

**THE HISTORICAL ROOTS OF INDIA'S SERVICE-LED DEVELOPMENT:
A SECTORAL ANALYSIS OF ANGLO-INDIAN PRODUCTIVITY
DIFFERENCES, 1870-2000**

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Abstract: India fell further behind the UK in terms of GDP per capita and overall labour productivity between the 1870s and the 1970s, but has been catching-up since. This paper offers a sectoral analysis of these trends. Comparative India/UK labour productivity in agriculture has declined continuously, and agriculture still accounts for around two-thirds of employment in India. Agriculture thus played a key role in India's falling behind and has subsequently slowed down the process of catching up. Although there have been substantial fluctuations in comparative India/UK labour productivity in industry, this sector has exhibited no long run trend. The only sector to exhibit an upward trend in comparative India/UK labour productivity is services. India's recent emergence as a dynamic service-led economy thus appears to have long historical roots. Although India has been characterised by relatively low levels of physical and human capital formation overall, its education provision has historically been unusually skewed towards secondary and tertiary levels. This has provided a limited supply of high productivity workers who have been employed predominantly in services.

JEL classification: N10, N30, O47, O57

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I. INTRODUCTION

There are a number of existing studies of comparative productivity and income over the period since the late nineteenth century for members of today's rich-country convergence club (Pilat, 1993; Broadberry, 1998; Broadberry and Irwin, 2007). However, to identify the forces making for economic success, it is also important to examine the experience of countries which have remained less developed and compare them with the experience of the rich world. This paper considers the experience of India since 1870 in comparison with the United Kingdom. An Anglo-Indian comparison is feasible because much statistical information was collected in India during the period of British rule before 1947, in a form which is relatively easy to compare with Britain. The comparison is also made possible by the impressive reconstruction of the Indian historical national accounts by Sivasubramonian (2000). The Anglo-Indian comparison is also of particular interest because of the recent emergence of India as a fast-growing tiger economy based on services rather than industry, in striking contrast to the case of China and other fast-growing Asian economies (Bosworth and Collins, 2007).

The comparative labour productivity performance can be summarised as follows. Between 1870 and 1970, output per worker in India fell from around 15 per cent of the UK level in the economy as a whole to less than 10 per cent, as India fell further behind. Since the 1970s, India has begun to catch up on the United Kingdom, but by the end of the twentieth century was still further behind than in the early 1870s. Looking at the sectoral aspects of this relative decline, it is clear that agriculture lies at the heart of India's productivity problem. Whereas in 1870 Indian labour productivity in agriculture was more than 10 per cent of the UK level, by 1999/2000 this had fallen

to around 1 per cent. In industry, comparative India/UK labour productivity has been stationary, with India returning to around 15 per cent of the UK level, although there have also been substantial periods of deviation from this long run level. In services, there has been a trend improvement of India's comparative labour productivity position from around 15 per cent of the UK level in the late nineteenth century to around 30 per cent by the late twentieth century. Since agriculture accounted for around three-quarters of the Indian labour force between the 1870s and the 1970s, and still 65 per cent at the end of the twentieth century, it is clear that India needs to drastically increase agricultural labour productivity if it is to improve its overall productivity performance. The sectoral results also suggest that India's recent experience of service-led growth has long historical roots (Bosworth and Collins, 2007).

The paper proceeds as follows. Section II sets out the basic data sources and methods, analysing the time series evidence on growth rates in the two countries and showing how to combine this with the cross-sectional evidence on comparative levels of income and productivity calculated at purchasing power parity. The results of the sectoral productivity comparison and the differences in the sectoral distribution of the labour force are then presented in section III. This is then followed in section IV by an analysis of differences in the share of the population in the labour force and the implications for comparative levels of per capita income, while Section V considers ways of cross-checking the results. Section VI investigates the long historical roots of India's better comparative performance in services. Although the overall level of investment in physical and human capital has been low, India's education provision has historically been unusually biased towards secondary and higher education. Thus

India has produced a small cadre of highly educated workers, who have been employed largely in services. Section VI concludes.

II. DATA AND METHODS FOR ANGLO-INDIAN PRODUCTIVITY COMPARISONS

1. Indian time series

The starting point for our comparative study is the time series data for India and the United Kingdom. For India, we rely largely on the historical national accounts reconstructed by Sivasubramonian (2000) for the twentieth century and Heston (1983) for the late nineteenth century. The data are generally presented on a fiscal year basis, running from 1 April to 31 March, and refer to the boundaries of British India until 1946/47 and modern India thereafter. Table 1 presents the output and employment data for the whole economy and for the three main sectors, agriculture, industry and services. It should be noted that agriculture includes livestock farming, forestry and fishing as well as arable farming, while industry includes mining, construction and the utilities as well as manufacturing. Services comprises railways and communications, government services, other commerce and transport, professions and liberal arts, domestic service and house property. Full details of data sources are given in Appendix 1.

