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West Indies technologies in the East Indies: Imperial preference and sugar business in Bihar, 1800–1850s

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ABSTRACT

Today India is among the major sugar producers and sugar-making has a long tradition, yet the adoption of modern sugar technologies was delayed. Which factors underpinned this? This article examines the attempts of European sugar entrepreneurs to adopt new sugar technologies in 1830s–1840s Bihar. Its findings correspond with recent literature on Indian economic development which emphasises the role of declining agricultural productivity in economic stagnation in the colonial period. This article supports the conclusions that low agricultural productivity was the outcome of inadequate investment on the part of the British Empire. It also highlights that in the case of commercial crops – such as sugar – investment into new technologies with potential for increasing productivity was hindered by British trade policies. As British imperial policies gave preference to the welfare of the British consumer, lacked consideration for colonial manufacturing, they did not create a beneficial environment for long-run investment projects.

KEYWORDS

British Empire; India; agricultural productivity; sugar technologies; political economy

By the nineteenth century the Indian peninsula had a centuries-long tradition of sugar making. Yet the production of European-type white sugar, manufactured for export, failed. Moreover, by the late nineteenth century production of Indian-type sugar was no longer sufficient to meet domestic consumption. Sugar started to be imported from Java and even from Europe.[1] The essential question to ask is which factors underpinned this failure. Can we consider this a management failure, a technological failure, or were the policies of the British Empire to blame? This article studies the efforts of English sugar manufacturers to transfer West Indies sugar technologies to Bihar in India, and adapt them to the local physical and socio-economic environment. The article takes a micro-approach and through a case study of two factories – the Jummoah factory and the Dhobah East India Company – shows the challenges faced by sugar manufacturers with respect to technologies, management, transport, and changes in British policies towards sugar duties.

This article is motivated by the following debates, particularly by Broadberry and Gupta's reassessment of nineteenth-century Indian economic development that places agricultural productivity at the heart of the development debate about economic stagnation in the colonial period.[2] Broadberry et al. showed that a decline in GDP per capita had already started in the seventeenth century and continued during the eighteenth century before GDP per

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capita stabilised at low levels in the nineteenth century.[3] The nineteenth and early twentieth centuries were, for India, a period of stagnation in income per capita and of growing divergence with Britain.[4] Conventionally the decline has been ascribed to deindustrialisation and/or to the Prebisch-Singer thesis of declining terms of trade between agricultural and industrial products.[5] Connected to the terms of trade discussion have also been the concepts of 'development of underdevelopment', world systems theory and the theory of unequal exchange.[6] All these theories argue that India's dependence on exports of agricultural products was associated with adverse economic impacts and, overall, with India falling behind Britain. Recent work by Gupta and Broadberry takes an opposite stance and instead highlights the role of declining agricultural productivity in driving economic stagnation.[7] Focussing on the comparative labour productivity performance between the UK and India they show that between 1870 and 1970 output per worker in India declined from 15% to 10% of the UK level. The decline was most severe in agriculture where output declined from 11.2% to 2.3%. Since agriculture accounted for two thirds of employment in India this had negative effects on overall productivity as well as on the living standards of agricultural labour.[8] The crucial factor behind this productivity decline was a lack of investment into agriculture on the part of the British Empire, in particular inadequate investment into irrigation.[9] Crop yields per acre of food grains in 1910 were lower than in 1600.[10] Neither landlords nor cultivators, who lacked access to credit, invested into land.[11] Although the colonial state started building irrigation infrastructure, by 1935 only 20% of cultivated land was irrigated.[12] Differences in yields per acre were staggering. Whereas in the case of irrigated land yields per acre of food crops were similar to the European levels, unirrigated land produced low yields.[13]

This article explains the failure of the European sugar entrepreneurs by examining the suitability of technologies employed, management and profitability of ventures, and the effects of the British Empire's trade policies. The findings of this study make the following contributions to the debate. Firstly, the underlying issue faced by sugar entrepreneurs was low sugar yields, which made sugar cane juice, as an input into refining, scarce and expensive. Low sugar yields were directly linked to inadequate irrigation. Without irrigation, sugar yields in Bihar were 5.7 times lower than in the West Indies. This disadvantage could not have been offset by the cheapness of labour in India. Secondly, as the sugar-producing regions in Bihar often did not have access to the nascent railway system and instead had to rely on an inefficient and unmodernised system of river transport, transport from the interior of Bihar to Calcutta made up to 3.7% of the overall cost of sugar production. This means the transport from Calcutta to London was only 4.2 times more expensive than the internal transport. Thirdly, ultimately this article argues that the decisive factor explaining the lack of success of the modern sugar industry in India was British trade policy. In 1836 Indian sugar was getting preferential duties to access the British market but this preference was withdrawn in 1846. Sugar entrepreneurs were still experimenting with production methods in 1846, the policy change came unexpectedly, and the infant industry was not yet competitive. Without further investment into irrigation and higher yielding cane varieties Bihar sugar entrepreneurs were unable to compete with Cuba and Brazil – economies with significantly higher sugar yields still relying on slave labour.

In comparison with other export commodities sugar production had higher capital requirements. Among the main export commodities, indigo was the least capital intensive. Indigo factories tended to be small and the fixed costs for setting up factories were low

because the necessary machinery was not very intricate.[14] In 1835, fixed costs for setting-up an indigo factory with an annual production capacity of 500 maunds was estimated to be £1000 and the annual variable costs £5500.[15] Tea cultivation was more capital intensive as building tea gardens, land clearances, and construction of transport infrastructure required significant capital outlays. For example the total expenditure of the Assam Company – the largest Indian tea joint-stock company – in 1840 was £50,000.[16] Raw silk production for export had even higher capital requirements. The English East India Company estimated that it invested over £1 million into silk production between 1760 and 1810.[17] Both initial investments into factory buildings and machinery and operational costs were high; in the period 1786–1803 the prime costs of silk manufacturing averaged over £260,000 annually.[18] The sugar industry was also capital intensive – the Dhobah East India Company invested between £100,000–140,000 into setting up sugar refineries with a production capacity of £7000 tons of white sugar.[19] Even the costs for setting up the infinitely smaller Jummoah factory amounted to £13,480.[20]

European entrepreneurs were incentivised to invest such large sums into sugar refining by two factors. First, London sugar prices in the late 1830s were high due to a decline in imports from the British West Indies following the abolition of slavery and thus Indian sugar promised high returns on investments. Second, the abolitionist movement and anti-slavery sentiment promised to keep cheaper sugar from slave economies out of the British market and instead championed East Indies sugar. These factors created a favourable environment for sugar refining in India and both factors were inextricably associated with contemporary British political economy. Unfortunately for the entrepreneurs, the favourable conditions lasted only ten years as the 1846 Sugar Duties Bill equalised duties on all sugar, no longer distinguishing between sugar made with free or slave labour or between sugar from the British Empire and foreign sugar, pushing for a laisser-faire approach to trade.

The essential incentive for entrepreneurs was the 1836 extension of favourable tariffs on sugar imports to the British market previously available only to West Indies sugar,to the East Indies. The entrepreneurs that invested into sugar production in Bihar did so with the understanding that the decline in sugar imports from the West Indies, connected with the 1830s ban on slave trade, opened up a new opportunity for East Indies sugar. Moreover, the political-economy discourse of the 1830s promised new opportunities for sugar production relying on free labour, as the abolitionists' demand for sugar harvested with free, rather than slave, labour reverberated into a trade policy of equalisation of duties between the East and West Indies. The initial costs of setting up sugar production in the East Indies were high as it was necessary to import West Indian technologies, and adapt them to the local environment and unique organisation of labour. Moreover, some entrepreneurs began to venture into sugar cane planting rather than simply buying pre-extracted sugar juice from peasants. These individuals then needed to invest in sugar cane cultivation and also to experiment with foreign varieties of sugar cane. Yet, the manufacturers did not have the opportunity to reap the benefits of their investment as 1846 brought a new change in trade policies; this time the end of the imperial preference and the equalisation of duties on all sugar. The British market was subsequently flooded with cheaper slave-made sugar from Cuba and Brazil and East Indies sugar exporters quickly went bankrupt within a year. From the point of view of economic efficiency, the end of imperial preference was an appropriate step for the government to make. The goal was to ensure access to sugar consumption for lower-income groups in Britain and this was achieved thanks to the decline in sugar prices following the 1846 tariff

equalisation. Yet, the policy also betrays a lack of consistency in British imperial policy and the ultimate preference for the welfare of the British consumer over manufacturing interests in the Empire.

