

INDIAN GDP, 1600-1871: SOME PRELIMINARY ESTIMATES AND A COMPARISON WITH BRITAIN

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Abstract: This paper provides estimates of Indian GDP constructed from the output side for the period 1600-1871, and combines them with population estimates to track changes in living standards. Indian per capita GDP declined steadily. As British living standards increased from the mid-seventeenth century, India fell increasingly behind. Whereas in 1650, Indian per capita GDP was more than 80 per cent of the British level, by 1871 it had fallen to less than 15 per cent. As well as placing the origins of the Great Divergence firmly in the early modern period, these estimates suggest a relatively prosperous India at the height of the Mughal Empire, with living standards well above bare bones subsistence.

JEL classification: N10, N30, N35, O10, O57

Key words: Indian GDP, comparison, Britain

I. INTRODUCTION

Recently, there has been much progress in reconstructing the historical national accounts of a number of European countries during the early modern and even the late medieval periods (Blomme and van der Wee, 1994; Malanima, 2003; Krantz, 2004; Álvarez-Nogal and Prados de la Escosura, 2007; Broadberry et al., 2009; van Leeuwen and van Zanden, 2009). This paper applies similar methods to Asia, providing estimates of Indian GDP for the period before 1870. There is a strong need for estimates of Indian GDP during the early colonial period, to assess the strong revisionist claims about Indian economic performance made recently in the context of the Great Divergence debate. Parthasarathi (1998) has made the most striking claims for south India during the eighteenth century, arguing that living standards were just as high as in Britain, while Bayly (1983) has painted a picture of a thriving north Indian economy during the eighteenth century.

This paper presents estimates of GDP constructed from the output side for the pre-1871 period, and combines them with population data. We find that Indian per capita GDP declined steadily between 1600 and 1871. As British living standards increased from the mid-seventeenth century, India fell increasingly behind. Whereas in 1650, Indian per capita GDP was more than 80 per cent of the British level, by 1871 it had fallen to less than 15 per cent. These estimates support the claims of Broadberry and Gupta (2006), based on wage and price data, that the Great Divergence had already begun during the early modern period. They are also consistent with a relatively prosperous India at the height of the Mughal Empire, although much of this prosperity had disappeared by the eighteenth century. Projecting back from Maddison's (2003) widely accepted estimates of GDP per capita

for the late nineteenth century in 1990 international dollars, we arrive at a per capita income in 1600 of \$782, well above the bare bones subsistence level of \$400, or a little over a dollar a day. This is more in line with the recent revisionist work on Europe, which suggests that Maddison (2003) has substantially underestimated living standards in the pre-modern world (Broadberry et al., 2009).

The paper proceeds as follows. We begin in Section II with a brief survey of the existing literature on India's long run economic performance. This is followed in Section III by an overview of methods, drawing on previous work reconstructing national income in Britain and Europe before 1800. Section IV then applies those methods to India, describing the procedures for estimating output in agriculture, industry and services, before aggregating the sectoral outputs into real GDP for India during the period 1600-1871. In Section V, these GDP estimates are then combined with data on population to derive estimates of Indian GDP per capita, and used to compare living standards in India and Britain. Section V concludes.

III. INDIA'S LONG RUN ECONOMIC PERFORMANCE

India's economic performance since the late sixteenth century has been the subject of enduring controversy. The travelogues of Europeans to India in the sixteenth and seventeenth centuries often described great wealth and opulence, but it is not difficult to see this as reflecting their contact with the ruling classes, who enjoyed a luxurious lifestyle with consumption of high quality food, clothing and ornaments, as well as imported luxury products. The middle class merchants and rich peasants that European travellers most frequently came into contact with also enjoyed a comfortable life-style. However, most travel accounts of Mughal India and the

Deccan also noted that the majority of Indians lived in poverty (Chandra, 1982; Fukazawa, 1982). The labouring classes were seen as living in mud huts with thatched roofs, eating inferior grains, wearing rudimentary clothing and the use of footwear was relatively unknown (Moreland, 1923: 197-203). While cultural and climatic conditions may explain some of the consumption differences between India and Europe, most writers were in little doubt that the average Indian lived in poverty.

Furthermore, there is a substantial literature which attempts to chart trends in Indian living standards over time, starting from 1595. The reign of Akbar is usually seen as the peak of economic well being, and is well documented in Abū 'l-Fazl's [1595] *Ā' īn-i-Akbarī*, which meticulously reported wages and prices in the region of Agra. This has provided a reference point for real wage comparisons with later years. Desai (1972) made the striking claim that at best, the average standard of living in 1961 was no higher than in 1595, when although a labourer could afford less industrial goods such as clothing, he could buy more food, with the changing relative prices reflecting the changing productivity trends in agriculture and industry. The paper provoked some controversy over the details of the calculations (Heston, 1977; Moosvi, 1977; Desai, 1978). Nevertheless, most writers seem to accept the idea of a downward real wage trend during the seventeenth and eighteenth centuries before recovery during the twentieth century, a pattern first suggested by Mukerjee (1967) and confirmed recently by Broadberry and Gupta (2006).

This view of Mughal India as a relatively backward economy has been challenged recently by the work of revisionist economic historians, whose work must be assessed within the wider context of changing views on the Great Divergence of

living standards between Asia and Europe. Parthasarathi's (1998) characterisation of south Indian real wages as on a par with English real wages in during the eighteenth century is at variance with the older literature, but fits well with the claims of Pomeranz (2000), Frank (1998) and other world historians that the most developed parts of Asia were on the same development level as the most developed parts of Europe such as Britain and the Netherlands as late as 1800. Bayly (1983) has painted a picture of a thriving market economy in north India during the eighteenth century, which leaves a similar impression.