The output and employment data from Table 1 can be used to calculate indices of labour productivity by major sector in Table 2. From these indices it is possible to calculate the average annual growth rates of labour productivity by sector. During the late nineteenth century, labour productivity growth was fastest in industry and slowest in services. During the first half of the twentieth century, although there was

respectable labour productivity growth in industry and services, labour productivity growth in the economy as a whole was held back by stagnation in agriculture. During the second half of the twentieth century, respectable labour productivity growth in industry and services has again been offset by slow productivity growth in agriculture.

2. UK time series

The UK time series are taken largely from the historical national accounts of Feinstein (1972), updated with output estimates from the *UK National Accounts* and employment data from O'Mahony (2002). Again, full details of data sources are given in Appendix 1. The territory covered refers to the United Kingdom of Great Britain and the whole of Ireland before 1920, but Great Britain and Northern Ireland after 1920. In contrast to Broadberry (1998), where the output and employment data were both spliced at 1920, following the procedures of Maddison (1995) to provide continuous series within the current boundaries of the United Kingdom, in this study both the output and employment series change with the secession of southern Ireland, as in Maddison (2003). This does not make a lot of difference to the UK data, but is more in line with the procedures of Sivasubramonian (2000) for dealing with the major boundary change at the time of Indian independence. The output and employment series are presented on a sectoral basis in Table 3, from which it is possible to derive the indices of labour productivity and the labour productivity growth rates shown in Table 4.

UK labour productivity growth before World War I was fairly evenly spread across the major sectors, but slightly faster in industry than in services or agriculture. The period 1920-1950 saw an increase in the labour productivity growth rate in

industry and agriculture, but stagnation in services. The period after World War II saw a further acceleration in the labour productivity growth rate, particularly in agriculture and industry.

Although the periodisation is slightly different in Tables 2 and 4, due to the different dates of major boundary changes, there are already a number of indications of some of the major factors behind the differential productivity growth performance of India and the United Kingdom. First, note that overall labour productivity grew faster in Britain than in India before 1970, and faster in India since 1970. We should thus expect to see India falling further behind Britain until around 1970 and beginning to catch up thereafter. Second, the largest growth rate differentials were in agriculture, so that we can expect to see this sector making a large contribution to Indian falling behind. Third, during the period of Indian catching up since 1970, although labour productivity growth has been faster in industry than in services in both India and Britain, it is only in services that labour productivity growth has been higher in India than in Britain. This is in line with the focus of Bosworth and Collins (2007) on the key role of services in Indian growth.

3. A benchmark for 1950

The labour productivity data for India and the United Kingdom from Tables 2 and 4 can be combined to provide trends in comparative labour productivity for each sector in index number form. To pin down the comparative labour productivity level, we provide a benchmark estimate for circa 1950, using data on nominal value added per employee in each country, compared at sector-specific price ratios, adjusted for purchasing power parity (PPP). This is necessary because the exchange rate cannot be

assumed to be a perfect guide to differences in prices between two countries, especially at the level of individual goods and services, or particular sectors. For example, a country with a comparative advantage in agriculture may expect to have relatively cheap food, while a country with a comparative advantage in manufacturing may expect to have relatively cheap industrial goods, although we may expect the effects of trade to moderate such tendencies. In the case of comparisons between developed and less developed countries, moreover, Balassa (1964) and Samuelson (1964) have highlighted the tendency of less developed economies to have a lower overall price level, due to the presence of non-traded goods and services.

Table 5 provides an India/UK PPP for agriculture circa 1950, using wholesale price data. Whilst it may be argued from a theoretical point of view that it would be better to have farm gate prices, this approach runs into the serious problem that the major Indian food crop is not grown in Britain. Given the importance of rice to the Indian economy, it seems more satisfactory to use wholesale prices to capture the availability of cheap food in the Indian economy. This is indeed reflected in the fact that at Indian production weights the PPP for agriculture is $\text{£}1 = \text{Rs } 10.80$, well below the exchange rate of $\text{£}1 = \text{Rs } 13.36$. Using UK production weights, however, gives a much higher weight to livestock products such as meat, which were relatively expensive in India, yielding a PPP for agriculture using UK weights of $\text{£}1 = \text{Rs } 16.43$. The geometric mean of the PPPs for agriculture at Indian and UK weights is $\text{£}1 = \text{Rs } 13.32$, which is close to the exchange rate.

Table 6 provides a PPP for industry circa 1950 using factory gate prices from production censuses for India and the United Kingdom. Weights reflect shares in

value added for major industrial categories such as chemicals, metals, etc. while within these categories individual products are weighted in line with shares of gross output. The industrial PPP of £1 = Rs 11.43 is the geometric mean of Rs 10.52 at Indian weights and Rs 12.43 at UK weights, indicating a lower industrial price level in India. However, this result depends heavily on the large textiles and clothing sector where Indian prices were low, with Indian prices of many other industrial products, particularly chemicals, being higher than in Britain.

For services, we have followed Broadberry and Irwin (2007) in using a weighted average of the PPPs for agriculture and industry, taking the geometric mean of Indian and UK weights. This yields a PPP of £1 = Rs 12.25 for services and also for the economy as a whole. Although this indicates a lower price level in India than in Britain, the scale of the deviation from purchasing power parity is relatively small compared with the differences in more recent times. This apparent absence of a large Balassa-Samuelson effect in 1950 is consistent with the empirical findings of Bergin, Glick and Taylor (2006), who show the emergence of a significant Balassa-Samuelson effect amongst a large sample of countries only after the 1950s.