The article first focuses on the role of East Indies sugar in British political economy. Second, it presents an overview of the Indian sugar industry with a focus on the technologies used, organisation of production and labour, and the type of sugar produced. Third, it studies the activities of European sugar entrepreneurs in Bihar in the 1830s–1840s providing a case study of the costs of setting up a sugar mill, the Jummoah factory. Fourth, it compares the costs of making sugar at the Jummoah factory with an average peasant producer and with a large-scale sugar business, the Dhobah East India Company. Lastly, it considers the effects of the ending of imperial preference on the European sugar business in India.

Indian sugar industry and British political economy

Recent research has pointed towards the importance of the stagnation of agricultural technologies and productivity for the stagnation of the Indian economy as a whole from the eighteenth century onwards.[21] Although the production of commercial crops for exports was more successful than the growing of food grains, the success of staples was not universal. The development of Indian food processing industries and industries processing raw materials was uneven. India was rich in highly demanded cash crops such as jute, cotton, indigo, silk, and sugar and other crops, mainly tea and coffee, were successfully transferred. Yet, not all these commodities were successfully processed into manufactured/semi-manufactured goods for the domestic and export markets. Production of indigo, jute, and tea are examples of successful ventures.[22] Production of raw cotton for export was somewhat less successful.[23] The silk and sugar industries decidedly failed to supply export markets in the early nineteenth century.[24] Decisive factors for success seemed to be the adoption of management systems that decreased transaction costs, enabled access to capital and led to the production of commodities with the quality required for the international market.[25] Attention has been directed to the successful staples, yet by focussing on the unsuccessful ventures further factors decisive for the stagnation of the Indian agricultural and staple complex can be found. Moreover, it will illuminate the challenges faced by entrepreneurs.

The development of the white sugar industry in India has been studied by a handful of scholars. The literature points to the lag in the adoption of a modern sugar industry in India and presents three main explanations. According to Bagchi, the British Empire should be blamed for this development as it actively constrained the technological advancement of the sugar industry. Bagchi perceived the lack of capital from the metropolis available for the adoption of new technologies together with the lack of support from state as the leading cause of technological underdevelopment.[26] Ulbe Bosma in his monograph that compares the Indian and Indonesian sugar industries emphasised the resistance of the local system to the adoption of the modern sugar industry. He points out that the peasant producers of gur – local sugar – preferred gur production to supplying sugar cane to factories. He also emphasised the important role of gur in the community as it was a form of payment and an instrument for settlement of debts. Moreover, he argues that the British were very well aware of the role of gur in the rural economy and so did not push for the implementation of the sugar plantation complex.[27] In the wider framework, this was part of their policy of not disturbing agricultural economies. The second factor deterring the rise of a modern sugar

industry in India according to Bosma was the system of scattered landholding, which did not favour the large-scale production that was so important for sugar planting.[28] These explanations are based on aggregate studies of the Indian sugar industry or on micro-studies of rural agricultural producers. This article uses the several proceedings from British Select Committees on sugar production to examine the key challenges faced by entrepreneurs attempting to transfer up-to-date sugar technologies to India.

The fact that the House of Commons set up a Select Committee to inquire into the state of sugar industries in the British Empire already shows that interest in the industry was not lacking. Although the Report from the Select Committee on East India Produce, the First Report from the Select Committee on Sugar and Coffee Planting and the Report from the Select Committee on Sugar Industries, which were the outcome of these inquiries, betray that the West Indies was much more in the centre of attention, this was not to the exclusion of the East Indies.[29] The focus on the West Indies seems only natural as the decline of West Indian sugar production was feared to have immediate impact on the possibilities of the British workforce to buy sugar. Moreover, the fortunes of the West Indian planters attracted considerable attention in Britain. These two reasons make the concentration on the West Indies seem unsurprising. Nonetheless, East Indies sugar production attracted significant attention especially in the 1849 Report of the Select Committee on Coffee and Sugar Planting. This can be explained by the contemporary advocacy of the abolitionists for importing East Indies sugar as it was made with the use of free labour. In this way debates about East Indies sugar production and imports reflect the social and political-economy debate in nineteenth-century Britain well.

The nineteenth century saw the rise of laisser-faire policies, implemented most actively in the form of free trade policies, as well as the intensification of the campaign for the abolition of slavery in the British Empire.[30] Sugar had a central role in the arguments of both abolitionists and free trade advocates.[31] Due to its connection to the slave plantation complex in the West Indies, the sugar question was at the heart of anti-slavery political and economic debates in the Victorian Britain. The abolitionists campaigned for the free labour doctrine, putting emphasis on the moral dimensions to political economy. Free trade advocates argued for ending the favourable tariffs on imports of West Indian sugar and for equalisation of duties on imports of all sugar. They believed free labour to be economically superior to slave labour and thus expected that equalisation of duties on West and East Indies sugar would lead to the importation of cheaper sugar made by free labour.[32] As Richard Huzzey emphasised, this was a 'contest of two different models of anti-slavery' rather than a contest of anti-slavery principles against amoral free trade.[33] The question remained who was to pay for anti-slavery policies. In the case of the protectionist anti-slavery camp it would be the British consumer; free-trade advocates on the other hand 'offered consumers the chance to have their conscience, their sugar, and eat it.'[34] Thus, the two camps brought the subject of the welfare of the British consumer into the debate, and especially a concern for the welfare of the poorer British classes. Sugar consumption by British workers was seen as a privilege not to be redressed. Moreover, sugar consumption was considered beneficial by British politicians who believed that sugar-sweetened beverages were substituting for the consumption of alcohol.[35] Free trade campaigners and businessmen with economic interests in regions of the British Empire other than the West Indies believed that sugar produced by free labour could be cheaply gotten from other parts of the Empire such as the East Indies.[36] Moreover, competitive pressure was supposed to facilitate the switch to free labour in West Indies.

With this view in mind Parliament in 1836 passed a law: 'allowing sugar, the produce of Bengal, to be brought to England at the same duty as sugar of the West Indies; namely 24 s. a cwt'.[37] The Bill applied only to the Bengal territory and not to other parts of British India, such as Madras. The Bill was supposed to favour sugar made in British East Indies and not spur re-exports of sugar made in parts of Asia which did not belong to the British Empire.[38] This meant that the importation of sugar into British India needed to be prohibited first. Madras became the second territory to satisfy this condition and imports of sugar to Britain at the duty of 24 s. a cwt. were permitted in 1838.[39] The expectation was that the equalisation of duties would put the British East Indies on the same footing as the West Indies and attract British manufacturing interests to invest into East Indian sugar production in order to supply British markets.

The equalisation of duties seems strong evidence to counter the argument that there was an interest in Britain to suppress the development of the Indian sugar industry. However, a remarkable feature of the approach to the sugar industry in the British Empire was the conviction that no support was necessary for the rise of a modern sugar industry in India. This perception continued to be cemented in the views of the Select Committees on the Sugar Industry throughout the nineteenth century, in spite of the rise of the highly protected Continental European beet sugar industry. The Committees seemed to be unaware that infant industry protection enabled the Continental sugar beet producers to enjoy considerable technological advancement in sugar processing and refining.[40]

Indian sugar industry before the 1836 equalisation of duties

The history of Indian sugar production far predates the history of the modern sugar industry. Sugar cane is indigenous to India and mentions of sugar cane and/or juice in ancient texts suggest that sugar cane juice was used since the ancient period. Sugar juice was used for medicinal purposes as well as in cooking.[41] By the early nineteenth century sugar consumption was widespread and was a stable part of the Indian diet. Leonard Wray – a sugar planter in Jamaica and India – in the 1840s claimed that every Indian consumed at least a pound of sugar per capita per month.[42] Sugar was eaten in the form of sweetmeats termed meetoye rather than consumed in tea and coffee as in Europe.[43] Moreover, sugar consumed in India was of a different type than in Europe. Wray in the 1840s classed the various types as: rhab, boiled sugar juice, khar, coarse muscovado, and dhoosa, bhalee, and goor, which were more refined varieties of boiled sugar juice.[44]

In Britain sugar was defined according to five categories for customs purposes. Candy, brown, and white double refined sugar were considered the best quality sugar and classified for the highest tariff. Other refined sugar formed a second category, the third category was white clayed sugar, the fourth muscovado and lastly there were molasses – as Table 1 shows the more refined the sugar was, the higher the duties were. Similar categorisation and tariff rules were used throughout Europe and the Americas. Lower tariffs on less refined sugar were meant to support sugar refining in European countries.