Broadberry and Gupta (2006) compare silver and grain wages in Britain with those in India and China during the seventeenth and eighteenth centuries, which casts doubt on the revisionist position, suggesting that the Great Divergence was already under way during the early modern period. However, a full assessment, encompassing the ruling elites and middle classes as well as the labouring classes, requires the reconstruction of national income in European and Asian countries. This paper makes a start on that process by deriving estimates of GDP and population in India between 1600 and 1870, and comparing GDP per capita between India and Britain. This is the first time series of national income estimates for India before the mid-nineteenth century, which can be seen as joining up with Heston's (1983) estimates for the period after 1870. Our comparative results are also broadly consistent with Roy's (2010) finding that GDP per capita in Bengal was substantially lower than in England and Wales during the second half of the eighteenth century.

III. AN OVERVIEW OF METHODS

The first phase of historical national accounting focused on reconstructing national income for a small number of relatively rich countries in Western Europe and North America, and starting around 1870, at the beginning of the modern statistical age (Kuznets, 1946; Clark, 1957; Maddison, 1982). A natural development was the application of this approach to other parts of the globe, and many non-western countries now have historical national accounts reaching back to around 1870 (Maddison, 1995). For the period before 1870, there has now been a substantial period of experimentation, beginning with the study of British economic growth back to 1688 by Deane and Cole (1967).

Deane and Cole's (1967) study was remarkable for the way in which the authors made efficient use of the limited range of processed data series that were available at the time. Subsequent research by many authors has dramatically extended the range of data now available, with the revised estimates of Crafts and Harley (1992) proving an important staging post. Broadberry and van Leeuwen (2008) have now succeeded in producing annual estimates of GDP for Great Britain over the period 1700-1850. Furthermore, Broadberry et al. (2009) have extended the approach back to 1300 for the territory of England.

Deane and Cole's (1967) approach now seems remarkably simple in the light of the vast amount of subsequent research. Nevertheless, its simplicity and modest demands on data makes it particularly suitable as a starting point for Asian historical national accounting in the period before the wide availability of official statistics at a national level. We focus here on Deane and Cole's (1967) method for the eighteenth century, where they constructed an index of total real output, based on industry,

agriculture and services. Their estimates are reproduced here in Table 1. The sector that was most firmly grounded in the data was industry. For the export industries, such as cotton, output was assumed to grow in line with exports, for which abundant data were available. For home industry, production was assumed to move in line with the physical quantities of output of leather, beer, candles and soap. Finally, since Deane and Cole had no independent data on commerce, the index of industrial output was assumed to apply also to the commercial sector. It is not much of an exaggeration, therefore, to say that the whole of the industrial and commercial sector was dependent on the export data.

For agriculture and services, by contrast, the key data series was population. For agriculture, an index of production was derived by assuming that agricultural demand grew in line with population, which amounted to assuming constant per capita corn consumption. An adjustment was then made for known imports and exports of grain, to convert demand to domestic production. For services, even in modern national accounts it is not uncommon to assume that real output moves in line with employment. Since for the eighteenth century Deane and Cole had only fragmentary evidence on employment, they assumed that service output grew in line with population. For the government sector, however, it was possible to obtain direct estimates of output from government budget sources. Finally, to combine the individual series into an index of GDP, it was necessary to find appropriate weights for agriculture, industry and services. These were taken from Gregory King's [1696] social tables, and are given at the top of each column in Table 1.

It should by now be clear that Deane and Cole's (1967) estimates of British GDP in the eighteenth century are overwhelmingly dependent on the path of population and exports, with a minor role for government expenditure and a restricted set of volume indicators for home industry. It would not be difficult to assemble a similar data set for India between 1600 and 1871, and that is what we proceed to do in the next section. However, we will not stop there, because work conducted since Deane and Cole's (1967) study suggests a number of ways of improving upon this approach, and again in ways which can be replicated with the data available for India.

First, subsequent work on the agricultural sector has allowed for a more sophisticated treatment of demand. Crafts (1976) criticised Deane and Cole's assumption of constant per capita corn consumption while real incomes were rising and the relative price of corn was changing, and Crafts (1985) recalculated the path of agricultural output in Britain with income and price elasticities derived from the experience of later developing countries. The approach was developed further by Allen (2000) using consumer theory. Allen (2000: 13-14) starts with the identity:

$$q_a = r c N \tag{1}$$

where q_a is agricultural output, r is the ratio of production to consumption, c is consumption per head and N is population. Agricultural consumption per head is assumed to be a function of its own price (p_a), the general consumer price level (p_c), and income (y). Assuming a log-linear specification, we have:

$$\ln c = \alpha_0 + \alpha_1 \ln p_a + \alpha_2 \ln p_c + \beta \ln y \tag{2}$$

where α_1 and α_2 are the own-price and cross-price elasticities of demand, β is the income elasticity of demand and α_0 is a constant. Consumer theory requires that the own-price, cross-price and income elasticities should sum to zero, which sets tight

constraints on the plausible values, particularly given the accumulated evidence on elasticities in developing countries (Deaton and Muellbauer, 1980: 15-16, 60-82). For early modern Europe, Allen (2000: 14) works with an own-price elasticity of -0.6 and a cross-price elasticity of 0.1, which constrains the income elasticity to be 0.5.