These PPPs can be used in Table 7 to provide a benchmark level of comparative labour productivity by sector circa 1950, which can be contrasted with the levels obtained using the market exchange rate. Using the sector-specific PPPs raises the Indian labour productivity level significantly in industry, services and the economy as a whole. For the economy as a whole circa 1950, Indian output per worker was less than 10 per cent of the UK level.

III. SECTORAL ASPECTS OF PRODUCTIVITY PERFORMANCE

1. Comparative labour productivity levels by sector

Table 8 provides a breakdown of comparative labour productivity levels by the three main sectors of agriculture, industry and services. It is clear that agriculture played a key role in India's falling further behind during the period 1871-73 to 1970-71 and has subsequently slowed down the process of catching-up. In the early 1870s, an average Indian agricultural worker produced a bit more than 10 per cent of the output produced by an average British agricultural worker. By the 1970s, this had fallen to around 2 per cent, and by the 1990s to as little as 1 per cent. In industry, comparative labour productivity fluctuated but remained stationary, with Indian labour productivity returning to around 15 per cent of the British level. In services, the India/UK comparative labour productivity level trended upwards from around 15 per cent to around 30 per cent, although the disruption surrounding independence interrupted this upward trajectory, providing a setback to services as well as to agriculture and industry.

2. The structure of economic activity

To fully understand the contributions of the three main sectors to comparative productivity performance, it is necessary to track their shares in economic activity as well as their comparative productivity levels. Table 9 shows the percentage distribution of employment by major sectors for selected years. The sectoral composition of economic activity was clearly very different in the two countries. Compared even with other developed economies, Britain already by the late nineteenth century devoted a very small share of the labour force to agriculture. Thus, for example, while both Germany and the United States still had around 50 per cent of

their labour forces tied up in agriculture circa 1870, the United Kingdom had just 22.2 per cent (Broadberry, 1998: 385). For India, the agricultural share of the labour force was around 75 per cent for the century after 1870, and even by the end of the twentieth century agriculture still accounted for nearly 65 per cent of Indian employment. Given this commitment of resources to an inherently low value added sector, and the poor productivity performance within that sector, it is not difficult to understand India's disappointing overall productivity performance during this period.

The other striking development in Table 9 is the growing share of employment accounted for by services in India, as well as in Britain. During the period of British rule in India, this was accompanied by a declining share of industry, but as agriculture began to shrink in importance, it became possible for both industry and services to expand their shares of employment, particularly after 1970. Again the importance of services in Indian productivity performance highlighted by Bosworth and Collins (2007) for the current period appears to have its roots in earlier experience.

IV. PER CAPITA INCOMES AND LABOUR PRODUCTIVITY

Table 10 shows trends in comparative India/UK per capita incomes and labour productivity for the economy as a whole for the period 1871-73 to 1999-2000. The trends in the two series are quite similar, but the long term decline in India's relative position is greater for per capita income than for labour productivity, and the start of catching-up in per capita incomes is delayed until after 1980. The differences can be explained by trends in the share of the population in the labour force in the two countries, shown in Table 11. Whereas in the early 1870s India had a slightly larger share of the population working than the United Kingdom, by the 1990s India's share

was substantially lower than the UK's. This can be explained by the growing share of young people in the Indian population and by the growing proportion of women not entering the labour force in India.

V. CROSS-CHECKING THE RESULTS

A number of recent studies have questioned the use of time series projections from a single benchmark over long periods of time, the methodology used here in Tables 8 and 10. Ward and Devereux (2003) suggest that the further one projects from the original benchmark, the bigger the discrepancy between time series projections using GDP per head in constant prices and cross-sectional benchmarks based on nominal GDP per head converted at PPPs, because of index number problems. The issue is the subject of debate in Broadberry (2003) and Ward and Devereux (2004). In fact, however, Broadberry (1993) had already suggested the use of additional benchmarks to provide cross-checks in a study of comparative productivity in manufacturing, while Broadberry (1997a; 1997b; 1998) applied the method to full sectoral productivity comparisons over the period 1870-1990 for the United Kingdom with the United States and Germany, and found broad agreement between the benchmarks and time series evidence for those countries. Broadberry and Irwin (2006; 2007) find similar agreement between time series projections and benchmarks for the United Kingdom compared with the United States in the nineteenth century and the United Kingdom compared with Australia over the period 1861-1948.

Dealing with a less developed economy such as India presents greater data problems than with relatively rich countries such as the United States and Germany. Nevertheless, for the agricultural sector at least, it is possible to collect together a

number of additional benchmark estimates of comparative India/UK labour productivity levels in Table 12. For 1935/36, it is possible to use the same methods as for the 1950/51 agricultural benchmark, to arrive at a comparative India/UK labour productivity level of 7.5, which is quite consistent with the time series projection of 7.1. For the period 1970-1990, Prasada Rao (1993) provides benchmark estimates of agricultural output per worker every 5 years for many countries, including India and the United Kingdom. These estimates suggest that the time series projections are broadly tracking the benchmarks.

