Britain, superior factory technology was not yet the main force at work. Instead, we believe that it was reduced agricultural productivity in India that mattered most in this epoch. Grain prices rose and thus—in a relatively stable real wage subsistence economy where grain was the key consumption good—pushed up nominal wages economy-wide. The own wage rose in textiles, damaging cost competitiveness there.¹⁸ Textiles must therefore have experienced a contraction. 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 export commodities, a weak deindustrialization effect.

During the third epoch, about 1810 to 1860, 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 to the free trade policy imposed on India by her colonial ruler. While the effects of the Mughal decline were pretty much over, the effect of unfavorable climate was not (Figure 2) and thus low Indian grain productivity persisted, implying continued high nominal wages in manufacturing.

The rate of deindustrialization slowed down early in the fourth epoch, about 1860 to 1913, and then reversed as India slowly reindustrialized. This slow down and reversal can be explained by the subsidence in both the unbalanced productivity advance favoring European manufacturing and in the world transport revolution. The terms of trade trend was flat and did not penalize import competing manufacturing. In addition, climate conditions improved for Indian

¹⁸ 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.

agriculture. Perhaps more importantly, however, the emergence of an integrated world grain market (Latham and Neal 1983) probably served to put downward pressure on grain prices and nominal wages in India, thus increasing the competitiveness of local manufacturing.

These predictions are largely confirmed by our new relative price and terms-of-trade evidence, which we plot in Figures 3-10. The price evidence includes three new series for grains, textiles, and agricultural commodities in India from 1700 to 1850 (Figure 3). A full description of how we constructed the data can be found in the Appendix.¹⁹ We use these price series to measure the intersectoral terms of trade between textiles and agricultural commodities and the own wages in the two sectors. We measure own wages in textiles and commodity exports using both the sparse wage data as numerator and the plentiful grain price data as a proxy for wages.²⁰ The analysis which follows will focus on our middle two epochs (1760-1860), when deindustrialization was most dramatic.

[Figure 3 about here]

The first epoch corresponds to the dissolution of the Mughal empire. Despite favorable climate, the price of grain nearly doubled between 1700 and 1760, putting upward pressure on nominal wages and hurting India's competitiveness in both textile and commodity exports (Figure 3). Textile and commodity prices were roughly constant from 1700-1740 before climbing steadily between 1740 and 1760. There is no evidence here of falling textile prices due to improvements in production technology or transport. The intersectoral terms of trade between textiles and agricultural commodities moved slightly in favor of commodities during this period, putting some pressure on the allocation of resources between export sectors (Figure 4). Grain prices rose while our sparse measure of nominal wages fell from 1700 to 1740 (Figures 3 and 5). Our two own wage series thus tell different stories for the 1700-1760 period (Figures 6 and 7). The proxy own

¹⁹ The grain price series includes prices for rice, wheat, bajra, and jower from locations spanning the subcontinent. Restricting the included series to rice and wheat for Bengal and North India, which comprise the longest and most regionally consistent prices, shows the same patterns as the overall series. The main difference is that the rise in grain prices 1780-1850 is smoother in the restricted series.

²⁰ Our model assumes that the ratio of nominal wages and grain prices is constant.

wage moved out of India's favor for both textiles and agricultural commodities from 1700-1740, roughly doubling before falling back 1740-1760, suggesting no net strong deindustrialization effect. In contrast, the own wage moved in India's favor from 1700-1730 and was then flat, suggesting India actually became more competitive in its exports 1700-1760. Taking the evidence together, we find no support for deindustrialization induced by an own wage decline in textiles 1700-1760 and some evidence of deindustrialization induced by a small twist in the intersectoral terms of trade in favor of agricultural commodities.

[Figures 4-7 about here]

Now consider the case for strong deindustrialization across the middle two epochs combined (1760-1860), recalling that strong deindustrialization is defined as an absolute decline in the industrial workforce, driven in our model by the own wage. Figures 6 and 7 both show that the own wage in textiles rose spectacularly between 1765 and 1810, more than tripling, with faster growth in the latter part of the period. Why the spectacular rise in p_G/p_T in the late 18th century? The answer is that grain prices, while volatile in the short run, soared upwards in the long run (Figure 3). This did not serve to reduce real wages (w/p_G). Figures 1 and 5 shows that grain wages appear to have been largely stable following the early-mid 18th century.²¹ Nominal wages were thus driven up along with grain prices. While there was great short-run volatility in the grain wage, a Lewis-like assumption about long run real wage stability seems to be reasonable for the second epoch. Textile prices also began to fall after 1785, and were about half the 1785 level in 1810.

²¹ Note that Broadberry and Gupta's north India grain wage series contains no data points between 1690 and 1874, so it is impossible to discern trends within the 18th century from it.

Since there is no qualitative evidence suggesting significant productivity advance in Indian textiles and other manufacturing production before 1810,²² we take our evidence on the own wage and own wage proxy as powerful support for the thesis that reduced agricultural productivity attendant on the dissolution of Mughal hegemony and more frequent droughts can indeed explain much of India's pre-1810 loss of world markets and resulting deindustrialization. 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 up the nominal wage 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. Thus, conditions in the grain sector stabilized a bit in the third epoch (1810-1850), and the fall in p_T dominated deindustrialization conditions in Indian manufacturing. The own wage continued to rise and deindustrialization continued, now driven mainly by exogenous world market forces. Between 1810 and 1850, the own wage roughly tripled.

Consider now what we call weak deindustrialization across the middle 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. Figures 6 and 7 show our own wage measures tripling between both 1765 and 1810 and 1810 and 1850.²³ Own-wage growth was slightly stronger in the third epoch. Conversely, the intersectoral terms of trade shift appears to have been strongest in the second epoch, that is before 1810 not after (Figure 4). Figure 10 documents India's external terms of trade from 1800. It shows two big spikes, 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

²² In any case, since agriculture was so huge, it must have dominated nation-wide labor scarcity conditions, not just those in manufacturing.

²³ Our data on wages is more sparse and of lower quality than our data on grain prices. Under our assumption of constant real grain wages, we can proxy for the own wages w/p_T and w/p_C with p_G/p_T and p_G/p_C . Figure 5 shows that these proxies show the same pattern as the own wages in Figure 7.

penalizing the import competing sector) is very modest. In contrast, during the second epoch the intersectoral terms of trade between textiles and agricultural commodities (Figure 5: p_T/p_C) underwent a very sharp decline. By 1810 it was only 20 percent of its 1780 level, causing lost agricultural productivity to fall *much* more heavily on textiles than on export commodities during that period. Indeed, the own wage in export commodities was stable or falling during this period (Figures 6 and 7). This pattern suggests that deindustrialization was likely to have been greater during the half century before 1810 than in the half century thereafter. Before 1810, workers left textiles due to their demand for higher nominal wages to buy increasingly expensive grain and to a strong shift in the terms of trade favoring commodity exports and disfavoring textiles, while after 1810 workers left mainly due to falling world textile prices and a sagging demand for their output.