Second, a number of authors have used the share of the population living in towns as a measure of the growth of the non-agricultural sector. This approach began with Wrigley (1985), and has recently been combined with the demand approach to agriculture to provide indirect estimates of GDP in a number of European countries during the early modern period (Malanima, 2003; Álvarez-Nogal and Prados de la Escosura, 2007; Pfister, 2008). With the path of agricultural output (q_a) derived using equations (1) and (2), overall output (q) is derived as:

$$q = \frac{q_a}{1 - q_{na}/q} \quad (3)$$

where the share of non-agricultural output in total output (q_{na}/q) is proxied by the urbanisation rate. The approach can be made less crude by adjusting the urbanisation rate to deal with rural industry or agricultural workers living in towns.

IV. ESTIMATING INDIAN NATIONAL INCOME

In this section we derive estimates of Indian GDP by sector, following the basic approach of Deane and Cole (1967), but incorporating demand effects into agriculture and urbanisation effects into services.

1. Population

The first full census of India was conducted non-synchronously between 1867 and 1872, but is usually presented as the first decennial census for 1871. For the period

1801-1871, we use the decadal estimates of Mahalanobis and Bhattacharya (1976), who assembled information collected by the British for the three Presidencies of Bengal, Madras and Bombay, and supplemented this with assumptions about the rate of population growth in the non-enumerated regions. For earlier years, we have drawn on the estimates collected together by Visaria and Visaria (1983: 466), based on a 50-year frequency. We use the Bhattacharya estimates for 1751-1801, the mean Datta estimates to link 1600 and 1750, the Wilcox estimates to link 1600 with 1650, and log-linear interpolation for 1700.

Given the hybrid nature of the series projected back from the 1871 benchmark, it is worth noting that Habib (1982: 164-166) provides a useful cross-check for the absolute population level in 1600, on the basis of three alternative methods of estimation. One approach, based on the cultivated area, yields an estimate of 142 million, while an alternative approach based on land revenue suggests a population of 144.3 million. A third method, based on the size of armies, suggests a population of 140 to 150 million. All three estimates are broadly consistent with our population figure of 142 million in 1600.

2. Agricultural output

The simplest procedure for estimating an index of agricultural output is to follow Deane and Cole's (1967) assumption of constant per capita grain consumption in deriving domestic demand. This is also the approach used by Wrigley (1985) for pre-industrial Europe. However, Deane and Cole also made an allowance for net exports of grain, and in the case of India, we shall need to allow for net exports of agricultural crops, particularly during the nineteenth century as exports of cotton cloth declined.

Focusing initially on domestic demand, our first index of domestic agricultural production is simply the index of the population level. Following Crafts (1985) and Allen (2000), however, it is desirable to allow for consumer response to changing real incomes. Table 3 thus sets out an index of real wages for unskilled labourers in India, derived from Broadberry and Gupta (2006) for the seventeenth and eighteenth centuries, supplemented by additional information for the nineteenth century from Mukerjee (1967). Although the precise magnitude of the fall in the real wage from its high level in the early seventeenth century is a matter of controversy, most scholars have acknowledged the downward trend (Desai, 1972; 1978; Moosvi, 1973; 1977; Heston, 1977). Furthermore, it is interesting to note that the scale of the Indian real wage decline is similar to that suggested by Allen (2001) for early modern southern and eastern Europe, where a long period of decline steadily eroded the post-Black Death doubling of real wages.

Indices of domestic agricultural production are provided in Table 4A. The first index is based on the assumption of constant per capita grain consumption, while the second series is derived from the demand model with an income elasticity of demand of 0.5. Whereas the constant per capita grain consumption model suggests a substantial growth of agricultural output with the expansion of the population, the demand model suggests an agricultural sector that was struggling to maintain output at its Mughal peak until well into the nineteenth century.

Turning to the impact of foreign trade, Table 4b provides an index of agricultural exports. This is derived by obtaining the value of total exports in current

prices and the share of agricultural crops from Chaudhuri (1983), and deflating the resulting series of agricultural exports in current prices by an agricultural price index from Mukerjee (1967). For the seventeenth and eighteenth centuries, we have assumed that agricultural exports grew in line with domestic agricultural production. Weights for the export and domestic components of agricultural production in 1871 are obtained by projecting the share of exports in total production in 1901 back in time. Although the share of exports in total agricultural production in 1871 was only around 10 per cent, agricultural exports nevertheless had a significant impact on the path of total agricultural production in the nineteenth century, as exports of crops such as raw cotton, opium and indigo offset the decline in exports of cotton piece goods.

3. Industrial Output

Table 5 sets out the data for estimating the output of industry oriented towards the home market. Before the nineteenth century, this moved in line with population, as the result of an assumed constancy of per capita consumption of cloth at 8.41 square yards per head, derived from Prakash (1976: 174) for the early eighteenth century, and consistent with the level suggested for the late nineteenth century by Ellison [1886: 63]. Nevertheless, domestic production did not move simply in line with population after 1801 because of the growing penetration of the Indian home market by imports from Britain.