For the economy as a whole, we can check the projection of GDP per capita from the 1950/51 benchmark in Table 10 against Maddison's (2003) benchmark estimate for 1990. Our time series projection suggests Indian GDP per capita in 1990 at 8.8 per cent of the UK level, which compares with Maddison's benchmark estimate of 8.5 per cent.

For industry, as yet we lack comparable benchmark studies for other years. Timmer (1999) has conducted an India/US benchmark comparison for manufacturing using Indian price data for 1983/84 and US price data for 1987 projected back to 1983. Making use of a US/UK benchmark for 1987, it is possible to derive an estimate of the India/UK comparative labour productivity level. Apart from the fact that this already involves a substantial element of time series projection to a year for which we do not have employment data, there are additional adjustments which make comparability with the Sivasubramonian (2000) data problematic. Timmer (1999) finally reports his results in the form of a benchmark for 1987, reporting Indian labour productivity in manufacturing at 16.4 per cent of the UK level for registered firms, but

only 4.1 per cent for all firms. The former number is broadly consistent with our time series projections, while the latter seems difficult to square with the data on GDP per head. This suggests that Timmer is including more of the village economy in the industrial sector than Sivasubramonian (2000).

VI. THE HISTORICAL ROOTS OF SERVICE-LED GROWTH

The sectoral analysis suggests that the recent dynamic performance of services is not something which suddenly emerged during India's recent phase of overall catching-up, but rather has long historical roots. Indeed, India has been catching-up in services since the late nineteenth century, and we now investigate the factors behind this early dynamism of India's service sector and its persistence into the present.

Growth accounting relates growth of labour productivity to accumulation of physical and human capital and residual growth of total factor productivity. India's record of investment in physical and human capital has been less than impressive overall, and this has clearly contributed to India's relative decline (Sivasubramonian, 2004; Bosworth et al., 2006). Nevertheless, as noted above, India's relative productivity performance has varied by sector, with better performance in services. Here, we note an unusual feature of India's approach to factor accumulation, which can be seen as contributing to this; a long standing bias in educational investment towards secondary and higher education, even at very low levels of development.

Table 13 shows the share of secondary and higher education in total government expenditure on education in India, together with data for Indonesia and Japan. The data have been put carefully on to a comparable basis by van Leeuwen

(2007) for a comparative study of human capital and economic growth in these three economies. At the aggregate level, van Leeuwen (2007) finds that India and Indonesia had relatively low levels of investment in education compared with Japan, as would be expected if human capital has a role to play in economic development. However, the data in Table 13 show rather strikingly that what little investment in education that did occur in India was dramatically skewed towards secondary and higher levels, rather than primary education. Indeed, as early as the late nineteenth century, India already exhibits the pattern of a developed country in the distribution of resources across the different levels of education. If these more highly educated workers were employed predominantly in services, then it would help to explain the better labour productivity performance of Indian services.

Figure 1 shows the breakdown of the labour force by level of education in the main sectors of the Indian economy in 2001. Clearly, the proportion of workers with secondary or higher education is much greater in finance and public administration, but the ratio is also very favourable in trade and transport. The only non-service sector with a high share of its labour force educated above primary level is the very small utilities sector. The majority of workers in Indian agriculture and the rest of industry are illiterate or educated only to primary level. India's most highly educated workers today are thus disproportionately employed in services, the most dynamic sector. We now show that this was also the case in the early twentieth century, and provide a historical explanation for this elitist system of education.

Although the 1901 census does not allow us to provide a complete breakdown of the education levels of workers by sector, it is still possible to demonstrate an

association between education and services. First, the 1901 census shows that the inhabitants of urban areas were far better educated than those of rural areas. Whereas 259 males and 49 females per thousand could read and write in large towns, the corresponding literacy rates for the country as a whole were 98 for males and 7 for females. Although the cities were not the only centres of commerce, they were where the centres of higher education, seats of government and the law courts were located. A second way of demonstrating a link between education and services is through the caste system. The statistics of education by religion show that the Parsis were by far the most educated group, with nearly three-quarters of males and more than half of females able to read and write, giving a figure of almost two-thirds for all Parsis. The Jains were the next most highly educated, with 47 per cent of males and 2 per cent of females literate, giving a figure of 25 per cent for all Jains. Both these communities had a large presence in trade, commerce and modern industry.

Few occupations within the caste system required education, and given the hereditary structure of occupation through the caste system, education remained confined to the elite castes. The majority of people involved in agriculture and cottage industry had little demand for education, as there were no incentives of upward mobility. The upper castes had their own schools and when state education became a reality in colonial India, they were in a position to exploit the system. In states where caste divisions were stronger, the schools catered specifically to the upper caste children. Chaudhury (2007) shows that districts with a high concentration of upper castes spent less on the education of lower castes than on infrastructure. She shows also that districts with greater caste diversity spent less on primary education as a share of secondary education. A third interesting finding is that districts with a high

share of Brahmans (the priestly caste) had a high proportion of secondary schools, again suggestive of the high demand for post-primary education among the elites.