If we take the own-wage in manufacturing as a critical indicator of cost competitiveness, and if England was India's main competitor in world markets, we can compare trends in the own-wage in textiles between the two as an indicator of relative productivity change. We must be cautious here, since a measured increase in the ratio of Indian to English w/p_T will understate the role of own-wage inflation to the extent that English productivity growth performance was superior to India even before the great factory boom. Our source for England is Gregory Clark (2004: Table 6 for nominal wages; Table 4 for grain and clothing prices), whose data allow us to construct both our proxy own wage (p_G/p_T) and the own wage in textiles (w/p_T) for 1705-1845. Figure 8 plots indices of Indian p_G/p_T , English p_G/p_T , and their ratio. The Indian series uses five-year averages due to the volatility of p_G in India, and thus starts in 1705, the end of the first five years for which we have data. Figure 9 reports the parallel exercise for w/p_T in India and England. The India/England ratios of both own wages and proxy own wages was relatively stable between 1705 and 1760. The own wage in England grew by about 80% between 1765 and 1845, but the own wage and proxy own wage in India grew much faster. Indeed, the ratio of the proxy own wage in India to England grew by more than *five times* due to the much bigger p_G boom in

India. Grain prices rose almost four times faster in India than England, an event which we argue put greater upward pressure on wage costs in India than England, thus raising the Indian own wage in textiles relative to England. The ratio of w/p_T in India relative to England similarly shot up from 79 in 1760 to 181 in 1810 and 492 in 1845. Nearly half of that 85-year increase was completed by 1810, before the great flood of factory-produced textiles hit Indian markets in the third deindustrialization epoch. But even after 1810, it appears that some part of Indian deindustrialization was explained by poor productivity performance in grains: after all, p_T was pretty much equalized between India and Britain, so the faster rise in India's p_G/p_T implies a poorer productivity performance in grains there, and perhaps even compared with the rest of the periphery.

Our relative price evidence is complicated by the fact that India's textile export volume grew strongly in the last decades of the eighteenth century (Datta 1999). Does this evidence counter our view of 18th century deindustrialization? We think not, for two reasons. First, we have already noted that the period from 1772 to 1812 saw an artificial increase in demand for Indian textile exports from East India Company servants, who used them as a vehicle to transmit their fortunes back to England. This artificial demand shock served to mask the longer run fundamentals driving the Indian textile industry. Second, Table 4 shows that exports were by 1800 a relatively small component of the Indian textile market. Roy (2000) and Bagchi (1972) suggest that per capita consumption of cotton textiles in 1920 was about 11.65 yards. Between 1800 and 1920, India's per capita GDP grew by about 30 percent while the price of cotton textiles fell by half. Both of these events would have made per capita consumption of textiles considerably greater in 1920 than 1800. Using the level of per capita textile consumption in 1920 as a base, textile demand elasticities with respect to income and price applied to the observed changes in price and income per capita over the century imply per capita textile consumption in 1800 (Table 4, panel A). Total Indian population in 1800 -- about 194 million -- can then be used to compute the total domestic consumption of textiles under each of the estimated elasticities

(Table 4, panel B).²⁴ Textile export volumes are a bit harder to judge; while much of the export trade was carried out by the East India Company, there were also private local traders and other European companies at work. K. N. Chaudhuri (1983) presents evidence that London was the destination of 38 percent of the total exports of Bengal in the five years leading up to 1800. Michael Twomey (1983) suggests that Indian textile exports to London in 1800 were 30 million yards. If we assume the English share of the total exports of Bengal is equal to the English share of the textile exports of India, we conclude that total textile exports of India in 1800 was about 80 million yards. It follows that the export share of the Indian textile market in 1800 was between 4 and 12 percent (Table 4, panel C). We think 6-7 percent is most plausible. In any case, by 1800, after India had lost much of its world market, even strong growth in export volume would have had only a modest effect on India's textile industry as a whole.

[Table 4 about here]

6. Indian Relative Price Trends Compared with the Rest of the Periphery

Deindustrialization appeared everywhere around the 19th century periphery, and globalization plays a major role in each region's historiography. Here we ask whether 19th century India faced a big or a small deindustrializing global price shock compared with other parts of the periphery. If India's global price shock was relatively small, it follows that domestic supply-side deindustrialization forces were relatively important in India compared with other parts of the periphery.

Figure 10 compares the terms of trade for India 1800-1913 with population-weighted series for other regions of the poor periphery, consisting of Latin America, the Middle East, and

²⁴ Maddison (2003) estimates 1820 population at 207 million and population growth at about 0.38 percent per year.

Southeast Asia.²⁵ India underwent a significant improvement in its terms of trade from 1800 to the mid-1820s, followed by a collapse through the early 1830s. India's terms of trade rose and collapsed again between 1850 and 1865. After that, India's terms of trade maintained an average level of about 115 between 1870 and 1910. Between 1800 and 1870, India's terms of trade rose only 15 percent, just over 0.2 percent per annum. The 1800-1870 experience of other regions of the poor periphery offer a stark contrast. Over this period, the Middle Eastern terms of trade rose by 270%, or 3.9 percent per annum; the Southeast Asian terms of trade increased by 231%, or 3.3 percent per annum; and the Latin American terms of trade increased by 247%, or 3.5 percent per annum.

[Figure 10 about here]

Although Indian historians discuss deindustrialization more actively than do historians of other poor periphery regions, external price shocks facing India were actually quite modest compared to the rest of the periphery.²⁶ This suggests that domestic supply side conditions played a far more important role in accounting for deindustrialization in India than elsewhere.

7. Conclusions

India deindustrialized between 1760 and 1860, and two main epochs, with very different deindustrialization causes, distinguish that century. The first epoch ran from about 1760 to 1810 and was a direct result of poor climate conditions and an indirect result of the dissolution of the Mughal Empire. The deterioration in climate conditions lowered agricultural productivity, raised

²⁵ These series come from Williamson (2007), which also describes their construction.

²⁶ Terms of trade increases up to the 1860s were also much bigger for Indonesia, Italy and Spain.

In addition, after the 1840s their increase was much bigger for Japan and the Mideast (Williamson 2006a, 2006b, 2007). Like India, the terms of trade boom was modest for Mexico 1750-1870. Since Dutch disease forces were weaker, Mexico was better able to minimize deindustrialization effects (Dobado, Gómez Galvarriato, and Williamson 2007 forthcoming).

grain prices, and thus increased nominal wages in home manufacturing, like textiles, lowering India's competitiveness with England and other world textile producers. Furthermore, as central authority waned, these forces were strengthened: revenue farming expanded, the rent burden increased, warfare raised the price of agricultural inputs, and regional trade within the sub-continent declined, all serving to drive down the productivity of foodgrain agriculture still further. So grain prices had another reason to rise, and given that ordinary workers lived near subsistence, the nominal wage rose even faster, hurting India's competitiveness in the export market all the more. India thus lost ground to Britain in the world textile market during a period when most British production was still carried out using the cottage system. Additionally, the intersectoral terms of trade moved against textiles, encouraging a shift to agricultural commodity production. India's share of world industrial production fell faster than in any other part of the non-European world. During the second epoch, running from about 1810 to 1860, productivity advance resulting from the adoption of the factory system drove down the relative price of textiles world-wide, a trend that was magnified as a world transport revolution lowered the price of European textile imports even further everywhere in the periphery. Thus, while the productivity of Indian agriculture stopped its decline during this period, under the relative security of Company rule and reinforced by a secular fall in drought frequency, and while the rise in grain prices slowed down and then stabilized, the *relative* price of grain continued to rise.²⁷ By 1860, India had completed a century-long two-part transition from being a net exporter to a net importer of textiles. India's terms of trade were relatively flat over the 19th century, especially compared to the booms in the