It is important to note that the different system of categorisation and production of sugar did not preclude the export of Indian sugar to Europe entirely, although additional refining processes needed to be adopted before sugar could be sold in Europe. Indian sugar entered European markets in the eighteenth century as both the Dutch and English East India Companies used it as ballast in their ships.[45] The English East India Company started importing

Table 1. Sugar duties (per cwt.), 1836–45.

Type of sugar	Origin of sugar											
	Foreign			British colonies in America			East India Company possessions			Other British colonies		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Brown, Muscovado or Clayed unrefined	3	3		1	4		1	4		1	12	
Molases	1	3	9		9			9			9	
Refined sugar	8	8		8	8		8	8		8	8	
Candy, brown sugar	5	12		5	12		5	12		5	12	
Candy, white sugar	8	8		8	8		8	8		8	8	

Source. Sugar Duties Act 6 Will IV, pp. 1–2.

sugar from India on a commercial basis in 1791. However, the values of Indian sugar sold on the British market were small and in the period 1790–1821 formed on average only 3.1% of total imports of sugar to Britain. As Table 2 shows it proved to be a losing business for the Company as losses incurred in the period 1791–1821 far outweighed profits. The key burden turned out to be customs, merchandise, freight and demorage costs that several times outweighed the prime costs – the costs of sugar production and procurement in India.[46]

Sugar for home consumption was produced in most of the Indian subcontinent, often on small patches of land used for subsistence farming. Sugar production for export, on the other hand, was concentrated in Benares, Bengal, and Bihar with the best sugar coming from Benares – the key sugar producing region.[47] The soil type and weather were the key advantages that made Benares the chief sugar producing region. The soil was known under the name of bangor land and it needed to be irrigated. However, when irrigated the land produced at least twice as much cane per begah than the land in other parts of British India.[48] Besides, the quality of the cane was also said to be higher.[49] In Bengal, sugar was produced on bhat soils which were of the alluvial type and retained moisture well thanks to a large nitre content.[50] Weather was of course the decisive factor in respect to irrigation. The weather northward from Bengal is dry with hot winds, which made irrigation a necessary condition for cultivation of sugar cane. In Bengal itself, and southward from Bengal, irrigation did not need to be very extensive as there was more rain.[51] Tirhoot, the region that attracted the attention of the European sugar manufacturers, is located in the Bihar region northwards from Bengal between Benares and Bengal and its bhat soils did not require irrigation.[52] The paradox of the situation is that the less advantageous climate of Benares, which made irrigation a necessity for sugar cane cultivation, resulted in higher yields of better quality sugar cane.

Traditionally sugar cane cultivation in India was carried out by peasants. Sugar cane was cultivated normally on small patches of land as peasants cultivated other crops alongside cane on their fields. Peasants devoting only five acres to sugar cane were considered large land proprietors.[53] Cane was cultivated with the use of cattle ploughs and since the majority of peasants devoted only a small acreage to sugar cane shared ploughing was common.[54] Sugar used for subsistence consumption was obtained by boiling cane juice at peasant homes.

Peasants producing cane juice for sale on the market relied on advances for investment into sugar cultivation. Money lenders called sahookars advanced money to peasants in the form of a loan to cultivate a specific amount of sugar cane, which they then often bought from the peasant.[55] In order to get sugar suitable for intra-Indian or regional trade it was necessary to refine the boiled sugar juice made by peasants.[56] For example, sugar sent to Europe was of the khar variety, that is muscovado of the Indian type. Before being sent to

Table 2. English East India Company's imports of Indian sugar to Britain, 1790–1821.

Year	Quantity (cwt.)	Share of prime costs on total costs (%)	Share of custom duty on total cost (%)	Share of convoy duty, freight, demorage, charges on merchandise (%)	Profit (£)	Loss (£)	Share of Indian sugar on total sugar imports (%)	Total sugar imports (cwt.)
1790	0	0.0	0.0	0.0	0		0.0	2,402,000
1791	4,017	22.0	39.6	38.4	1,027		1.0	2,304,000
1792	3,310	20.2	41.2	38.5	1,748		0.6	2,721,000
1793	36,246	45.9	0.0	54.1	4,872		3.7	2,955,000
1794	57,583	54.0	0.0	46.0		25,650	4.6	3,348,000
1795	155,682	45.0	0.0	55.0		85,945	15.0	2,901,000
1796	84,606	45.8	0.0	54.2	18,168		8.2	3,057,000
1797	70,891	52.6	0.0	52.4	41,319		7.1	2,885,000
1798	138,864	40.7	0.0	58.2	82,164		12.5	3,663,000
1799	46,001	37.5	0.4	65.5	16,150		2.6	4,637,000
1800	111,070	34.1	1.4	63.7		106,923	5.7	4,301,000
1801	55,797	35.0	1.7	60.7		26,370	2.7	5,436,000
1802	55,786	34.4	3.2	62.4		56,761	1.7	5,878,000
1803	27,141	41.6	1.1	57.3		38,482	1.3	4,356,000
1804	75,757	46.9	1.3	51.9		1,673	4.5	4,440,000
1805	102,735	42.2	1.2	56.6		31,281	6.8	4,337,000
1806	65,806	38.9	1.0	60.1		68,481	2.8	5,205,000
1807	105,503	39.4	0.8	59.8		139,514	4.1	4,972,000
1808	48,447	42.0	0.8	57.3		68,873	1.7	5,128,000
1809	31,618	41.8	0.7	57.5		50,290	1.3	5,451,000
1810	40,534	44.4	0.9	54.7		11,651	1.4	6,558,000
1811	1,824	53.1	0.9	46.0		325	0.1	5,346,000
1812	67,610	38.1	0.8	61.1		48,972	3.1	5,033,000
1813	45,166	36.4	1.1	62.5	15,911		0.0	0
1814	36,725	41.4	0.0	58.6	58,896		2.7	5,493,000
1815	0	0.0	0.0	0.0	0	0	0.0	5,440,000
1816	12,025	49.2	0.0	50.8		6,760	0.5	5,141,000
1817	1,275	51.8	0.0	48.2		147	0.1	5,189,000
1818	19,086	54.7	0.0	45.3		12,015	0.8	5,418,000
1819	20,754	51.8	0.0	48.2		18,963	0.7	5,568,000
1820	18,318	68.5	0.0	31.5		8,434	0.6	5,553,000
1821	39,731	72.8	0.0	27.2		20,720	1.0	5,739,000
Total	1,579,908	43.0	1.0	56.4	240,255	828,230		140,855,000
Average	49372.1	41.3	1.7	59.1	21,841.4	37,646.8	3.09	4,401,718.8

Source. House of Commons, *An Account of Sugar Imported by the East India Company* (1823); B. R. Mitchell, *British Historical Statistics* (Cambridge, 1988), pp. 286, 289.