Given the economic conditions of the majority of the people and the rigidities of the caste system, it is not surprising that education was confined to a small elite of occupational groups such as priests, traders and accountants, who worked largely in the service sector. Furthermore, the narrow boundaries of caste groups within which a demand for education existed ensured that there was a disproportionately high demand for secondary education.

It is clear, then, that the elites had a strong preference for secondary and higher education. However, it should also be noted that within the elites, the trading castes had similar preferences to the Brahmans, the group usually considered to have had the highest demand for education. Table 14 examines the caste-level literacy figures by province for 1901. The figures in bold give the literacy rates for all castes in the province, while the other figures give the rates for the elite priestly, warrior and trading castes. The caste hierarchy differed across regions, with different castes dominant in trade, commerce and other services in different provinces. Note that although the Brahmans had the easiest access to education, they were not necessarily the most literate in all provinces. Indeed, in some provinces, such as Bengal, Bombay and Madras, the castes engaged in trade and commerce had significantly higher levels of literacy than the Brahmans. Table 14 thus suggests that the high levels of education found in the Indian service sector today date back at least to the beginning of the twentieth century.

VII. CONCLUSION

This paper provides a sectoral analysis of comparative India/UK labour productivity performance over the period 1870-2000. Between 1870 and 1970, output per worker in India fell from around 15 per cent of the UK level in the economy as a whole to less than 10 per cent, as India fell further behind. Since the 1970s, India has begun to catch-up on the United Kingdom, but by the end of the twentieth century, was still further behind than in the early 1870s. This disappointing Indian productivity performance is largely due to the agricultural sector. This is the only sector where India has continued to fall further and further behind, with labour productivity at the end of the twentieth century around 1 per cent of the UK level. Although there have been fluctuations in comparative India/UK productivity in industry, there has been no trend, with India at around 15 per cent of the UK level in the late nineteenth and late twentieth centuries. Only in services has there been an upward trend in comparative India/UK labour productivity. The recent emergence of a dynamic service-led Indian economy thus has long historical roots. Although overall levels of investment in human capital have been low in India, there has been a long-standing bias towards secondary and higher education, and these educated workers have been employed largely in services, where their productivity has been relatively high.

TABLE 1: Indian time series for output and employment (1929=100)

A. Output				
	Agriculture	Industry	Services	GDP
1872/73	65.8	36.7	47.3	56.0
1882/83	71.0	38.9	46.8	59.1
1890/91	81.3	46.3	51.2	67.4
1900/01	82.9	56.2	53.4	70.3
1910/11	99.2	78.0	67.8	86.8
1920/21	85.0	61.9	78.9	80.1
1929/30	100.0	100.0	100.0	100.0
1935/36	99.2	107.0	102.4	101.2
1946/47	101.3	119.4	110.4	106.5
1950/51	87.8	108.0	91.6	91.7
1960/61	119.7	196.4	135.6	134.9
1970/71	149.9	333.2	212.7	193.7
1980/81	175.4	493.4	322.1	262.9
1990/91	180.7	994.3	589.2	453.0
1999/00	313.4	1,717.0	1,126.9	751.1

B. Employment				
	Agriculture	Industry	Services	Total
1872/73	83.4	99.4	82.3	84.6
1882/83	84.9	100.9	84.2	86.2
1890/91	91.3	108.8	90.5	92.7
1900/01	93.1	111.2	92.0	94.5
1910/11	99.7	114.1	96.2	100.5
1920/21	99.9	103.9	93.0	99.1
1929/30	100.0	100.0	100.0	100.0
1935/36	101.7	108.4	107.6	103.2
1946/47	111.9	125.4	117.4	113.9
1950/51	112.5	130.0	127.5	116.3
1960/61	130.1	168.4	145.6	135.7
1970/71	161.5	203.0	170.9	166.7
1980/81	165.3	264.2	194.1	178.5
1990/91	208.0	316.5	278.7	228.1
1999/00	262.9	474.7	463.4	311.7

Sources: see Appendix 1.

TABLE 2: Indian labour productivity

A. Time series for output per employee (1929=100)				
	Agriculture	Industry	Services	GDP
1872/73	78.9	36.9	57.5	66.2
1882/83	83.6	38.6	55.6	68.6
1890/91	89.0	42.6	56.6	72.7
1900/01	89.0	50.5	58.0	74.4
1910/11	99.5	68.4	70.5	86.4
1920/21	85.1	59.6	84.8	80.8
1929/30	100.0	100.0	100.0	100.0
1935/36	97.5	98.7	95.2	98.1
1946/47	90.5	95.2	94.0	93.5
1950/51	78.0	83.1	71.8	78.8
1960/61	92.0	116.6	93.1	99.4
1970/71	92.8	164.1	124.5	116.2
1980/81	106.1	186.8	165.9	147.3
1990/91	86.9	314.2	211.4	198.6
1999/00	119.2	361.7	243.2	241.0

B. Average annual growth rates (% per year)				
	Agriculture	Industry	Services	GDP
1872/73 to 1900/01	0.4	1.1	0.0	0.4
1900-01 to 1946/47	0.0	1.4	1.0	0.5
1950/51 to 1970/71	0.9	3.4	2.8	1.9
1970-81 to 1999/00	0.9	2.7	2.3	2.5

Sources: Derived from Table 1.