²⁷ After 1860, global trade in grains changed conditions considerably. Thus, the assumption that grains were non-tradable is increasingly untenable as the late 19th century concludes. We think cheap imported grains (and railroad development within India) may have played a role in lowering the own wage in manufacturing after the 1860s or 1870s, and thus may have contributed to reindustrialization in India.

rest of the poor periphery, suggesting that supplied side conditions played a relatively important role in India. India's deindustrialization was over by the late 19th century, and a period of slow reindustrialization began, as it did in Shanghai, Japan, Brazil, Mexico and other parts of the poor periphery.

Appendix: The Data

Wages. The nominal wage series for India comes from R. Mukerjee (1939), *The Economic History of India: 1600-1800* (London: Longmans, Green and Company) and S. Broadberry and B. Gupta (2005), “The Early Modern Great Divergence: Wages, Prices, and Economic Development in Europe and Asia, 1500-1800” (Working Paper, University of Warwick, February). They mostly reflect conditions in North India. Linear interpolation was used to produce annual estimates from the data, which are reported for the years 1595, 1600, 1616, 1623, 1637, 1640, 1690, 1729, 1750, 1807, 1816, 1850, and 1870.

Grain Prices. The grain price index incorporates data from several locations for four key foodgrains in India: bajra, jowar, rice, and wheat. The index takes an unweighted average across all locations and all grain price quotes available for any given year. The sources are as follows. Prices of bajra, jowar, and wheat 1700-1750 from the Amber region (near present day Jaipur) are from S. Nurul Hasan, K.N. Hasan, and S.P. Gupta (1987), “The Pattern of Agricultural Production in the Territories of Amber (c. 1650-1750),” in S. Chandra ed. *Essays in Medieval Indian Economic History* (Delhi: Munshiram Manoharlal Publishers). Rice prices at Calcutta from 1700-1800 come from G. Herklotts’ *Gleanings in Science* of 1829, quoted in Rajat Datta (2000) *Society, Economy, and Market: Commercialization in Rural Bengal c. 1760-1800*. New Delhi: Manohar. Rice prices in Birbhum and Burdwan, Lower Bengal, from 1784-1813 are also quoted in Datta (2000) and originally come from W.B. Bayley’s *Asiatick Researches* of 1816. The price of rice at Calcutta 1712-1760 are from K.N. Chaudhuri (1978), *The Trading World of Asia and the English East India Company* (Cambridge: Cambridge University Press). Wheat prices at Delhi 1763-1835, rice prices at Madras 1805-1850, wheat and jowar prices at Pune 1830-1863, and wheat, jowar, and bajra prices at Agra City 1813-1833 are from A. Siddiqi (1981), “Money and Prices in the Earlier Stages of Empire,” *Indian Economic and Social History Review* (vol. 18, nos. 3-4). Prices of bajra, jowar, and wheat quoted at Pune 1795-1830 are from

V.D. Divekar (1989), *Prices and Wages in Pune Region in a Period of Transition, 1805-1830 A.D.* (Pune: Gokhale Institute Monograph No. 29, Gokhale Institute of Politics and Economics). Rice and wheat prices at Fatehpur (in present-day Uttar Pradesh) for 1830-1850 come from C. W. Kinloch (1852), *Statistical Report of the District of Futtehpore, July 1851* (Calcutta: F. Carbury). Wheat and rice prices at Cawnpore (present-day Kanpur) for 1823-1846 are from Sir Robert Montgomery (1849), *Statistical Report of the District of Cawnpore* (Calcutta: J.C. Sherriff).

Textile Prices. The bulk of the 18th and 19th century Indian manufacturing sector was involved in producing cotton textiles. Our textile price series from 1700-1760 is the weighted average unit value of East India Company textile exports from Bombay, Calcutta, and Madras found in K.N. Chaudhuri's (1978) *Trading World of Asia and the English East India Company, 1660-1760*. Between 1765 and 1820 the series is the unweighted average of the import prices of muslin and calico piece goods reported at London and collected by Javier Cuenca Esteban (underlying his "The British balance of payments, 1772-1820: India transfers and war finance," *Economic History Review* LIV February 2001: 58-86, and sent to us by the author). Since these manufactured goods had high value relative to their bulk, transport costs were a small fraction of their selling price in London by the late 18th century. The 1700-1760 and 1765-1820 series are connected using the cotton piece to weight equivalents in East India Company and Cartwright (1788). The 1820-1850 India textile price series is taken to be the price of cotton piece goods reported in D. B. and W. S. Dodd (1976), *Historical Statistics of the United States from 1790-1970* (University, Ala.: University of Alabama Press).

Export Commodity Prices. Our export commodity price index for 1700-1760 is a weighted average of the unit values of the four main commodities imported by the East India Company: indigo, black pepper, raw silk, and saltpetre. The unit values are reported in Chaudhuri (1978). During the 19th century, the five key export commodities produced in India were indigo, raw silk, raw cotton, opium, and sugar. Our export commodity price index was created by weighting the prices of these five commodities by their export shares as reported in K.N. Chaudhuri (1983),

“Foreign Trade and Balance of Payments (1757-1947),” in D. Kumar ed. *The Cambridge Economic History of India v.2* (Cambridge: Cambridge University Press), hereafter Chaudhuri. The Chaudhuri export shares only begin in 1811, and these (fixed) 1811 shares were used to weight prices in earlier years. Since 18th century price data for each of the five component commodities begins in different years prior to 1795, the export commodity price index weights the available prices by their 1811 export shares in a total export that includes only those commodities for which prices are available. Thus, the weights used in each year always add up to one. The coverage of the component series is as follows: indigo, 1782-1850; raw cotton, 1790-1850; raw silk, 1782-1850; opium, 1787-1850; sugar, 1795-1850. The indigo data is composed of British import prices of Indian indigo collected by Cuenca Esteban for 1782-1820 and for 1821-1850 British import prices of indigo in general from the microfilmed supplement to A. D. Gayer, W. W. Rostow, and A. J. Schwartz (1975), *The Growth and Fluctuation of the British Economy, 1790-1850* (Hassocks: Harvester Press), hereafter GRS, for 1821-1850. Raw cotton data are also British import prices of Indian cotton from Cuenca Esteban for 1790-1831 and British import prices of raw cotton in general from GRS for 1832-1850. Raw silk is composed of British import prices of Bengal silk from Esteban for 1782-1820 and British import prices of raw silk in general from GRS for 1821-1850. Opium price data are taken from the Calcutta auction price of export opium recorded in Great Britain, Sessional Papers of the House of Commons (1895: vol. XLII), *Final Report of the Royal Commission on Opium, Part II Historical Appendices, Appendix B 62-63* for 1787-1840 and from the average revenue yielded per chest of export opium found in J. Richards (2002), “Opium Industry in British India,” *Indian Economic and Social History Review* (vol. 39, nos. 2-3) for 1841-1850. Sugar prices for 1795-1820 are British import prices of Indian brown sugar from Esteban and data for 1820-1850 are British import prices of sugar in general from GRS. We connect the 1700-1760 and 1782-1850 series based on the two overlapping components, indigo and raw silk, and their shares in commodity exports in 1811.