For export industry, it is possible to track Indian textile exports to Britain for the period 1665-1834 from Chaudhuri (1978) and Bowen (2007). The data are set out in Table 6 and Figure 1. Although we lack data for Indian exports to other countries, it is possible to make an allowance for the growing share of Britain as an export

destination using data on regional shares of bullion inflows to India from Haider (1996: 323), since the purchase of Indian textiles was financed largely with silver. The data in Figure 1 capture the healthy state of the Indian cotton textile export industry during the seventeenth and eighteenth centuries. After 1801, however, the industry went into decline, particularly with the growing British competition after the end of the Napoleonic Wars (Broadberry and Gupta, 2009a). Table 7 charts the continued decline of the Indian textile export industry until the establishment of a modern factory based industry in Bombay during the 1850s (Morris, 1983: 572-583; Farnie, 2004: 400-405). The current price data for the period 1851-1871 have been converted to constant prices using an index of imported cotton cloth prices from Sandberg (1974: 260), which tracks well the price of domestically produced cloth for overlapping years from Mitra (1978: 207). During this period, the price of cloth rose by just 6.3 per cent, so the deflation makes only a small difference to the nominal data.

Putting together the trends in home industries and export industries, it is clear that there was an absolute decline in industrial production in nineteenth century India, rather than just a reduction of the share of industry in economic activity, consistent with Clingingsmith and Williamson's (2008) definition of strong rather than weak deindustrialisation. Nevertheless, the scale of Indian deindustrialisation shown here is in line with that suggested by Twomey (1983) rather than the more catastrophic domestic industrial collapse claimed by Bagchi (1976) on the basis of evidence from the state of Bihar.

4. The service sector

For domestic services and housing, Deane and Cole (1967) assumed growth in line with population. However, recent work on the long run development of the European economy suggests that service sector growth moves more closely in line with the urban population (Broadberry et al., 2009). Estimates of the urban share of the population in India are presented in Table 8 for benchmark years, suggesting a decline in the share of the population living in cities of more than 5,000 inhabitants. Multiplying the population by the urban share, with interpolation between benchmark years, yields an estimate of the urban population, which remained fairly stable despite the growing total population.

5. Sectoral shares

To aggregate the time series for output in each of the major sectors into a total real output index, we require value added weights. The earliest sectoral value added weights for India are for 1900/01 from the work of Sivasubramonian (2000). However, these can be projected back to circa 1871 using changes in employment structure, following the procedure used by Hoffmann (1965: 389) for Germany. Essentially, this involves assuming that the sectoral distribution of value added per employee in 1900/01 acts as a good indicator of the sectoral distribution of value added per employee in 1871.

The sectoral weights for India circa 1871 are set out in Table 9. The largest sector was agriculture, and industry was largely geared towards the domestic market. Commerce accounted for 5.5 per cent of GDP, but is combined here with industry. Government, domestic services and housing together accounted for the remaining 10.3 per cent of GDP.

6. Total real output

Table 10 sets out the time series for all the major sectors and the aggregate output or gross domestic product (GDP) index obtained using the 1871 sectoral weights from Table 9. Industry and commerce grew rapidly during the seventeenth and eighteenth centuries, in contrast to the stagnation in agriculture. Since agriculture was the largest sector, the growth of total output was therefore quite modest before 1801. During the nineteenth century, although agriculture began to grow, this was offset by developments in industry and commerce, where there was a severe loss of export markets and penetration of the Indian home market by cotton textile imports from Britain, so that total output stagnated.

V. PER CAPITA GDP

The GDP series from Table 10 can be combined with the population data from Table 2 to establish in Table 11 the path of GDP per capita in India. Per capita GDP declined fairly steadily between the seventeenth and nineteenth centuries. Table 12 puts India's per capita GDP performance in an international comparative perspective. Benchmarking on the comparative India/GB per capita GDP level for 1871 from Broadberry and Gupta (2009b), we see that India's comparative position deteriorated sharply from a position of more than 80 per cent of the British level in 1650 to just 14.5 per cent by 1871. The relative decline occurred fairly steadily from the mid-seventeenth century.

Table 13 converts the GDP per capita information in index number form from Table 12 into absolute levels of 1990 international dollars, as has become standard

since the work of Maddison (1995). This enables us to gauge how far above bare bones subsistence India was. The World Bank's "dollar-a-day" definition of poverty suggests a per capita income level of around \$400 as a minimum, and Maddison (1995) finds a number of third world countries at this level in the modern world. Note, however, that Mughal India was well above this level, and even after the decline of the seventeenth century, per capita incomes remained between 650 and 750 dollars for most of the eighteenth century. It was only during the nineteenth century that Indian per capita incomes fell close to bare bones subsistence.

Tables 12 and 13 have important implications for the debate over the Great Divergence. First, Parthasarathi (1998) uses a comparative real wage study of Britain and India to support the "California School" view that living standards in the most developed parts of Asia were on a par with the most developed parts of Europe as late as the end of the eighteenth century (Frank, 1998; Pomeranz, 2000). The evidence presented in Table 12, however, suggests that Indian living standards were already substantially below the British level during the seventeenth century. This supports the view of Broadberry and Gupta (2006) that the Great Divergence was already well underway during the early modern period.

Second, although Table 13 provides evidence of a prosperous India at the height of the Mughal Empire at the time of Akbar, much of this prosperity had disappeared by the eighteenth century. However, it is only with further decline during the nineteenth century that most Indians were reduced to what Allen (2009) calls "bare bones" subsistence. With per capita incomes of between 650 and 750 international dollars in 1990 prices, eighteenth century India was still sufficiently

prosperous to be consistent with the scale of market activity described by Bayly (1983).