Europe the khar went through the process of whitening, which was 'performed by the use of a water weed, which is termed seewah, up the country [north from Calcutta]; the watery particles of this weed percolate through the mass of sugar, and wash the crystals; the consequence is, that the khar is much whitened, the crystals are very small and weak, but at the same time as it gets rid of a large quantity of uncrystallisable matter'.[57] Alternatively, the sugar exported to Europe was a re-boiled rob or shukhah. Both rob and shukhah were names used for a crudely boiled sugar juice produced by the sugar cultivator. Re-boiling was a separate trade from sugar growing.[58]

European sugar producers in Bihar, 1830s–1840s

A new phase in sugar exportation from India to Britain came with the equalisation of custom duties between the East Indies and West Indies in 1836, which provided an impetus for

importing sugar from India. We are left with more extensive and detailed information on sugar production in Bihar, which was for the purposes of sugar exports formally considered part of Bengal. In the 1840s, Bihar was a region newly exporting sugar to Europe and yet of prime interest for European manufacturers.[59] Among the sugar entrepreneurs were West Indies sugar planters as well as traders with interests in diverse commodities. European sugar entrepreneurs adopted West Indian sugar technologies in order to produce muscovado sugar of the quality demanded in Europe. The technologies they adopted – steam engines and vacuo pans – were even more advanced than in the West Indies itself.[60] However, as transfers of technologies stand for significantly more than simple adoption of machinery and as the Indian system of sugar production differed starkly from the West Indies technology complex, the adoption of steam engines and vacuo pans did not mean an automatic advantage vis-à-vis West Indies. The adoption of the technology complex was not simple as both the environment and socio-economic complex differed from the West Indies. Among the key challenges were the quality and type of soil, lack of experience with sugar cane varieties in the new environment, labour management, transport, and costs of technologies and adaptations. I will illustrate how costly these challenges proved for sugar entrepreneurs making sugar from scratch through the case of the Jummoah factory, which represents an appropriate example of an European-owned sugar factory with adjoining sugar plantation in the interior of Bihar.

Two approaches to sugar production emerged among the European entrepreneurs: the purchase of ready-made sugar from peasants and the production of sugar from scratch according to the West Indies' principles. The former strategy was more prevalent as it was less risky and did not require special knowledge of sugar-making or large amounts of capital. This approach was taken especially by European leaseholders leasing land from the East India Company and then renting all or part of this land to peasants.[61] For example, Andrew Sym having a lease of 60,000 acres in Goruckpoor, Bengal, pointed out: 'sugar cane, indigo, and opium; we do not cultivate all these things at our own risk, but the tenants cultivate them'.[62] This was not a general aversion to making and exporting sugar but rather a sign of a lack of interest in tying large amounts of capital into sugar production. Sym used only 200 acres of the land himself for sugar cane growing and the sugar that he was making on this land was of the native variety.[63] Mostly, Sym bought cane juice from peasants that were renting his land. This sugar cane juice was already boiled by the peasants into a form called rhab. Since rhab contained parts of the cane and other impurities and had a low concentration of sucrose it was necessary to press the juice to remove excess water. Shukar was produced in this way. In the next step shukar was mixed with water and re-boiled into syrup, syrup was then evaporated to make it into a granular substance.[64]

Alternatively, traders bought sugar in the form of dhoosa, bhalee or goor on the Calcutta market. These sugars, though it was still necessary to purify them and re-boil them in vacuo, were relatively fine and generated less refuse. Dhoosa yielded 65–70% of sugar per its original weight, bhalee 60%, goor 50%.[65] Sugar refineries that re-boiled dhoosa, bhalee, and goor followed the West Indies principles and adopted vacuo pans technology. The muscovado sugar that they produced was of a far higher quality than the one made from boiled sugar juice and so fetched a higher price at sales in London. The major refineries that produced muscovado in vacuo were Dhobah, Cossipore, Seebpore, Albion, and Ballicall.[66] Two problems were connected with refining the sugar juice bought from peasants, and to a lesser extent also with dhoosa, bhalee and goor refining. The first was the quality of the sugar,

particularly impurities contained in the sugar were a problem, and the losses sustained during the re-boiling processes.[67] In the process of making one maund of rhab at least two maunds of refuse molasses were produced.[68] The second was the quantity of boiled sugar available for purchase. As the consumption of sugar steadily rose over the nineteenth century, prices of boiled sugar juice rose and the quantities available decreased.[69]

The second approach to sugar-making entailed a higher level of risk than the purchase of sugar cane juice or lightly refined sugar, especially since it usually meant specialisation in a sole commodity. The newly coming sugar entrepreneurs interested in a wholesale transfer of West Indies sugar technologies often had previous experience with sugar production in the West Indies and many of them continued with their sugar business in West Indies while trying to expand into India.[70] European sugar merchants/manufacturers were attracted to the East Indies by the decreasing profitability of sugar production in the British West Indies. They were interested in starting sugar production in Bihar, especially in the region of Tirhoot.[71] Tirhoot had previously been a centre of indigo production but the decreasing profitability facilitated interest in new commercial activities and principally in sugar.[72] European sugar manufacturers often bought former indigo factories.[73] Alternatively, they rented land, mostly from zamindars.[74] These entrepreneurs often relied on experimentation and attempted the adoption of new varieties of sugar cane. A key part of their investment went into the transfer of sugar technologies.

The adoption of West Indies production methods in Bihar proved to be challenging as a range of adaptations was needed. Entrepreneurs were required to adapt to the use of different cane varieties, to adapt the principles of cultivation to the climate and soil type, and to make alterations in labour organisation and management. The European manufacturers lacked knowledge of the environment 'having everything to learn as to the cultivation and selection of soils and the proper time for planting'.[75] As the statement from Arthur Crooke, a merchant in Liverpool and sugar planter in the East Indies shows, errors of judgement were not unheard of: 'the boongah soil is very difficult to work; a very dry soil; but having the reputation in the Benares district of being the best adapted to cane, we put the most of our cultivation in it, and avoided the other [phoolponky], which afterwards proved to be the best soil for cane'.[76] Planting cane also was not without problems. Arthur Crooke complained of the great difficulties with getting cane seed in the beginning of his involvement in sugar planting in Bihar. Choosing the right variety of cane was also important. European planters introduced Otaheite cane into Bihar but did not succeed in substituting the native cane entirely.[77] Otaheite was a cane native to Tahiti, which due to its high yields by the nineteenth century became the standard variety planted in the West Indies, Mauritius, Brazil, and Mexico and was widely cultivated also in Java and India.[78] European planters acquired this cane from the Company Gardens in Calcutta.[79] Otaheite cane produced high yields also in Bihar but only in the first year after planting and its yields often failed in the second year. Planters therefore cultivated red Bourbon cane and Chinea cane – cane variety originally from China – alongside Otaheite. Furthermore, the cane crop was endangered by the vagaries of environment. Leonard Wray – a sugar planter – remarked that 'India has many enemies to the cane plant, which are unknown elsewhere, as white ants, jackalls, wild pigs, and in other districts wild elephants, and also hot winds'.[80]

The organisation of labour in the Indian sugar industry was distinctly different from the West Indies. Instead of relying primarily on human labour, cattle and ploughs were used in

combination with human labour for the tasks of land preparation, cane-planting, cutting and grinding the canes, and boiling the cane juice.[81] In areas where irrigation was necessary it was also done by a combination of human and animal power as irrigation systems powered by steam were exceedingly rare.[82] The manufacturers relied on hired labourers termed coolies for most of these tasks, and especially in weeding, and hoeing. Contemporaries believed that the productivity of coolie labour was low in comparison with free African labour in the West Indies, arguing that six hired labourers in India performed the work of one free African labourer. Manufacturers used two approaches to what they perceived as a productivity problem – supervision and payment by task. Crooke had one superintendent per 20 coolies and this superintendent was supervised by a 'factory servant' termed lollah.[83] Some manufactures paid coolies by task, others such as Crooke by day. The daily wage for hoeing at Crooke's estate was 1 and ¼ d. per day.[84] Crooke found it difficult to pay his labourers by task as he did not have enough free labour to tap into and needed to thus create longer-term relationships with his labourers. The seasonality of work was driven by rainfall and the sugar cane cycle. Rainfall in July, August and part of September did not allow cultivation in Tirhoot but with the exception of these months Crooke did not have a problem to find work for his labourers. His concern was rather the lack of an available labour force.[85]

Further challenges were connected with cane processing. In India cattle-mills were used for processing sugar juice but this technology did not allow for precision. Thus, a large part of the cane 'runs to molasses' rather than being made into muscovado, which could be further refined and was thus suitable for exports.[86] Crucially cattle mills did not have enough horsepower to grind the cane fully.[87] Molasses also found a market and were sold to local confectioners and distillers. However, the supply of molasses in Tirhoot soon outstripped the demand and transport to Calcutta was not be profitable for a lower value item such as molasses. For example, in 1839 Sym sold sugar for 46 s. per cwt on the London market and molasses for 5 s. per cwt within India. Besides, molasses were subject to fermentation in hot climates.[88] These factors created a strong incentive to innovate technologies and some manufacturers, in spite of the expenses this represented, decided for technology upgrade.