Terms of Trade. The net barter terms of trade for India 1800-1913 is the ratio of series of export and import prices. From 1800 to 1870, prices for cotton piece goods, raw cotton, raw silk, opium, indigo, and sugar are weighted by the export shares found in Chaudhuri. Individual commodity price series are as described above in the textile and commodity price sections. The import price component for 1800-1870 followed the method used in the BCW database, compiled by Jeffrey Williamson and his collaborators Chris Blattman and Michael Clemens. U.S. prices for textiles, metals, building materials, and chemicals and drugs are taken from the *Historical Statistics of the United States from 1790-1970* and are weighted using the fixed weights 0.55, 0.15, 0.075, and 0.075. The BCW terms of trade series is continued to 1913 by use of the India terms of trade series found in the BCW database and appendix. This 1870-1913 series was first reported in Clemens and Williamson “Where did British Foreign Capital Go?” *NBER Working Paper 8028*, National Bureau of Economic Research, Cambridge, Massachusetts (December 2000) which was subsequently published as “Wealth Bias in the First Global Capital Market Boom 1870-1913,” *Economic Journal* vol. 114 (April 2004): 311-44. The BCW appendix describes their construction and it is available from Williamson upon request. Construction of the population-weighted terms of trade series for Latin America, the Middle East, and South East Asia followed similar principles described in more detail in Williamson (2007).

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Table 1

Population Dependent on Industry In Gangetic Bihar
(in percent)

	1809-1813	1901
Assumption A	28.5	8.5
Assumption B	21.6*	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).

* Bagchi reports 18.6, but this appears to be a mistake. See the breakdown in Table 2.

Table 2

Population of Gangetic Bihar Dependent on Different Occupations
(in percent)

	1809-1813	1901
Spinners	10.3	} 1.3
Weavers	2.3	
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 3

World Manufacturing Output 1750-1938
(in percent)

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 entire subcontinent.

Table 4: Estimating Export Share of Textile Production in 1800

Textile Consumption in 1920 (yards/capita):	11.65
Per-Capita Income Growth 1800-1920:	30%
Textile Price Change 1800-1920:	-50%

Panel A: Estimated Domestic Per-Capita Consumption, yards

Price Elasticity of Demand	Income Elasticity of Demand	
	1.0	1.5
0.0	9	6
-0.5	6.0	4.0
-1.0	4.5	3.0

Panel B: Estimated Total Domestic Consumption, million yards

Price Elasticity of Demand	Income Elasticity of Demand	
	1.0	1.5
0.0	1,746	1164
-0.5	1,164	776
-1.0	873	582

Panel C: Estimated Export Share of Textile Production

Price Elasticity of Demand	Income Elasticity of Demand	
	1.0	1.5
0.0	4%	6%
-0.5	6%	9%
-1.0	8%	12%

Notes: Estimated textile consumption in 1920 comes from Roy 2006 and Bagchi 1972. Per-capita income growth is based on estimates in Maddison 2003; we assume income in 1800 was the same as 1820. Textile price changes come from Haines 2006. Price and income elasticities represent the range of estimates found in the literature. Income elasticity estimates come from Winston and Smith 1950 and Iyengar 1967. Price elasticity estimates are from Wright 1971 and Kaisha 1952.

Figure 1
Grain Wages in India 1600-1938 (1600=100)