VI. CONCLUDING COMMENTS

This paper provides estimates of Indian GDP constructed from the output side for the pre-1871 period, and combines them with population estimates to track the path of living standards. Indian per capita GDP declined steadily between 1600 and 1871. As British living standards increased from the mid-seventeenth century, India fell increasingly behind. Whereas in 1650, Indian per capita GDP was more than 80 per cent of the British level, by 1871 it had fallen to less than 15 per cent.

These estimates cast further doubt on the extent of the recent revisionist work which seeks to date the origins of the Great Divergence of living standards between Europe and Asia only after the Industrial Revolution (Frank, 1998; Parthasarathi, 1998; Pomeranz, 2000). The GDP per capita data, as well as the wage and price data surveyed by Broadberry and Gupta (2006), suggest strongly that the Great Divergence had already begun during the early modern period. They are also consistent with a relatively prosperous India at the height of the Mughal Empire, although much of this prosperity had disappeared by the eighteenth century. Nevertheless, India sank close to the bare bones subsistence level of living standards only during the nineteenth century.

TABLE 1: Index numbers of British eighteenth century real output (1700=100)

	Agricul- ture	Export industries	Home industries	Total industry and commerce	Rent and services	Govt and defence	Total real output
(weights)	(43)	(18)	(12)	(30)	(20)	(7)	(100)
1700	100	100	100	100	100	100	100
1710	104	108	98	104	103	165	108
1720	105	125	108	118	103	91	108
1730	103	142	105	127	102	98	110
1740	104	148	105	131	102	148	115
1750	111	176	107	148	105	172	125
1760	115	222	114	179	113	310	147
1770	117	256	114	199	121	146	144
1780	126	246	123	197	129	400	167
1790	135	383	137	285	142	253	190
1800	143	544	152	387	157	607	251

Source: Deane and Cole (1967: 78).

TABLE 2: Indian population, 1751-1871

Year	Millions
1600	142
1650	142
1700	164
1751	190
1801	207
1811	215
1821	205
1831	216
1841	212
1851	232
1861	244
1871	256

Sources: Mahalanobis and Bhattacharya (1976: 7); Visaria and Visaria (1983: 466).

TABLE 3: Real wages of Indian unskilled labourers, 1600-1871

Year	1871=100
1600	207.9
1650	179.8
1700	171.9
1751	140.7
1801	120.8
1811	106.7
1821	94.4
1831	101.5
1841	109.1
1851	117.5
1861	108.3
1871	100.0

Source: Broadberry and Gupta (2006: 14); Mukerjee (1967: 58).

TABLE 4: Indian agricultural output, 1751-1871 (1871=100)**A. Agricultural production for domestic market**

Year	Constant per capita grain consumption	Demand model
1600	55.5	85.4
1650	55.5	77.6
1700	64.1	87.1
1751	74.2	89.3
1801	80.9	89.3
1811	84.0	86.8
1821	80.1	77.8
1831	84.4	85.0
1841	82.8	86.6
1851	90.6	98.5
1861	95.3	99.3
1871	100.0	100.0

B. Agricultural exports and total production

Year	Agricultural exports	Agricultural production for domestic market	Total agricultural production
1600	12.2	85.4	78.1
1650	11.1	77.6	71.0
1700	12.5	87.1	79.6
1751	12.8	89.3	81.7
1801	12.8	89.3	81.6
1811	14.1	86.8	79.5
1821	20.5	77.8	72.1
1831	23.8	85.0	78.9
1841	32.9	86.6	81.2
1851	54.5	98.5	94.1
1861	61.2	99.3	95.5
1871	100.0	100.0	100.0

Sources and notes: Domestic agricultural production: derived from Tables 2 and 3. Agricultural exports in current prices: Chaudhuri (1983: 828-837, 842-844), converted to constant prices using an agricultural price index from Mukerjee (1967: 51). Before 1801, agricultural exports assumed to grow in line with domestic production. Share of agricultural exports in agricultural production in 1901 from Sivasubramonian (2000) projected back to 1871.

TABLE 5: Cotton textile production for the domestic Indian market

Year	Population (millions)	Cotton consumption (m yds)	Imports from Britain (m yds)	Domestic production (m yds)
1600	142	1,194	0	1,194
1650	142	1,194	0	1,194
1700	164	1,379	0	1,379
1751	190	1,598	0	1,598
1801	207	1,741	0	1,741
1811	215	1,808	1	1,807
1821	205	1,724	20	1,704
1831	216	1,817	38	1,779
1841	212	1,783	141	1,642
1851	232	1,951	348	1,603
1861	244	2,052	514	1,538
1871	256	2,153	793	1,360

Sources: Population: Table 2. Cotton consumption per head: Prakash (1976: 174). Imports from Britain: Sandberg (1974: 142).

TABLE 6: Indian textile exports to Britain, 1665-1831

Year	Pieces	Years	Pieces
1665	291,666	1665-69	139,677
1700	868,095	1700-04	597,978
1751	701,485	1750-54	632,174
1801	1,037,440	1800-04	1,355,304
1811	691,640	1810-14	901,745
1821	758,397	1820-24	542,117
1831	287,814	1830-34	192,965

Sources: 1665-1761: Chaudhuri (1978: Tables C.20-C.22); 1761-1834: Bowen (2007).

FIGURE 1: East India Company imports of textiles from India (pieces)



Sources: Chaudhuri (1978: Tables C20-C.22); Bowen (2007).