An example is Crooke's Jummoah factory in the interior of Bihar some 330 miles from Calcutta.[89] His estate was situated on the Bogmutty river banks and consisted of 6,000 acres of rented land of which 600 acres he used for sugar cane cultivation.[90] Initially, Crooke relied on cattle-mills for refining but after the first year upgraded to the steam-engines and open pans technology used in the West Indies. The total costs for setting up the Jummoah sugar mill to process sugar cane from Crooke's circa 600 acres of land, was £3661 (Table 3). As Table 3 illustrates the cost of machinery was not the only outlay, the sugar pans and steam engine came from Britain and needed to be transported through Calcutta to the interior of Tirhoot. Moreover, the transport from Calcutta to the factory in Tirhoot was particularly risky as the machinery needed to be taken by river, insurance would not cover the transport and 'if one boat had gone down, the whole cane crop of the year would have been useless'.[91]

Moreover, at least in the case of the first manufacturers that pioneered the use of new technologies in India, significant outlays would go into adaptations. It is not possible to disentangle the costs of adaptations versus the initial costs of machinery and factory building. Crooke's estimates seem to indicate that adaptations increased the costs of the transfer several times as according to his estimates by 1846 the overall costs of building the Jummoah factory reached £13,480.[92] These costs were owing to 'building and rebuilding, taking down one set of machinery and putting up another'.[93]

Table 3. Costs of setting up a sugar mill in Tirhoot, 1841–1842.

Crooke's estate	
Costs of setting up Jummoah factory	
two sugar mills (£)	443
set of sugar pans made in England (£)	630
set of sugar pans made in Calcutta (£)*	945
steam engine (£)	1,350
sundry costs connected to steam engine (£)	93
further costs (£)**	200
Total	3,661

*Taking lower estimate of 1.5 times more expensive than in England, the only item made outside England.
**It is not clear what these costs are, these are the difference between the total figure cited in the document and the costs of English machinery stated above.
Source. *First report of S.C. on sugar and coffee*, pp. 14, 15.

Sugar manufacturers and merchants did not face challenges only in the production phase: insurance, interest on borrowed capital, commission paid to managing agencies, and freight often posed high costs and/or were a source of uncertainty. Interest rates on borrowed capital were 10% so not exorbitantly high, however this increased through the medium of commission charges.[94] Managing agencies that lent capital to sugar merchants/manufacturers expected to also earn commission charges on merchandise intermediation.[95] This commission covered several charges of intermediation between sugar producers in India and final buyers on the London market: 'there is the commission on shipment. […] Five per cent, is the usual commission in Calcutta. Then there are the go-down charges, taking to the custom-house, and shipping'.[96] Overall, the commission, alternatively also called agency charges, amounted to 10% of the value of sugar. Only larger manufacturers such as the Dhobah East India Sugar Company – a joint-stock company with a capital of £200,000 in 1848 – did not rely on intermediaries and saved on commission.[97]

During this whole period sugar remained ballast so the charges for freight were lower than if sugar had been transported as an export good of its own standing. When taken as ballast the average price in the 1840s was £5 per ton. However, there were freight price fluctuations during the year according to demand for rice, which competed for ballast with sugar. It was expected by both manufacturers and the Select Committee that if demand for bulky commodities such as sugar and rice increased, sugar freight costs would expand.[98] Moreover, since most producers were not located in Calcutta itself there were the costs of internal freight. Crooke estimated the costs of freight from Tirhoot to Calcutta to be 19 s. 7d. per ton. Transport was risky as sugar was carried by boats on rivers and insurance was necessary to protect against the loss of the whole consignment. Yet, the insurance could not protect the merchant fully as the infrastructure was underdeveloped, which made the transport slow and cargo liable to damage. From Crooke's description it is clear that the transaction costs of this type of transport were far from negligible: the journey took two to three months and some 5% of the value of sugar was lost to quality deterioration and robbery.[99]

The overall costs due to churrundar's wages – a servant of the local insurance office –, damages and losses and insurance were estimated by Crooke to amount to £2 2 s. 6d. per ton. The lack of infrastructure was a crucial shortcoming as transport by a steamboat did not run the risk of losses and damages and was considered safe enough for manufacturers

to resign on insurance. Transportation by steamboat entailed a saving of £1 14 s. 9d. per ton in spite of the fact that transport by steamboat was more expensive.[100] Considering that insurance for the Calcutta-London transport together with charges in London amounted to around £5 per ton in the late 1840s, the costs of insurance and damages incurred in the Tirhoot-Calcutta transport were exorbitant.[101]

Effects of new technologies on Bihar sugar production

When assessing the transfer of West Indies sugar technologies to Bihar the key issues to consider are the production costs in Bihar, the quantity and quality of production, as well as the costs of transport and charges in London/Liverpool. The examples of the Jummoah and Dhobah East India Company illustrate this. Jummoah factory was a small-scale refinery with a high unit cost of production, further burdened by high transport costs to Calcutta. The Dhobah East India Company owned three factories close to Calcutta and produced sugar on a significantly larger scale with considerably lower production costs.[102]

Table 4 shows the estimates of the costs of bringing one ton of East Indies sugar made at Crooke's Jummoah factory according to the West Indies principles to London. The case of the Jummoah factory represents a valuable source of information on capital requirements and sources of losses along with the potential for improvement. As Table 4 illustrates, sugar production had high capital requirements as the cultivation of sugar on 600 acres required working capital of £3,000. When we look at the production costs per ton the key outlay was cultivation and refining costs at £35, then duty at £14, transport to London together with insurance and charges in London was at £9. That brought the overall total to £58, yet the best price Crooke received for his sugar was £51 15 s., which would mean a loss of £6 5 s. per ton. In order to find the underlying reasons for the loss incurred, it is necessary to compare Jummoah production with the profitable peasant producers.

Table 5 shows the costs of sugar production incurred by an average peasant cultivating sugar. On average, a peasant cultivating sugar for the market had 0.25 acres of land devoted

Table 4. Estimate of the costs of bringing 1 ton of East Indies sugar made according to West Indies principles to the British market, 1840s.

Crooke's estate, Jummoah factory		
European sugar manufacturer (West Indies technologies) costs per acre cultivation of soil losses on villages Manufacture transport to Calcutta + insurance		
Total Production Costs (£/acre)	**£5**	
Production costs (per ton) Transport to London/Liverpool (per ton) Insurance and charges in London/Liverpool (per ton) Duties (per ton)	35 5 4 14	
Costs total (£/ton)	**£58**	
Cultivation (acres) Cultivation costs total Production of muscovado (tons) If cwt sale price is 51s. 9d*	600 3,000 84	
If ton sale price is £51 15s	**–£6 5s.**	**Loss on 84 tons £525****

*Price with duty according to which Crooke would make profit.
**Gross profit not accounting for investment.
Source. *First report of S.C. on sugar and coffee*, pp. 17–20.

to sugar and cultivation cost him 12.8 s. That means that the cultivation costs per acre were £2 10 s. for the production of boiled sugar juice or goor. Goor needed further re-boiling and refining, though these processes would be carried out by sugar traders/manufacturers. Table 6 shows that an average peasant cultivator did make a profit of £2 15 s. from his 0.25 acres of sugar cane and that is because he was able to produce 200 lbs. of goor, which corresponds to 7.1 cwt of goor per acre. Since 7.1 cwt would give after refining 3.5 cwt of muscovado per acre, an average peasant sugar cultivator was producing more muscovado sugar per acre than Crooke's Jummoah factory, in spite of the losses due to re-boiling and refining. Table 7 shows that the production of muscovado per acre at the Jummoah factory was only 2.8 cwt so 20% lower than in the case of peasant cultivators. To put this into a wider context, Crooke believed that the productivity of his land should be 4 cwt per acre, his key problem was that he kept losing a large acreage of sugar cane to bad harvests, principally the Otaheite cane. If the Jummoah factory produced 4 cwt per acre of muscovado with the same production costs Crooke would be making a profit of £450 if the sale price in London/Liverpool remained £51 15 s. This highlights the second issue – the quality of the refined sugar. For example, in the late 1840s white sugar sold in London for approximately 40–50% more than brown sugar. Thus, the quality of the product had a strong bearing on profits.