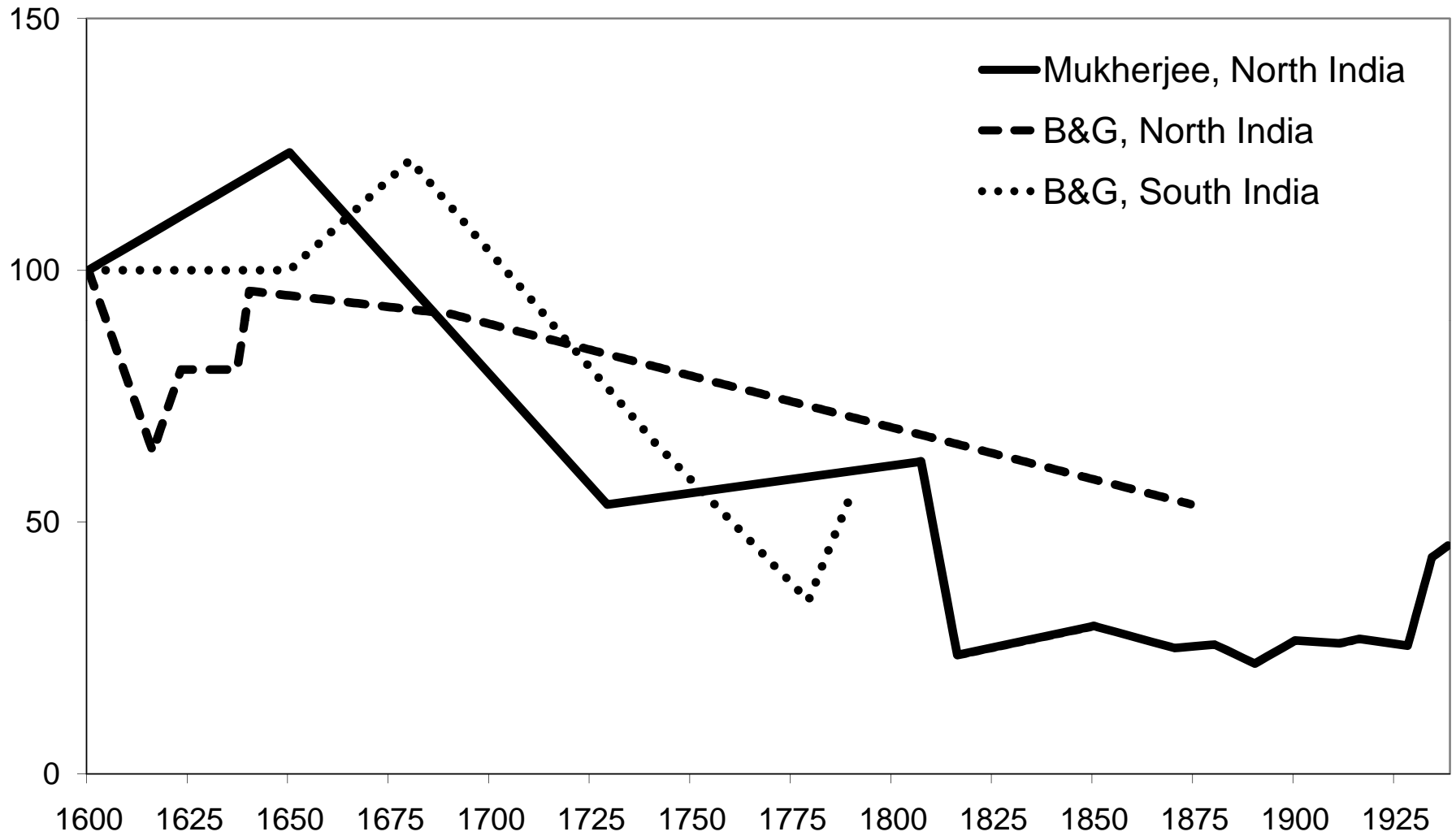
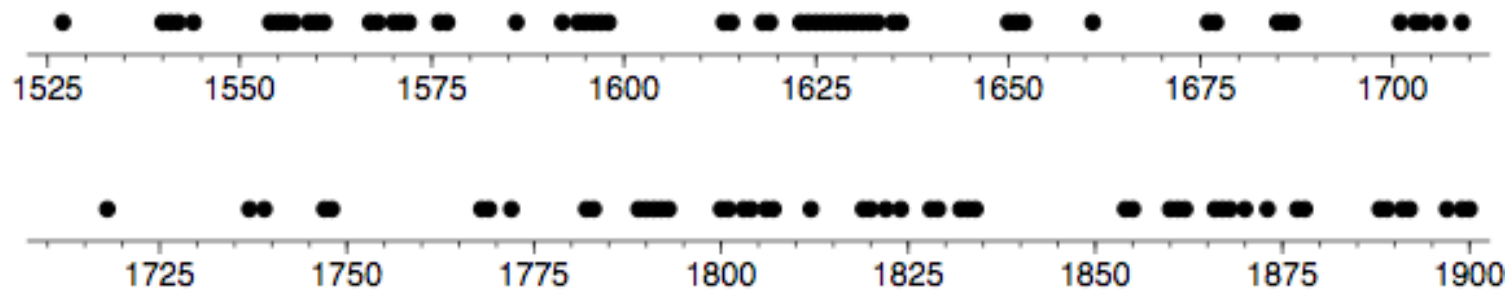
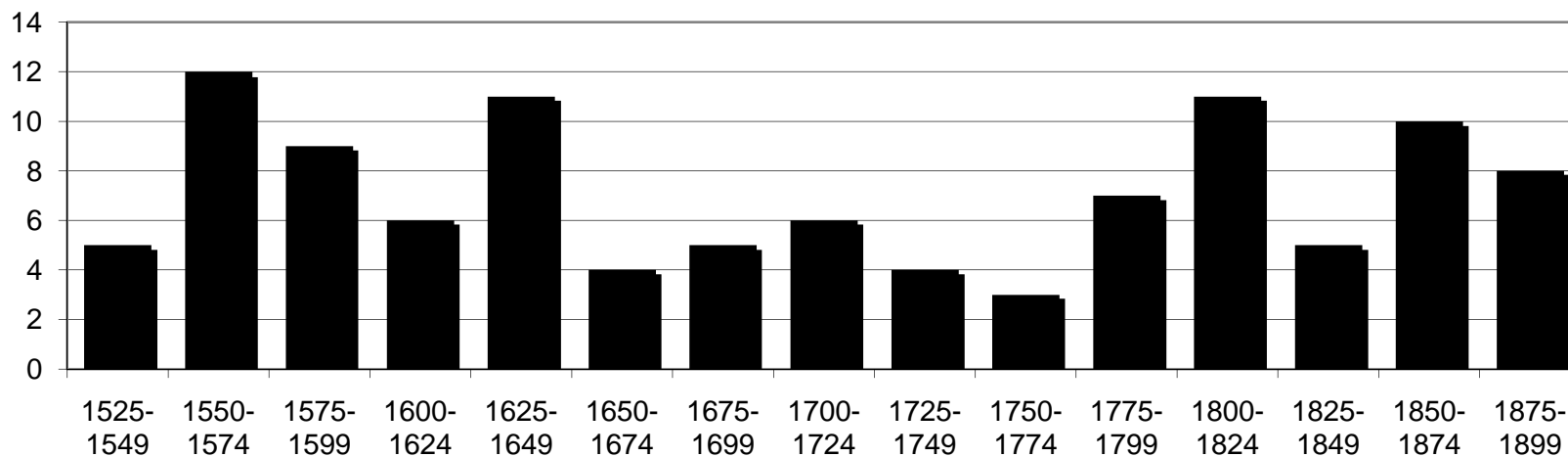


Figure 2
Drought in India 1525-1900



(a) Drought Years, 1525-1900



(b) 25-Year Average Number of Drought Years

Figure 3
Prices of Key Indian Goods 1700-1850 (1700=100)