TABLE 3: UK time series for output, employment and labour productivity (1929=100)

A. Output				
	Agriculture	Industry	Services	GDP
1871	121.8	34.7	41.3	44.0
1881	116.8	42.6	52.5	52.2
1891	124.3	51.1	64.4	62.5
1901	113.6	64.0	78.3	75.0
1911	118.5	72.9	93.5	87.1
1920	83.5	78.0	93.5	87.0
1929	100.0	100.0	100.0	100.0
1935	103.4	112.5	107.1	109.2
1948	114.4	148.2	122.3	131.0
1950	125.8	165.7	124.6	140.7
1960	158.6	224.4	152.6	180.8
1970	201.1	296.0	195.6	235.0
1980	263.0	316.5	237.8	270.7
1990	327.8	374.0	317.5	349.5
1999	333.4	412.5	401.3	414.9

B. Employment				
	Agriculture	Industry	Services	Total
1871	207.7	67.7	51.6	70.4
1881	190.4	73.4	59.5	75.5
1891	175.1	82.4	70.3	83.5
1901	161.1	93.1	83.7	93.6
1911	159.8	102.0	93.4	102.2
1920	115.9	109.5	92.5	101.8
1929	100.0	100.0	100.0	100.0
1935	91.2	98.3	103.9	100.5
1948	106.5	111.6	121.4	115.8
1950	105.0	115.2	120.5	117.0
1960	89.9	124.9	130.4	124.9
1970	59.7	123.6	141.3	127.3
1980	48.8	108.2	167.0	132.1
1990	42.4	86.4	196.6	136.3
1999	35.0	71.4	215.1	138.0

Sources: See Appendix 1.

TABLE 4: UK labour productivity

A. Time series for output per employee (1929=100)				
	Agriculture	Industry	Services	GDP
1871	58.6	51.3	80.0	62.5
1881	61.3	58.0	88.2	69.1
1891	71.0	62.0	91.6	74.9
1901	70.5	68.7	93.5	80.1
1911	74.2	71.5	100.1	85.2
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1920	72.0	71.2	101.1	85.5
1929	100.0	100.0	100.0	100.0
1935	113.4	114.4	103.1	108.7
1948	107.4	132.8	100.7	113.1
1950	119.8	143.8	103.4	120.3
1960	176.4	179.7	117.0	144.8
1970	336.9	239.5	138.4	184.6
1980	538.9	292.5	142.4	204.9
1990	773.1	432.9	161.5	256.4
1999	952.6	577.7	186.6	300.7

B. Average annual growth rates (% per year)				
	Agriculture	Industry	Services	GDP
1871 to 1911	0.6	0.8	0.6	0.8
1920 to 1950	1.7	2.3	0.1	1.1
1950 to 1970	5.2	2.6	1.5	2.1
1970 to 1999	3.6	3.0	1.0	1.7

Sources: Derived from Table 3.

TABLE 5: An India/UK PPP for agriculture, 1950/51

	PPP (Rs per £)	Indian weights (%)	UK weights (%)
Wheat	16.12	15.1	14.2
Rice	6.97	52.9	
Barley	10.37	3.5	13.2
Tea	12.38	3.5	
Coffee	7.68	0.3	
Sugar	19.33	14.9	15.2
Mutton	17.78	1.6	50.5
Cotton	7.15	4.7	
Wool	12.59	0.2	6.6
Silk	20.41	0.3	
Jute	9.46	2.5	
Hides	8.07	0.5	0.3
Total agriculture	13.32	100.0	100.0

Sources: Indian prices: Central Statistical Organisation (1953: Table 121); UK prices: Editor of "The Statist" (1951); Indian weights: derived from Sivasubramonian (2000: Table 3.23, Appendix Table 3(c)); UK weights: Ministry of Agriculture, Fisheries and Food (1968); Ojala (1952: 208).

TABLE 6: An India/UK PPP for industry, 1950/51

	PPP (Rs per £)	Indian weights (%)	UK weights (%)
Chemicals & allied	20.98	8.8	7.2
Metals & engineering	11.66	20.6	46.9
Textiles & clothing	6.99	54.3	17.9
Food, drink & tobacco	15.43	11.0	10.7
Other industry	14.71	5.3	17.3
Total industry	11.43	100.0	100.0

Sources: Indian prices and weights: Ministry of Commerce and Industry (1954); UK prices and weights: Board of Trade (1956).

TABLE 7: Comparative India/UK GDP per employee by sector, 1950/51

A. Compared at exchange rate				
	Agriculture	Industry	Services	GDP
India (Rs)	421	833	997	556
UK (£)	587	498	466	487
Exchange rate (Rs per £)	13.36	13.36	13.36	13.36
India/UK (UK=100)	5.4	12.5	16.0	8.5

B. Compared at sectoral PPPs				
	Agriculture	Industry	Services	GDP
India (Rs)	421	833	997	556
UK (£)	587	498	466	487
PPP (Rs per £)	13.32	11.43	12.26	12.26
India/UK (UK=100)	5.4	14.6	17.5	9.3

Sources: Nominal GDP: India: Sivasubramonian (2000: Table 6.9, Appendix Table 8(a)); UK: Mitchell (1988: 824); Employment: India: Sivasubramonian (2000: Tables 2.11, 9.32); UK: Feinstein (1972: Table 59); Market exchange rate: Central Statistical Organisation (1953: Table 101); PPPs: Tables 5 and 6.