Overall, then the key issue for Crooke was to improve production per acre. In Bengal, production of muscovado ranged between 2.7 and 10.1 cwt per acre depending on the soil

Table 5. Estimates of costs of sugar production to average peasant cultivator, 1840s.

Costs to peasant cultivator*	0.25 acre (s.)	Per acre (s.)
Planting	3	12
3 irrigations	3.4	13.4
12 hoeings	3.4	13.4
rent**	3	12
Total	12.8	50.8

*For a season April–November/December.
**Rent per year.
Source. First report of S.C. on sugar and coffee, pp. 49–50.

Table 6. Sugar Production by average peasant cultivator, 1840s.

Average peasant sugar cultivator	
land (acres)	0.25
goor production (lbs.)	200
gross profit	£2 15s.
goor production per acre (cwt)	7.1
Muscovado production per acre (cwt)*	**3.5**

*Refining done by a sugar trader/manufacturer after sale.
Source. First report of S.C. on sugar and coffee, pp. 48–51.

Table 7. Sugar production at Jummoah factory (West Indies technologies), 1840s.

Crooke's estate, Jummoah factory	
Cultivation (acres)	600
Total production of muscovado (tons)	84
Muscovado production per acre (cwt)	**2.8**
Costs per acre (s.)	**100**

Source. First report of S.C. on sugar and coffee, pp. 17–20.

type, mode of cultivation and 'degree of attention'.[103] Irrigation, or rather the lack of it, played an essential role. Crooke considered that with manuring and irrigation muscovado production per acre could be increased to 10 cwt per acre at his estate.[104] However, irrigation would be very expensive as it was done by a combination of human and animal labour. Water for irrigation was taken from deep wells or rivers with the use of oxen or manual labour. The most common method for irrigation relied on the use of oxen and a moat – a large bucket with capacity of 12 gallons – that was lowered into the well and then lifted with the use of oxen and a revolving wheel. This method cost 5 s. 4d. per acre per one irrigation.[105] The number of irrigations required for the best results depended on the soil, climate, and time of year, peasants irrigated land under sugar cultivation even three times per season.

As valuable as the information from the Jummoah factory is for identifying the sources of low productivity, it should not be concluded that sugar production was bound to be unprofitable for all European manufacturers/traders in India. Large-scale producers that were able to keep unit costs of investment down, buy sugar for favourable prices, and produce large volumes of sugar did well. The largest sugar refining company in India, the Dhobah East India Company, found its venture profitable and was widely known to be a successful business. As John Bagshaw MP put it: 'they had been gainers for many years before [1847]; it was one of the most profitable concerns in India'.[106]

The Dhobah Company was a publicly traded company with a capital of £200,000. In contrast to the Jummoah factory it focussed only on refining sugar bought from peasants and did not own any sugar cane plantation.[107] The Dhobah Company had three sugar refineries with an aggregate capacity of annual production of 7,000 tons of white sugar.[108] The setting up of the three refineries cost Dhobah between £100,000–140,000. Table 8 shows that Dhobah was able to cut transport, insurance and other charges to £7.5 per ton, a more than 15% saving in comparison to the Jummoah factory. It seems that among these charges were also the costs of refining.[109] The key expenditure was the cost of sugar for refining. The buying price of sugar fluctuated annually on the Calcutta market depending on production and domestic demand, although the ability of Dhobah's merchants to buy cheap also played a role.[110] The price fluctuations were very significant as for example in 1846 Dhobah bought sugar on Calcutta market for 37 s. per cwt and in 1847 for 28 s. per cwt.[111] The key risk the company faced was price volatility on the London and Calcutta markets.[112] Overall, in the period 1836/7–1845 it made a gross profit of £84,000 on sugar. The profits made enabled the company to start paying dividends, in 1838/9 it paid £13 per share, the highest dividends were paid in 1840 at over £18 per share. In the year 1841 and 1845 Dhobah broke even and made no loss or profit, in 1844 it made a loss

Table 8. Estimates of costs of refining and bringing 1 ton of sugar to the British market, 1840.

Dhobah East India Company	
Buying price of sugar in Calcutta (£ per ton)	25
Insurance and charges (£ per ton)*	2.5
Transport (£ per ton)	5
Costs total (£ per ton)	32.5
Sale price in London**	38
Profit (£ per ton)	**5.5**

*Should include also costs of refining.
**Excluding duty.
Source. First report of S.C. on sugar and coffee, pp. 98–100.

£4,000-£5,000.[113] In those years sugar prices in Calcutta were high due to high demand for sugar and a bad crop and prices were low on the London market. However, the Dhobah Company was not solely dependent on sugar and also produced rum and distilleries, which supported its profitability.

To sum up, three factors become apparent. First, the crucial difference between profitable and unprofitable ventures was unit costs and volume of production as the cases of the Dhobah Company and Jummoah factory show. The Dhobah factory produced almost 84 times more sugar and of higher quality than the Jummoah factory with lower costs per unit of production. Second, in the short run sugar refining was more profitable than making sugar from scratch. The key difference here was the need to experiment with sugar cane varieties, lack of knowledge of soil types on the part of the manufacturers, and lack of irrigation. All these factors underpinned low sugar yields and thus low production per acre. In the case of the Jummoah factory, production per acre was 20% lower than for peasant cultivators. Third, in the long run if sugar production was to be profitable in India, cane yields per acre would have to increase and unit costs per ton of sugar decrease. If we take the example of an average peasant producer: production costs of a ton of unrefined sugar were £14.5, when transport costs to London, insurance and charges, and duty are included, the costs rose to £37.5. This is without adding the costs of refining and re-boiling and since only high quality sugar was being sold for £40–50 per ton before 1847, manufacturers would find it difficult to make profit if their production costs were as high as in the case of average peasant cultivators.

If Indian sugar was to supply domestic consumption as well as be exported to foreign markets the volume of production would have to drastically increase. In order to increase cane yields per acre and decrease costs per ton three interventions would have been necessary – irrigation, proliferation of advanced sugar technologies such as vacuo pans, and improved possibilities for transporting sugar within India. As the Reports from the Select Committee show, contemporary officials and manufacturers were aware that the extension of irrigation would be essential for improvement of sugar yields. For example, Captain A. Cotton, a civil engineer in charge of the works in Vizagapatam, Madras, promoted the building of a dam on the Godavari river with the argument that it would increase the yields of rice and 'improve the productive powers of the soil, […thus] raising the necessary food by the fewer people will be, to leave a larger proportion of the population disposable for the production of comforts and luxuries'.[114] By the luxuries he chiefly meant sugar, which he argued could be sold on the market and thus become a source of specie. As Vizagapatam suffered from specie outflow, production of export crops was raised by Cotton in his memorandum on sugar cultivation for the Government in India as essential remedy for the problem.[115]

The last factor to consider is labour costs. What made East Indies sugar production uncompetitive vis-a-vis slave-made sugar from Cuba and Brazil? Interestingly labour costs were not considered to be an impediment to sugar manufacturing, despite the low productivity of labour. Captain A. Cotton argued that labour was cheap in the East Indies.[116] In the West Indies labour input was the key channel for increasing productivity.[117] In India, human labour was not the only source of power as cattle and ploughs were used in planting and irrigation. Most importantly the low productivity per acre of sugar cane in India was mostly due to a lack of irrigation technology, problems with the adoption of higher-yielding sugar cane varieties and the vagaries of weather.

Imperial preference and Indian sugar on the British market: Sugar prices in London and production costs in Bengal

The Equalisation of duties between the East and West Indies was not the only factor that motivated manufacturers to set up sugar production in India, the key factor was high sugar prices on the London market in the 1830s.[118] The rise in sugar prices was driven by the decline of imports from the West Indies following the end of the slave trade. Moreover, the expansion of imports of Indian sugar was also perceived positively by British policy makers and the East India Company that represented the governing body of the Bengal Presidency. The rising demand for sugar on the British market coincided with the declining competitiveness of Indian cottons in Britain. In the early 1840s sugar became the second largest export item of Bengal on the British market and thus was perceived as an item that would help to boost Bengal exports.[119] Sugar was to become an important source of foreign exchange for an economy whose trade balance was declining. India was known to produce large amounts of sugar for home consumption and for exports to the Asian markets. It was thus perceived that with British capital and knowledge of sugar manufacturing, sugar exports would expand without considerable difficulties. Issues of profitability came to the fore of public discussion only once sugar manufacturers in the Bengal Presidency started to make losses.