TABLE 7: Total Indian textile exports, 1831-1871

Year	Thousand pieces	Value of cotton goods (Rs 0000, in 1851 prices)
1831	3,000	
1841	2,606	
1851	2,279	7,355
1861		8,365
1871		14,865

Source: Piece goods exports from Twomey (1983: 42); value of cotton goods exports from Chaudhuri (1983: 833-834, 844), converted to 1851 prices using unit values of imported cotton cloth sold in the Indian market from Sandberg (1974: 260).

TABLE 8: Urban population in India

Year	Population (millions)	Urban share (%)	Urban population (millions)
1600	142	15	21.3
1650	142	15	21.3
1700	164	14	23.0
1751	190	13	24.7
1801	207	13	26.9
1811	215	13	28.0
1821	205	12	24.6
1831	216	12	25.9
1841	212	11	23.3
1851	232	11	25.5
1861	244	10	24.4
1871	256	8.7	22.3

Sources: Population: Table 2. Urban share: 1600, 1801: Habib (1982: 166-171); 1871: Visaria and Visaria (1983: 519); Other years: interpolation.

TABLE 9: Indian sectoral weights, 1871

	%
Agriculture	67.5
Domestic industry	21.5
Export industry	0.7
Total industry and commerce	22.2
Services and housing	10.3
Total economy	100.0

Sources: Employment structure in 1875 from Heston (1983: 396); adjusted for value added per employee in current prices using 1900/01 data from Sivasubramonian (2000: 38, 405-408).

TABLE 10: Indian real output (1871=100)

Year	Agriculture	Home industries	Export industries	Total industry and commerce	Rent and services	Total real output
1600	78.1	87.8	148.6	93.9	95.5	82.5
1650	71.0	87.8	148.6	93.9	95.5	77.7
1700	79.6	101.4	202.0	111.5	103.0	87.6
1751	81.7	117.5	213.6	127.1	110.8	93.3
1801	81.6	128.0	457.9	161.0	120.7	98.2
1811	79.5	132.9	304.7	150.1	125.3	97.3
1821	72.1	125.3	183.2	131.1	110.3	88.2
1831	78.9	130.8	65.2	124.2	116.2	93.8
1841	81.2	120.7	56.6	114.3	104.6	92.0
1851	94.1	117.9	49.5	111.0	114.4	101.0
1861	95.5	113.1	56.3	107.4	109.4	100.4
1871	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Agriculture: Table 4B, total agricultural production; Home industries: Table 5; Export industries: Tables 6 and 7, adjusted for the growing share of British exports during the seventeenth century using data on bullion inflows by region from Haider (1996: 323); Rent and services: Tables 2 and 8; Sectoral shares: Table 9.

TABLE 11: Indian per capita GDP (1871=100)

Year	GDP	Population	Per capita GDP
1600	82.5	55.5	148.7
1650	77.7	55.5	140.0
1700	87.6	64.1	136.7
1751	93.3	74.2	125.7
1801	98.2	80.9	121.5
1811	97.3	84.0	115.8
1821	88.2	80.1	110.2
1831	93.8	84.4	111.1
1841	92.0	82.8	111.0
1851	101.0	90.6	111.5
1861	100.4	95.3	105.4
1871	100.0	100.0	100.0

Sources: GDP from Table 10; population from Table 2.

TABLE 12: Comparative India/GB GDP per capita

	Indian GDP	GB GDP	India/GB	India/GB
	per capita	per capita	GDP per capita	GDP per capita
	1871=100			GB=100
1600	148.7	30.4	488.9	70.9
1650	140.0	24.9	562.0	81.5
1700	136.7	40.7	335.8	48.7
1751	125.7	46.2	271.9	39.4
1801	121.5	59.0	205.9	29.9
1811	115.8	57.7	200.8	29.1
1821	110.2	57.6	191.4	27.7
1831	111.1	60.0	185.4	26.9
1841	111.0	65.6	169.3	24.6
1851	111.5	75.0	148.6	21.6
1861	105.4	84.5	124.8	18.1
1871	100.0	100.0	100.0	14.5

Sources and notes: Indian GDP per capita from Table 11; GB GDP: 1600-1700 from Broadberry et al. (2010); 1700-1870 from Broadberry and van Leeuwen (2008); 1870-1871 from Deane (1968: 106); GB population: Mitchell (1988: 9-12). Comparative India/GB GDP per capita level in 1871 derived from Broadberry and Gupta (2010), adjusting from a UK to a GB basis using Irish shares of GDP and population from Crafts (2005: 56) and Feinstein (1972: Table 55).

TABLE 13: Indian and British GDP per capita, 1600-1871 (1990 international dollars)

Year	Indian GDP per capita	GB GDP per capita
1600	782	1,104
1650	736	904
1700	719	1,477
1751	661	1,678
1801	639	2,142
1811	609	2,093
1821	580	2,090
1831	585	2,176
1841	584	2,380
1851	586	2,721
1861	554	3,065
1871	526	3,629

Source: Derived from Table 12 and Maddison (2003).