TABLE 8: Comparative India/UK labour productivity by sector (UK=100)

	Agriculture	Industry	Services	GDP
1871-73	11.2	18.2	18.1	15.0
1881-83	11.3	16.8	15.9	14.1
1890-91	10.4	17.3	15.6	13.8
1900-01	10.5	18.6	15.6	13.2
1910-11	11.1	24.2	17.7	14.4
1920-21	9.8	21.1	21.1	13.4
1929-30	8.3	25.3	25.2	14.2
1935-36	7.1	21.8	23.2	12.8
1946-48	7.0	18.1	23.5	11.7
1950-51	*5.4	*14.6	*17.5	*9.3
1960-61	4.3	16.4	20.0	9.7
1970-71	2.3	17.3	22.6	8.9
1980-81	1.6	16.1	29.3	10.2
1990-91	0.9	18.3	33.0	11.0
1999-00	1.0	15.8	32.8	11.4

Source: Derived from Tables 2, 4 and 7.

TABLE 9: Labour force by sector (%)

A. India			
	Agriculture	Industry	Services
1875	73.4	14.5	12.1
1910/11	75.5	10.3	14.2
1929/30	73.1	9.1	14.8
1950/51	73.6	10.2	16.2
1970/71	73.8	11.1	15.1
1999/00	64.2	13.9	21.9

B. United Kingdom			
	Agriculture	Industry	Services
1871	22.2	42.4	35.4
1911	11.8	44.1	44.1
1929	7.5	44.2	48.3
1950	6.8	43.5	49.7
1970	3.5	42.9	53.6
2000	1.9	22.9	75.2

Sources: India: derived from Sivasubramonian (2000); UK: derived from Feinstein (1972) and O'Mahony (2002).

TABLE 10: Comparative India/UK per capita income and labour productivity (UK=100)

	GDP per capita	GDP per employee
1871-73	15.6	15.0
1881-83	15.1	14.1
1890-91	14.4	13.8
1900-01	13.6	13.2
1910-11	14.8	14.4
1920-21	13.1	13.4
1929-30	13.5	14.2
1935-36	11.9	12.8
1946-48	9.7	11.7
1950-51	*9.1	*9.3
1960-61	8.9	9.7
1970-71	8.4	8.9
1980-81	8.0	10.2
1990-91	8.8	11.0
1999-00	10.8	11.4

Sources: Population: India: Heston (1983: 394); Sivasubramonian (2000: Table 2.10, Appendix Table 8(c)); UK: Feinstein (1972: Table 55); Central Statistical Office (various years). GDP and PPPs from Tables 1, 3 and 7.

TABLE 11: Labour force share of population (%)

	India	United Kingdom
1871/73	46.1	44.5
1910/11	46.2	45.0
1929/30	41.3	42.6
1950/51	45.0	46.1
1970/71	42.8	45.7
1999/00	43.7	46.2

Sources: Labour force: India: Heston (1983: 394); Sivasubramonian (2000: Tables 2.10, 9.30-9.32); UK: Feinstein (1972: Tables 59, 60); O'Mahony (2002); Population: sources listed in Table 10.

TABLE 12: Benchmarks and time series projections in agriculture

	Time series projection	PPP benchmarks
1935/36	7.1	7.5
1950/51	*5.4	5.4
1970/71	2.3	2.3
1980/81	1.7	2.0
1990/91	0.9	1.8

Sources: Time series projection: Table 8; PPP benchmarks: 1935/36: using same method as Table 5, based on Indian data from Secretary of State for India (1939: Table 171) and UK data from Board of Trade (1939: Table 192); 1950/51: Table 5; 1970/71, 1980/81 and 1990/91: Prasada Rao (1993: Table 5.9).

TABLE 13: Share of secondary and higher education in total government expenditure on education (%)