The crucial game changer for the fortunes of the Bengal sugar manufacturers was the Sugar Duties Bill of 1846 that was passed as part of the Importation Act of 1846, which simultaneously also repealed the Corn Laws.[120] The Bill equalised duties on sugar from British colonies and outside the Empire. The equalisation was to be gradual and was to take place over the period 1846–1851.[121] This Bill was part of the Whigs' policy of abandoning the imperial preference and favouring free trade.[122] The intention of the new policy was to decrease prices for consumers and thus expand consumption.[123] It was supposed that the increased consumption would offset the losses by the planters as well as the losses to the Exchequer.[124] The Act, however, proved ruinous for sugar producers across the British Empire and led to the 1847–1848 crisis for sugar firms driven by the decline in sugar prices in London (Table 9). Literature has mostly focussed on the effects on sugar planters in the West Indies and in Mauritius as these two regions produced a large share of sugar for the London market.[125] Moreover, West Indies sugar planters gained attention due to their former connection to slavery, declining fortunes and political influence. In West Indies the effects were severe and led in many cases also to bankruptcies, especially as many of the West Indian planters were often already indebted. The overall losses were huge as in the year 1847, according to the Supplement to the Report on Coffee and Sugar Plantation, 'leaves the British West Indian Planters absolutely £982,662 out of pocket, losers in short, by the year's transactions, of only a trifle under one million sterling'.[126] The crisis thus frequently meant a forfeiture of their mortgaged estates to the London banks.[127] However, the crisis was no less severe in the Bengal sugar industry and this was also understood by the contemporaries.

The European-owned sugar business in India was not built on sound ground and was an easy victim to price fluctuations. Table 9 shows the decline in selling prices after sugar from non-British settlements relying on slave labour was allowed to enter the British market. The sugar manufacturers incurred huge losses and not even the large enterprises could sustain the competition and were forced to close down.[128] The largest sugar enterprise in India, the Dhobah East India Sugar Company, made a loss of £40,000–50,000 in 1846 and a further £70,000 in 1847. The losses in those two years entirely wiped out the profits of £84,000 made

Table 9. Average sugar prices on the London market, 1830–1850.

Year	Average price of muscovado sugar (per cwt exclusive of duty)					
	West Indies		**Mauritius***		**British East India***	
	s.	d.	s.	d.	s.	d.
1830	24	11				
1831	23	8				
1832	27	8				
1833	29	8				
1834	29	5				
1835	33	5				
1836	40	10				
1837	34	7				
1838	33	8				
1839	39	2				
1840	49	1				
1841	30	8				
1842	36	11				
1843	33	9	33	10	35	5
1844	33	8	32	10	35	1
1845	32	11	31	10	33	5
1846	31	5	33	6	34	8
1847	24	3	30	4	27	
1848	23	8	23	3	25	4
1849	25	4	25	1	27	4
1850	26	1	25		27	3

*No data before 1842.
Source. House of Commons, *A return on quantities of sugar 1800–51* (1852), p. 3.

by the company in sugar trading in 1837–1845.[129] The losses do not take into account investment of more than £300,000 into fixed capital and this loss could not be restored by immediate sale of the factories.[130] The decision taken by the Board of the Dhobah Company was to cease production in 1848 to avoid further losses.[131] Similar steps were taken by other manufacturers as losses were made universally in 1846–1847.[132] The key problem manufacturers faced was that prices of sugar in Calcutta were increasing at the same time as London prices were declining. As most manufacturers bought sugar juice rather than produced muscovado from scratch, they were hard hit. The manufacturers that made muscovado from their own sugar cane were not better off as their production was not profitable due to the large initial investments and continual investment into adaptations and experimentation.[133] It could hardly be expected that the technology transfer would be costless and enterprises would immediately start making profit. The curious fact though is that sugar manufacturers did not try to produce sugar for the expanding market in India. The argument made in the literature is that Indian consumers preferred gur to European types of sugar.[134] Yet, by the late nineteenth century sugar started to be imported to India from South Asia and from 1890s even European beet sugar was imported.[135] The more plausible explanation is that the prices in India were not high enough to allow for profits on the part of European sugar manufacturers.[136]

The European manufacturers were well aware that their business would stop being profitable if prices in London dropped. They thus showed a great indignation at such a sudden change in policies that caused an immediate fall in sugar sale prices in Britain. Some directly blamed the government, such as in the case of the G.G de H. Larpent, Bart., proprietor of estates in Mauritius: 'vacillation of Parliament, the changes of legislation, and the departure from what was understood to be the system to be adopted during the time we laid out our

Table 10. Sugar duties (per cwt), 1848–1854.

	Candy, brown, white (double refined)				Other refined				White clayed				Brown clayed				Muscovado				Molasses			
	Foreign		British Empire		Foreign		British Empire		Foreign		British Empire		Foreign		British Empire		Foreign		British Empire		Foreign		British Empire	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1848–1849	27	9	23	4	24	8	21		21	7	18	4	20		16		18	6	15	9	6	4	5	7
1849–1850	25	6	21	9	22	8	19	4	19	10	16	11	18	6	15	3	17		14	6	5	11	5	3
1850–1851	23	3	19	10	20	8	17	8	18	1	15	5	17		14	6	15	6	13	3	5	4	4	9
1851–1852	21		18		18	8	16		16	4	14		15	6	13	9	14		12		4	11	4	4
1852–1853	19		17		16	8	15		14	9	13	3	14	6	12	6	13		11	6	4	6	4	1
1853–1854	17		16		15	2	14		13	2	12	5	13		11	3	12		11		4	1	3	11
1854–	15		15		13	4	13	4	11	8	11	8	10		10		10		10		3	9	3	9

Source. Sugar Duties Act 6 Will IV, pp. 1-2.

money, and sent out our machinery, and carried on those works'.[137] Moreover, manufacturers mostly professed not to have any inkling that the policies were to change.[138] The only exception seems to be Sir John Gladstone, 'who foreseeing probably, and having a longer view than We had, that slave-grown sugar was likely to come in, he was anxious to get out of it' tried to sell his factory in 1845.[139] Overall, East Indies sugar entrepreneurs considered the policies un-systemic, giving wrong signals to investors and manufacturers and a cause of investment losses.[140]

The aims of the Whig policies – reduction of consumer prices and a shift towards free trade in order to boost production efficiency – are clear and from the point of view of consumers and efficiency in general commendable. Yet, the policy changes in the first part of the nineteenth century also betray a lack of consideration for manufacturers, preference for the welfare of British consumers and most importantly an absence of long-run commercial policies towards India and a lack of understanding of the effects of policy changes in Britain on the Empire overseas. Moreover, no consideration was taken of the fact that sugar was the second most important channel for remitting revenues from India to Britain for the payment of 'Government servants, and for the payment of the dividends upon East India stock' for which 'upwards of three millions a year' were needed.[141]

Conclusion

Recent literature by Broadberry and Gupta has emphasised the role declining agricultural productivity played in the overall stagnation of the Indian economy during the colonial period.[142] This article concurs with these findings and highlights that sugar yields per acre in India were significantly lower than in other sugar producing regions. They were almost six times lower than in either the West Indies or the Straits of Malaca. Inadequate access to modern irrigation methods, together with low sugar-yielding varieties of cane were the chief culprits. Gupta highlights the persistent underinvestment in agriculture on the part of the British Empire.[143] Yet, state-sponsored investment was not the only possible channel of investment – in the case of commercial crops investment could also have come from entrepreneurs if such a step would have brought profits. In the 1830s–1840s European sugar manufacturers invested large sums into the transfer of sugar refining technologies to Bihar and some even invested into the adoption of new sugar cane varieties. Yet, the experimentation was cut short by a sudden shift in British trade policies, which meant ruin for Bihar sugar manufacturers. Whereas the 1836 equalisation of duties between the British East and West Indies created an incentive for European sugar entrepreneurs to venture into the Indian sugar industry and adopt innovative sugar refining technologies, the 1846 end of the Imperial preference system for sugar imports put an end to these efforts. To revert back to the question of whether a modern sugar industry failed to develop in India due to management failure, a technological failure, or due to the policies of the British Empire, it is necessary to emphasise the role of imperial policies. European entrepreneurs brought with them very advanced sugar refining technologies and adopted them successfully. Low sugar yields had their origin in inadequate irrigation technology, yet it was imperial policies that precluded capital-intensive projects such as investment into irrigation. The rapid changes in sugar duties imply that the British Government failed to create a long-run perspective for the development of colonial industries. Thus, the investment environment in colonies was not beneficial for large-scale investment projects with long-run returns and high-capital intensity.