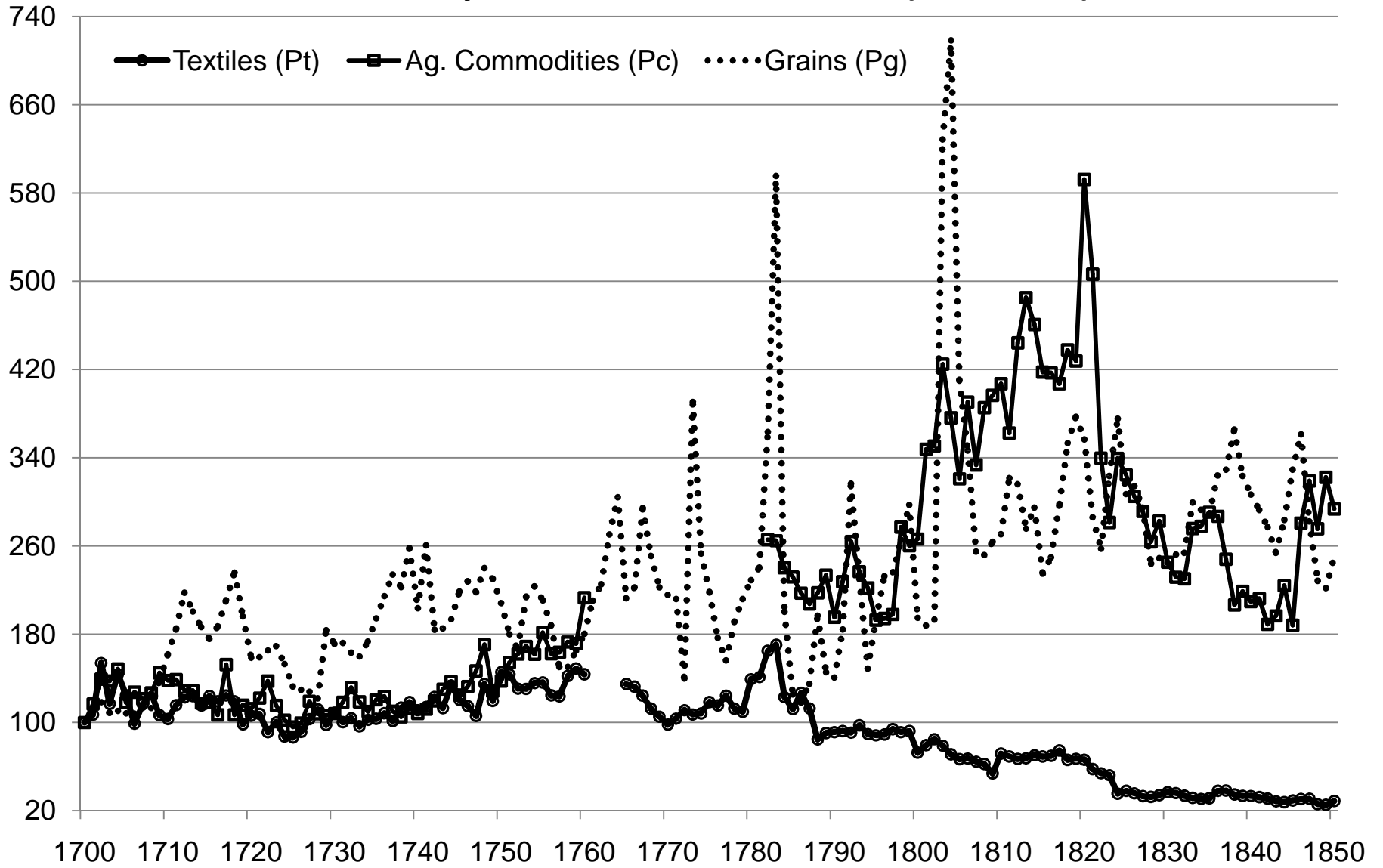


Figure 4
Intersectoral Terms of Trade (Pt/Pc)
1700-1850 (1700=100)

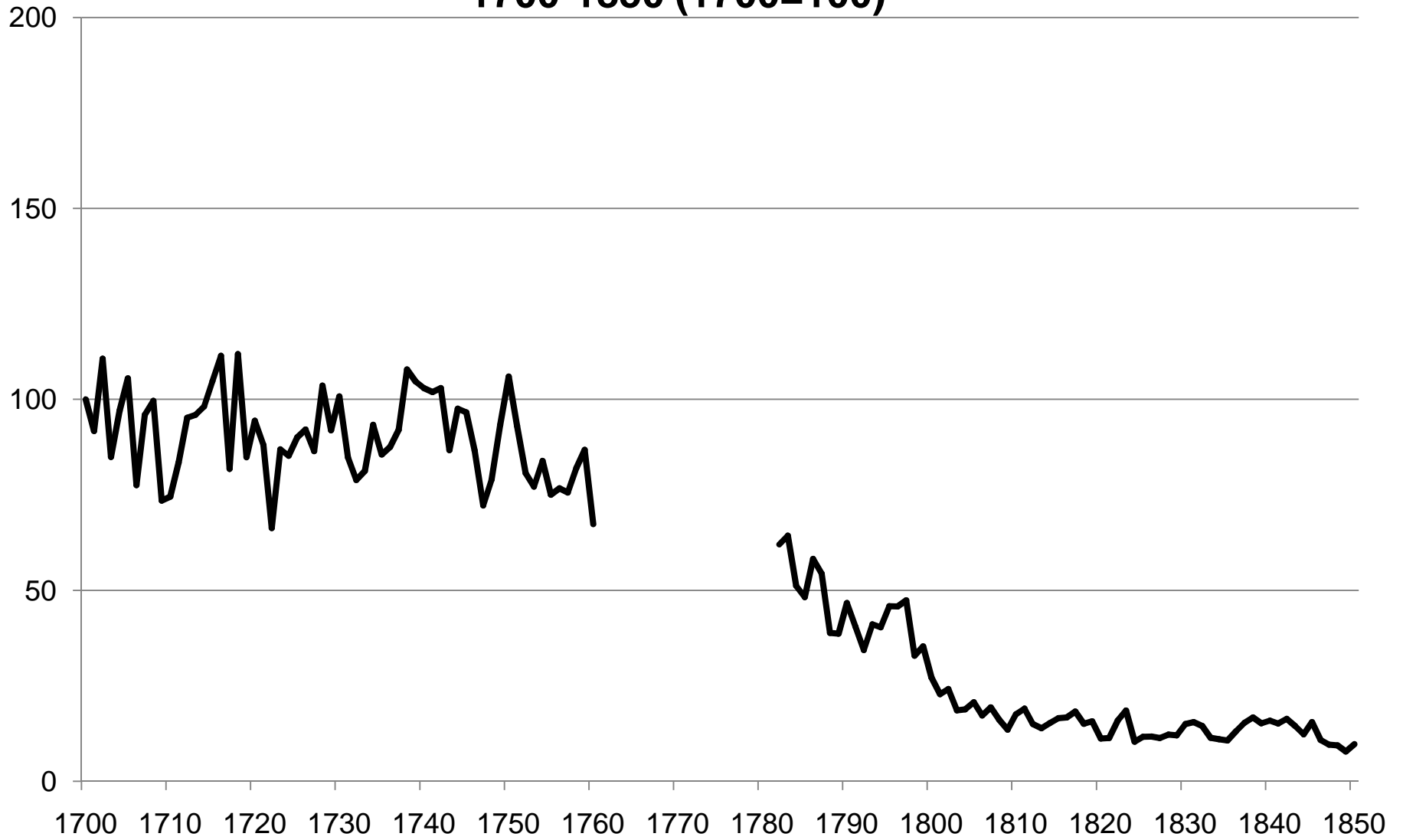


Figure 5
Grain Wage in India (w/Pg) 1700-1850 (1700=100)