REFERENCES

- Abū 'l-Fazl [1595] (1927), *The Ā'īn-i-Akbarī*. Translated into English by H.Blochman, Delhi: Low Price Publications.
- Allen, R.C. (2000), "Economic Structure and Agricultural Productivity in Europe, 1300-1800", *European Review of Economic History*, 3, 1-25.
- Allen, R.C. (2001), "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War", *Explorations in Economic History*, 38, 411-447.
- Allen, R.C. (2009), *The British Industrial Revolution in Global Perspective*, Cambridge: Cambridge University Press.
- Álvarez-Nogal, C. and Prados de la Escosura, L. (2007), "The Decline of Spain (1500-1850): Conjectural Estimates", *European Review of Economic History*, 11, 319-366.
- Bagchi, A.K. (1976), "De-industrialization in India in the Nineteenth Century: Some Theoretical Implications", *Journal of Development Studies*, 12, 135-164.
- Bayly, C.A. (1983), *Rulers, Townsmen and Bazaars: North Indian Society in the Age of British Expansion, 1770-1870*, Cambridge: Cambridge University Press.
- Blomme, J. and van der Wee, H. (1994), "The Belgian Economy in a Long-Term Historical Perspective: Economic Development in Flanders and Brabant, 1500-1812", in Maddison, A. and van der Wee, H. (eds.), *Economic Growth and Structural Change: Comparative Approaches over the Long Run*, Milan: International Economic History Congress, 77-96.
- Bowen, H. (2007), "East India Company: Trade and Domestic Financial Statistics, 1755-1838", UK Data Archive, <http://www.data-archive.ac.uk/findingData/snDescription.asp?sn=5690>.
- Broadberry, S.N., Campbell, B., Klein, A., Overton, M. and van Leeuwen, B. (2010), "British Economic Growth, 1270-1700: Some Preliminary Estimates", University of Warwick, <http://www2.warwick.ac.uk/fac/soc/economics/staff/faculty/broadberry/wp/>.
- Broadberry, S.N. and Gupta, B. (2006), "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500-1800", *Economic History Review*, 59, 2-31.
- Broadberry, S.N. and Gupta, B. (2009), "Lancashire, India and Shifting Competitive Advantage in Cotton textiles, 1700-1850: The neglected Role of Factor Prices", *Economic History Review*, 62, 279-305.
- Broadberry, S.N. and Gupta, B. (2010), "The Historical Roots of India's Service-Led development: A Sectoral Analysis of Anglo-Indian Productivity Differences, 1870-2000", *Explorations in Economic History*, (forthcoming).

- Broadberry, S. and van Leeuwen, B. (2008), "British Economic Growth and the Business Cycle, 1700-1850: Annual Estimates", University of Warwick, <http://www2.warwick.ac.uk/fac/soc/economics/staff/faculty/broadberry/wp>.
- Chandra, S. (1982), "Standard of Living 1: Mughal India", in Raychaudhuri, T. and Habib, I. (eds.), *The Cambridge Economic History of India, Volume 1: c. 1200-1750*, Cambridge; Cambridge University Press, 458-471.
- Chaudhuri, K.N. (1978), *The Trading World of Asia and the English East India Company, 1660-1760*, Cambridge: Cambridge University Press.
- Chaudhuri, K.N. (1983), "Foreign Trade and Balance of Payments (1757-1947)", in Kumar, D. and Desai, M. (eds.), *The Cambridge Economic History of India, Volume 2: c.1757-c.1970*, Cambridge: Cambridge University Press, 804-877.
- Clark, C. (1957), *The Conditions of Economic Progress*, (third edition), London: Macmillan.
- Clingingsmith, D. and Williamson, J.G. (2008), "Deindustrialization in 18th and 19th Century India: Mughal Decline, Climate Shocks and British Industrial Ascent", *Explorations in Economic History*, 45, 209-234.
- Crafts, N.F.R. (1976), "English Economic Growth in the Eighteenth Century: A Re-examination of Deane and Cole's Estimates", *Economic History Review*, 29, 226-235.
- Crafts, N.F.R. (1985), *British Economic Growth during the Industrial Revolution*, Oxford: Oxford University Press.
- Crafts, N.F.R. (2005), "Regional GDP in Britain, 1871-1911", *Scottish Journal of Political Economy*, 52, 54-64.
- Crafts, N.F.R. and Harley, C.K. (1992), "Output Growth and the Industrial Revolution: A Restatement of the Crafts-Harley View", *Economic History Review*, 45, 703-730.
- Datta, R. (2000), *Society, Economy and the Market: Commercialization in Rural Bengal c.1760-1800*, New Delhi: Manohar.
- Deane, P. and Cole, W.A. (1967), *British Economic Growth, 1688-1959*, (2nd edition), Cambridge: Cambridge University Press.
- Deaton, A. and Muellbauer, J. (1980), *Economics and Consumer Behaviour*, Cambridge; Cambridge University Press.
- Desai, A.V.(1972) "Population and Standards of Living in Akbar's Time", *Indian Economic and Social History Review*, 9, 43-62.