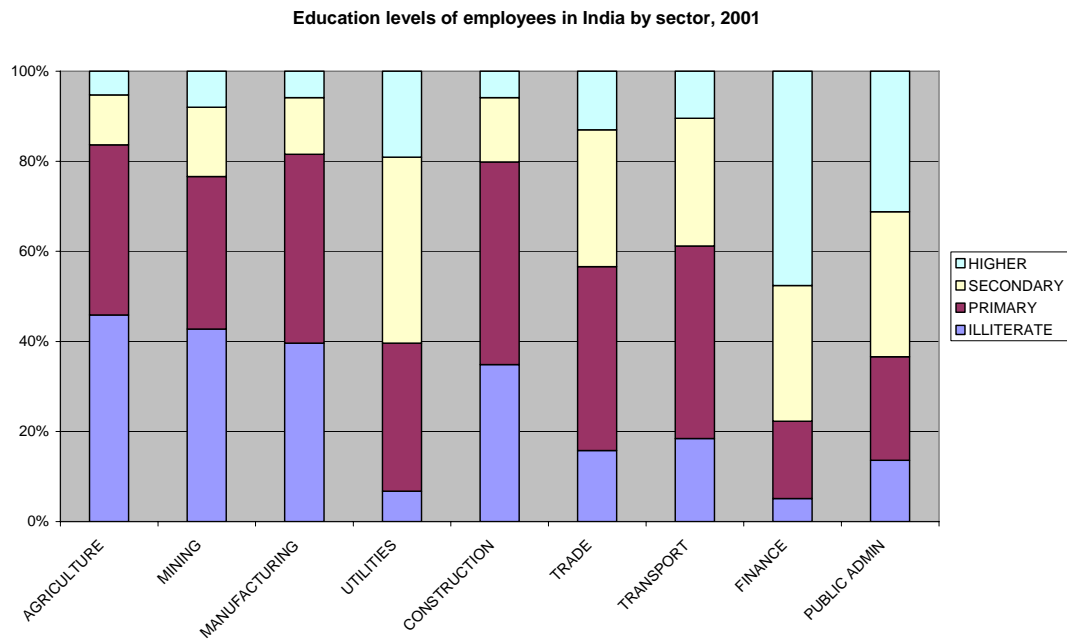
	India	Indonesia	Japan
1890	61.2	18.8	14.8
1910	62.3	18.5	24.2
1930	59.5	21.4	30.8
1950	57.3	28.2	59.6
1970	75.5	36.2	62.9
1990	56.9	58.8	66.9

Source: van Leeuwen (2007: 276-284).

TABLE 14: Literacy rates per 1,000 by caste in Indian states, 1901

	Males	Females		Males	Females
Assam	67	4	United Provinces of Agra and Oudh	57	2
Brahman	517	27	Kayastha	553	46
Kayastha	471	56	Barhai	17	1
			Lohar	17	1
Bengal	104	5	Baroda state	163	8
Baidya	648	259	Chatidraseni (Kayastha Prabhu)	744	88
Kayastha	560	66	Brahman (Maharashtra)	730	56
Brahman	467	26	Vania	631	18
			Brahman (Gujurat)	429	17
Berar	85	3	Central India Agency	55	3
Brahman	595	47	Maratha	231	10
Wani	530	8	Brahman	183	3
Pathan	104	7			
Bombay	116	9	Cochin State	224	45
Vani (Gujurat)	776	158	Brahman (Malayali)	695	227
Prabhu	474	177	Kshatriya (Malayali)	615	319
Bhahman	580	54			
Burma	378	45	Mysore State	93	8
Burmese	490	55	Brahman	681	64
Talaing	357	62	Digambara	410	21
Karen	143	37	Panchala	177	4
Central Provinces	54	2	Travancore State	215	31
Bania	446	11	Brahman (Malayali)	663	191
Brahman	365	9	Ambalavasi	576	156
Sonar	215	4			
Madras	119	9			
Eurasian	729	710			
Brahman	578	44			
Native					
Christian	162	59			

Source: *Report on the Census of India, 1901.*

FIGURE 1: Educations levels of employees in India by sector, 2001 (%)

Source: *Census of India, 2001.*

APPENDIX 1: SOURCES FOR TIME SERIES PROJECTIONS OF COMPARATIVE LABOUR PRODUCTIVITY BY SECTOR

INDIA

Output by sector

1868/69 to 1900/01: Heston (1983: 397). Note that Heston provides data only for services plus small-scale industry. Small-scale industry is calculated for the pre-1900 period as the 1900-01 share (36%). The share remained at about this level until WWI, then dropped to around 30%, where it remained for the interwar period. The total of small-scale industry and services also grew only very slowly during this period, at 0.5% per annum.

1900/01 to 1946/47: Sivasubramonium (2000: Table 6.11).

1946/47 to 1999/2000: Sivasubramonium (2000: Table 8b).

Employment by sector

1868/69 to 1900/01: Heston (1983: 396). The 1900-01 employment data from Sivasubramonium (2000: Table 2.11) were used to determine the breakdown between agriculture, industry and services. The Heston (1983: 394, 396) data were used to establish the constancy of sectoral shares before 1900.

1900/01 to 1946/47: Sivasubramonium (2000: Table 2.11).

1946/47 to 1999/2000: Derived from Sivasubramonium (2000: Table 9.32).

Territory

Boundaries of British India before 1946/47, modern India thereafter.

UNITED KINGDOM

Output by sector

1871-1965: Feinstein (1972: Table 8). Weights for component parts of service sector from Feinstein (1972: 208).

1965-2000: UK National Statistics (various years), *UK National Accounts*.

Employment by sector

1871-1938: Feinstein (1972: Tables 59, 60).

1948-1999: O'Mahony (2002), projected back from 1950 to 1948 using Feinstein (1972: Table 59).

Territory

Boundaries of the United Kingdom of Great Britain and Ireland before 1920, Great Britain and Northern Ireland after 1920.

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