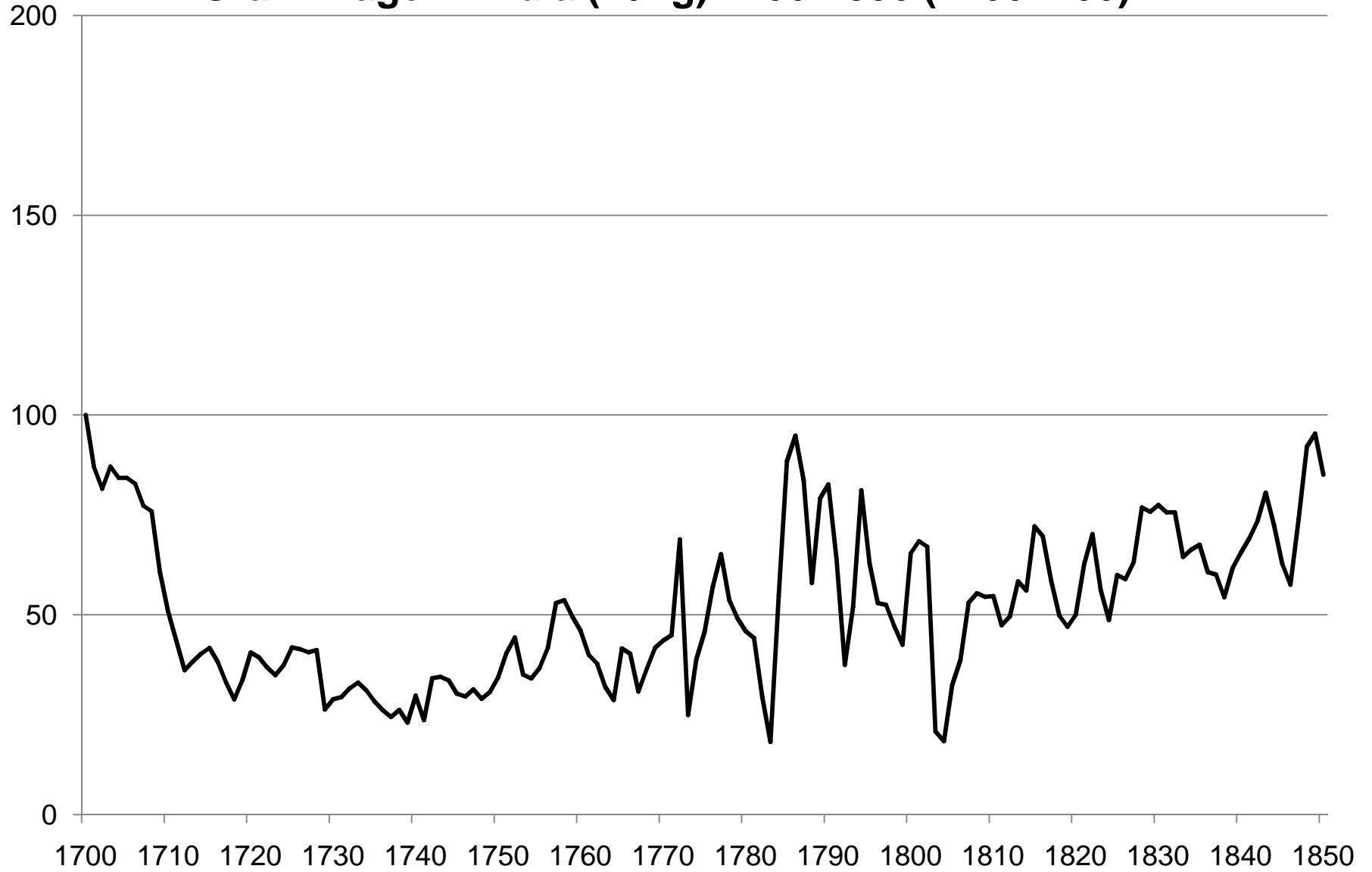


Figure 6
Proxy for Own Wage in Textiles and
Agricultural Commodities 1700-1850 (1700=100)

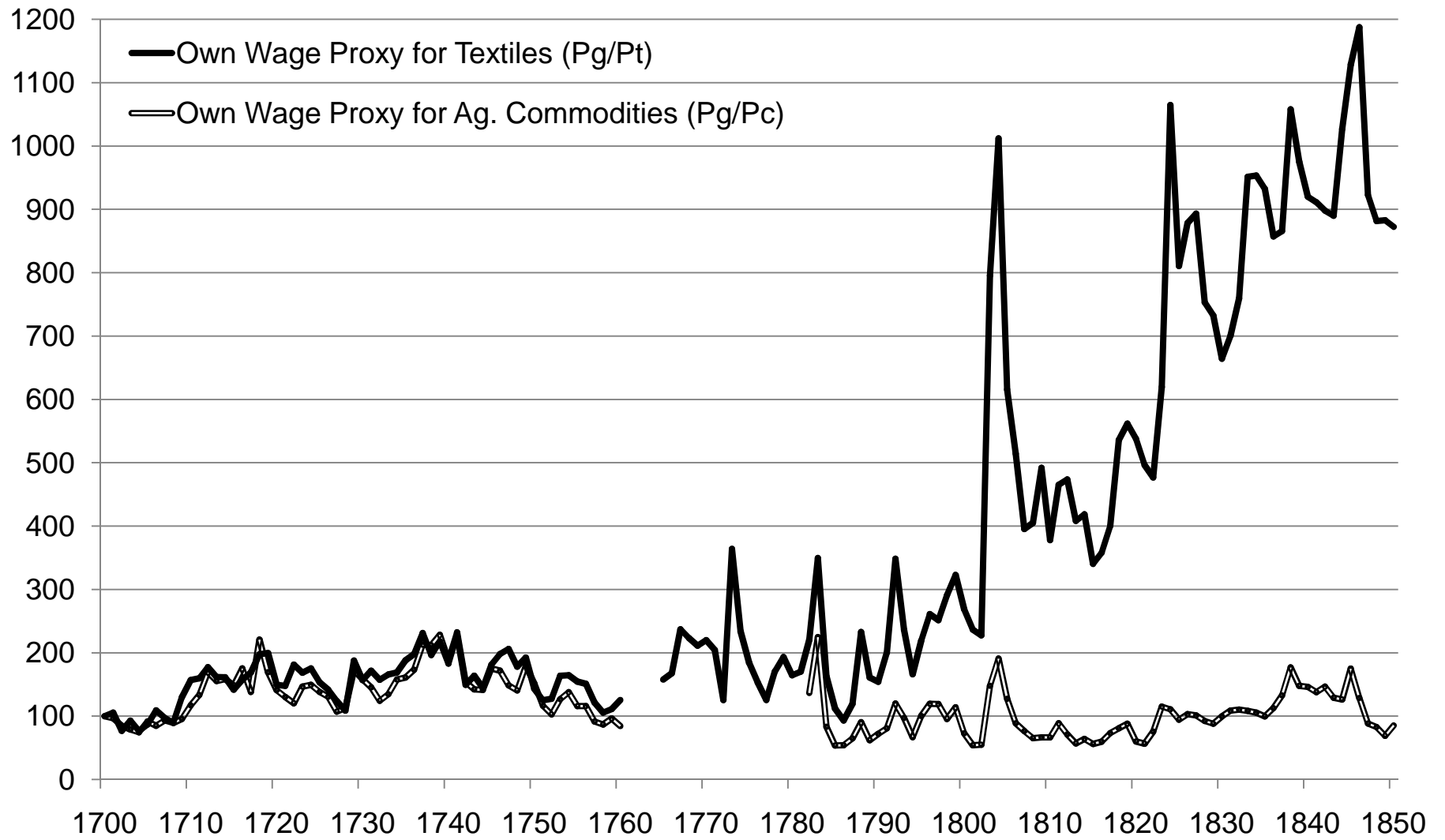


Figure 7
Own Wage in Textiles and Agricultural Commodities
1700-1850 (1700=100)