- Desai, A.V. (1978), "Population and Standards of Living in Akbar's Time: A Second Look", *Indian Economic and Social History Review*, 15, 53-79.
- Ellison, T. [1886] (1968), *The Cotton Trade of Great Britain*, New York: Kelley.
- Farnie, D.A. (2004), "The Role of Cotton Textiles in the Economic Development of India, 1600-1990", in Farnie, D.A. and Jeremy, D.J. (eds.), *The Fibre that Changed the World: The Cotton Industry in International Perspective, 1600-1990s*, Oxford: Oxford University Press, 395-430.
- Frank, A.G. (1998), *ReOrient: The Silver Age in Asia and the World Economy*, Berkeley: University of California Press.
- Fukazawa, H. (1982), "Standard of Living 2: Maharashtra and the Deccan", in Raychaudhuri, T. and Habib, I. (eds.), *The Cambridge Economic History of India, Volume 1: c. 1200-1750*, Cambridge; Cambridge University Press, 471-477.
- Habib (1982), "Population", in Raychaudhuri, T. And Habib, I. (eds.), *The Cambridge Economic History of India, Volume 1: c.1200-c.1750* , Cambridge: Cambridge University Press, 163-171.
- Haider, N. (1996), "Precious Metal Flows and Currency Circulation in the Mughal Empire", *Journal of the Economic and Social History of the Orient*, 39, 298-364.
- Heston, A.W. (1977), "The Standard of Living in Akbar's Time: A Comment", *Indian Economic and Social History Review*, 14, 391-396.
- Heston, A. (1983), "National Income", in Kumar, D. and Desai, M. (eds.), *The Cambridge Economic History of India, Volume 2: c.1757-c.1970*, Cambridge: Cambridge University Press, 463-532.
- Hoffmann, W.G. (1965), *Das Wachstum der deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts*, Berlin: Springer Verlag.
- Hossain, H. (1988) *The Company Weavers of Bengal*, Delhi: Oxford University Press.
- King, G. [1696] (1936), "Natural and Political Observations and Conclusions upon the State and Condition of England", in Barnett, G.E. (ed.), *Two Tracts by Gregory King*, Baltimore: Johns Hopkins Press.
- Krantz, O. (2004), "An Estimate of Swedish GDP in 1571", in Heikkinen, S. and van Zanden, J.L. (eds.), *Exploring Economic Growth: Essays in Measurement and Analysis*, Amsterdam: Aksant, 105-130.
- Kuznets, S. (1946), *National Product since 1869*, New York: National Bureau of Economic Research.

- Maddison, A. (1982), *Phases of Capitalist Development*, Oxford: Oxford University Press.
- Maddison, A. (1995), *Monitoring the World Economy, 1820-1992*, Paris: Organisation for Economic Co-operation and Development.
- Maddison, A. (2003), *The World Economy: Historical Statistics*, Paris: Organisation for Economic Co-operation and Development.
- Malanima, P. (2003), "Measuring the Italian Economy, 1300-1861", *Rivista di Storia Economica*, 19, 265-295.
- Mahalanobis, P.C. and Bhattacharya, D. (1976), "Growth of Population in India and Pakistan, 1801-1961", *Artha Vijnana*, 18, 1-10.
- Mitchell, B.R. (1988), *British Historical Statistics*, Cambridge: Cambridge University Press.
- Mitra, D.B. (1978), *The Cotton Weavers of Bengal*, Calcutta: Firma KLM.
- Moosvi, S. (1973), "Production, Consumption and Population in Akbar's Time", *Indian Economic and Social History Review*, 10, 181-195.
- Moosvi, S. (1977), "Note on Professor Alan Heston's 'Standard of Living in Akbar's Time: A Comment'", *Indian Economic and Social History Review*, 14, 397-401.
- Moreland, W.H. [1923] (1990), *From Akbar to Aurangzeb: A Study in Indian Economic History*, Delhi: Low Price Publications.
- Morris, M.D. (1983), "The Growth of Large-Scale Industry to 1947", in Kumar, D. and Desai, M. (eds.), *The Cambridge Economic History of India, Volume 2: c. 1757-c. 1970*, Cambridge: Cambridge University Press, 553-676.
- Mukerjee, R. (1967), *The Economic History of India, 1600-1800*, Allahabad.
- Parthasarathi, P. (1998), "Rethinking Wages and Competitiveness in the Eighteenth Century: Britain and South India", *Past and Present*, 158, 79-109.
- Pfister, U. (2008), "German Economic Growth, 1500-1850", Westfälische Wilhelms-Universität Münster.
- Pomeranz, K. (2000), *The Great Divergence: China, Europe, and the Making of the Modern World Economy*, Princeton: Princeton University Press.
- Prakash, O. (1976), "Bullion for Goods: International Trade and the Economy of Early Eighteenth Century Bengal", *Indian Economic and Social History Review*, 13, 159-186.

- Roy, T. (2010), "Economic Conditions in Early Modern Bengal: A Contribution to the Divergence Debate", *Journal of Economic History*, 70, 179-194.
- Sandberg, L.G. (1974), *Lancashire in Decline: A Study in Entrepreneurship, Technology and International Trade*, Columbus: Ohio State University Press.
- Sivasubramonian, S. (2000), *The National Income of India in the Twentieth Century*, New Delhi: Oxford University Press.
- Twomey, M.J. (1983), "Employment in Nineteenth Century Indian Textiles", *Explorations in Economic History*, 20, 37-57.
- van Leeuwen, B. and van Zanden, J.L. (2009), "The Origins of 'Modern Economic Growth': The Case of Holland in the Early Modern Period: Preliminary Results", University of Warwick and IISG/Utrecht University.
- Visaria, L. and Visaria, P. (1983), "Population (1757-1947)", in Kumar, D. and Desai, M. (eds.), *The Cambridge Economic History of India, Volume 2: c.1757 - c.1970*, Cambridge: Cambridge University Press, 463-532.
- Wrigley, E.A. (1985), "Urban Growth and Agricultural Change: England and the Continent in the Early Modern Period", *Journal of Interdisciplinary History*, 15, 683-728.