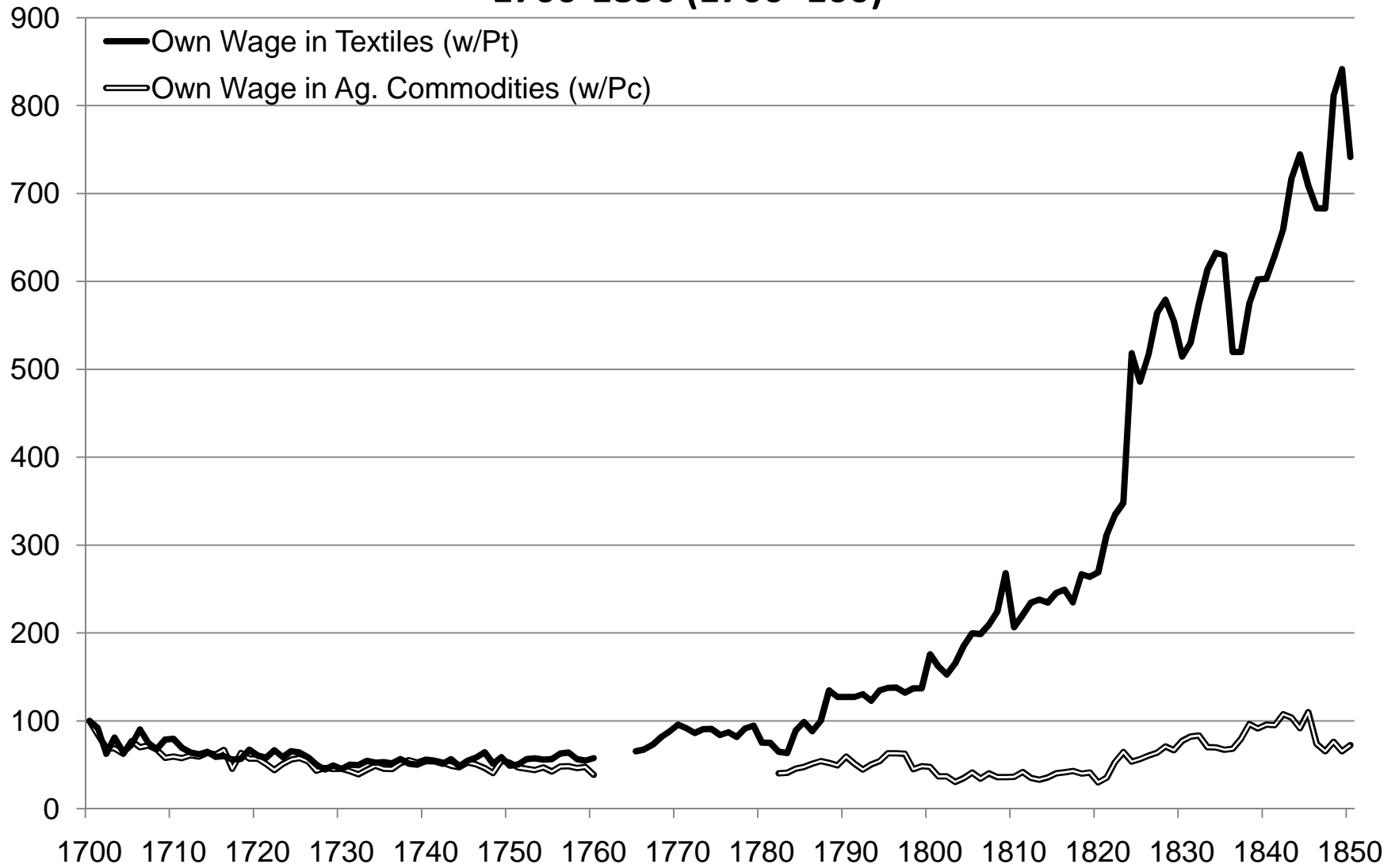


Figure 8
Proxy Textile Own Wage in India and England
(1705=100)

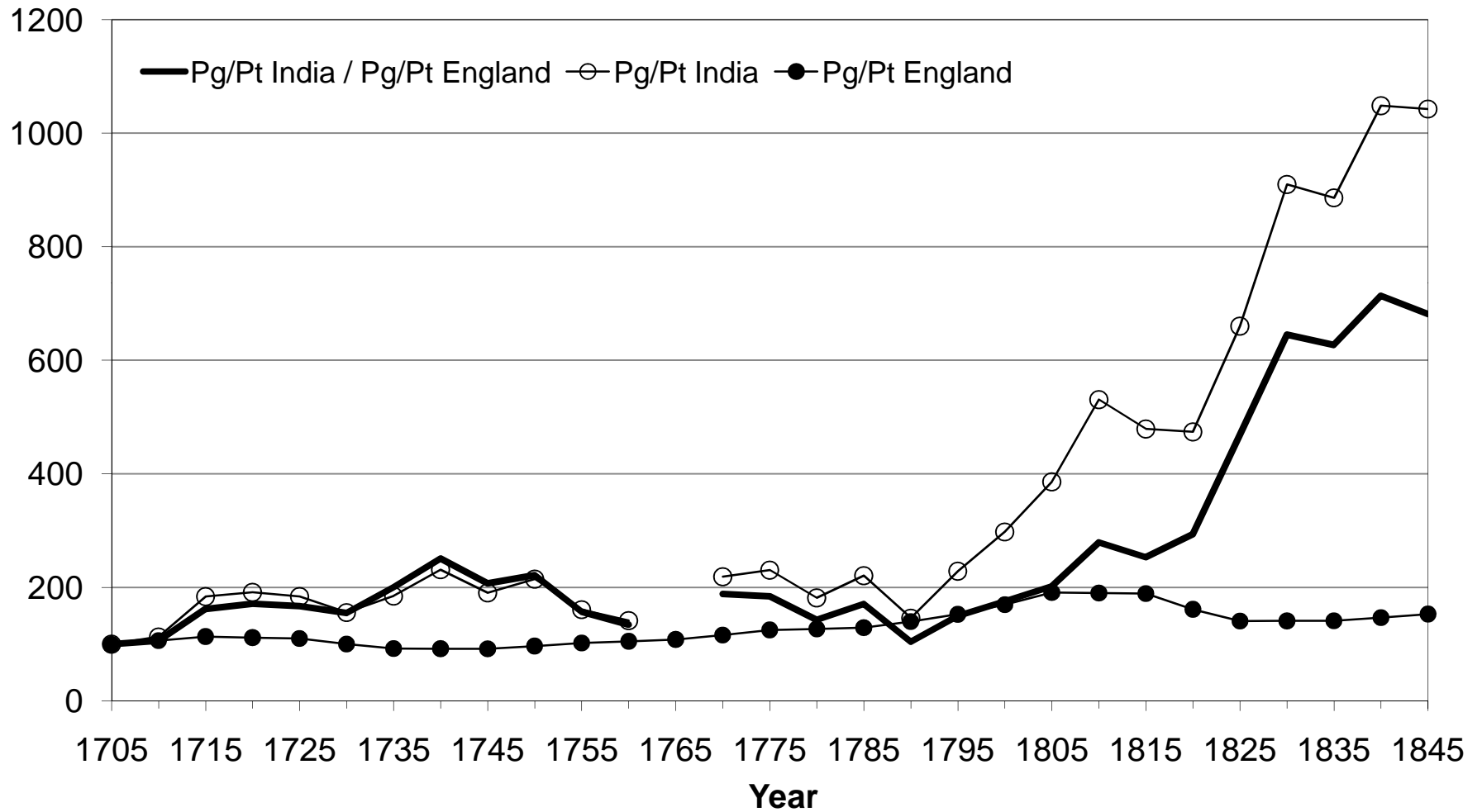


Figure 9
Textile Own Wages in India and England (1705=100)



Figure 10
Terms of Trade in India and the Poor Periphery (1800=100)