Yet, it should not be perceived that the British Government was totally oblivious to the fortunes of colonial manufacturing. The various *Reports* on the sugar industry attest that British politicians and economists assigned importance to East Indies sugar production, especially as the export trade was used as the chief channel for transferring revenue from India to Britain.[144] Their expectation was that under a free trade regime the Indian sugar industry would thrive without further assistance. Yet, in regions where the sugar industry successfully developed and became internationally competitive in the nineteenth century this happened with significant support from the state. In France, Germany and Austria-Hungary – countries that eventually took the lead in the world sugar markets – the sugar industry benefitted from infant industry protection, and export bounties especially played a key role in its development. The English sugar producers in Bihar, on the other hand, were subject to uncertainty about the Empire's sugar policies and rates of sugar duties and had very limited time to adopt new technologies, adapt them and become competitive on the international market.

Notes

1. Moreover industrially made sugar was cheaper, could be stored longer and had a higher sucrose content, which brought its flavour closer to the taste of pure sweetness without any extraneous taste. Bosma, *Sugar plantation*, pp. 20–21.
2. Gupta, 'Falling behind', pp. 803–808; Broadberry and Gupta, 'Historical roots', p. 274.
3. Broadberry et al., 'India and the great divergence', pp. 71–73.
4. Broadberry et al., 'India and the great divergence', p. 72.
5. Prebisch, Economic development of Latin America.
6. Frank, *Latin America*, Wallerstein, *Modern World-System*, and Amin, *Unequal Development*.
7. Gupta, 'Falling behind', pp. 813–815; Broadberry and Gupta, 'Historical roots', pp. 267–268.
8. Broadberry and Gupta, 'Historical roots', pp. 265, 267–278.
9. Railways on the other hand decreased trade costs, expanded trade and fostered market integration in India. Donaldson, 'Railroads of the Raj', pp. 931–932; Hurd, 'Railways', pp. 268–274.
10. Gupta, 'Falling behind', p. 813.
11. Roy, 'Delayed revolution'; Roy, *Economic history*, p. 135.
12. Chaudhary et al., 'Agriculture in colonial India', pp. 109–111.
13. Gupta, 'Falling behind', p. 814.
14. Aldous, 'From traders to planters', pp. 5–6.
15. Aldous, 'From traders to planters', pp. 5–6, Ray, *Bengal industries*, pp. 226–227. Maund equals to approx. 80 lbs.
16. Its paid-up capital amounted to £200,000 in 1866. Aldous, 'Avoiding Negligence', p. 665.
17. Hutková, *English East India*, p. 119.
18. Hutková, *English East India*, p. 157.
19. *First report of S.C. on sugar and coffee*, p. 100.
20. *First report of S.C. on sugar and coffee*, pp. 17–18. The Jummoah factory was producing just 84 tons of sugar, however its production capacity was potentially higher.
21. Gupta, 'Falling behind', pp. 813–817; Broadberry and Gupta, 'Historical roots', p. 266.
22. Antrobus, *History of the Assam Company*; Griffiths, *History of Indian Tea*; Aldous, 'From traders to planters'; Nadri, *Political economy of indigo*, pp. 7–8; Gupta, 'Rise of modern colonial industry', pp. 67–83.
23. Logan, 'India – Britain's substitute', pp. 475–478; Riello, *Cotton*, pp. 256–262.
24. Hutková, *English East India*, pp. 159–163.
25. Aldous, 'Avoiding negligence'; Aldous, 'From traders to planters', pp. 14–15.
26. Bagchi, 'Colonialism', pp. PE40–PE42.

27. It is also important to note that by the early nineteenth century the British administration in London relied on increasingly laisser-faire approaches with respect to production in India and trusted that it should be left to private entrepreneurs. Bosma, *Sugar plantation,* pp. 38–42.
28. Bosma, *Sugar plantation*, pp. 36–38. Roy shows how the plans of a Bengal zamindar and entrepreneur Dwarkanath Tagore to set up a large-scale sugar plantation were thwarted by dissenting tenants on his estate. Roy, 'Factor markets', p. 143.
29. *S.C. on East India produce; First Report of S.C. on Sugar and coffee*; *S.C. on Sugar industries.*
30. Although research shows that the nineteenth century was not really a heyday of laisser-faire policies, in the realm of trade policies shift towards more free trade came with the 1822 appointment of Frederick John Robinson and William Huskisson to the Cabinet. William R. Brock. (1940). *Lord Liverpool and Liberal Toryism, 1820 to 1827* (pp. 121–177). Cambridge: Cambridge University Press; Norman Gash. (1979). *Aristocracy and People: Britain 1815-1865*. London: E. Arnold.
31. Huzzey, 'Slave sugar', p. 359.
32. Huzzey, 'Slave sugar', p. 363–365. The previous literature perceived abolitionism and free trade as mutually incompatible. See for example: Hall, *Civilising subjects*, pp. 338–339; Drescher, *Mighty experiment*, p. 166.
33. Huzzey, 'Slave sugar', p. 361.
34. Huzzey, 'Slave sugar', p. 361.
35. Access to sugar for working people was a matter of large debate in the 1840s. See for example, Hilton, *Mad, bad*, p. 575; Burnett, *Plenty and want*, p. 15. For a summary of the contemporary discussion: Huzzey, 'Slave sugar', pp. 364–365.
36. Major emphasises that here the interests of abolitionists and East Indian merchants intersected to create the image of 'free grown' sugar for the East Indies produce. The fact that various forms of unfree labour existed in India was not taken into consideration. Major, 'Slavery', pp. 502–503.
37. *S.C. on East India produce*, p. 12.
38. *S.C. on East India produce*, p. 13.
39. *S.C. on East India Produce,* p. 13.
40. Making sugar from beet has significantly higher technological requirements and could only develop following advancements in the chemical industry, namely the Archard process of obtaining sugar from sugar beet. Similarly the process of refining developed a higher level of sophistication as machine making advanced in Continental Europe. By the late nineteenth century, European sugar processing technologies were exported to sugar cane producing areas as they proved to be more efficient.
41. Shrivastava et al., 'Sugarcane', p. 267.
42. An exaggeration based on consumption in Bengal. *First report of S.C. on Sugar and coffee*, p. 45.
43. *First report of S.C. on Sugar and Coffee*, p. 46.
44. *First report of S.C. on Sugar and Coffee*, p. 46
45. Bosma, *Sugar Plantation*, p. 47.
46. Quantities brought to Europe by private merchants were miniscule, although private merchants proclaimed interest in the sugar trade. Bowen, *Business of Empire,* p. 245.
47. *S.C. on East India produce*, p. 54.
48. Begah was 1/3 of acre.
49. *S.C. on East India produce*, p. 55.
50. *S.C. on East India produce*, p. 101.
51. *First report of S.C. on Sugar and coffee*, p. 47.
52. *S.C. on East India produce*, p. 55.
53. *First report of S.C. on Sugar and coffee*, p. 19.
54. *First report of S.C. on Sugar and coffee*, p. 19.
55. *S.C. on East India produce*, p. ; *First report of S.C. on Sugar and coffee*, p. 173.
56. Indian sugar was exported to the Asian markets, principally to central Asia, Russia and Persia. *First report of S.C. on Sugar and coffee*, p. 170.
57. *First report of S.C. on Sugar and coffee*, p. 47. Whitened khar, if not sent to Europe, was consumed in India. Its price was higher than khar and in the 1840s Calcutta sold for 17 s. 10 d. to 24 s. 9d per cwt.

58. *First report of S.C. on Sugar and coffee*, p. 19.
59. There is fragmentary evidence that sugar factories ran by Europeans might have existed even before the 1830s/40s. See for example Wilson, *History of Behar*, pp. 14, 19.
60. Ratledge, From Promise to Stagnation, pp. 180–200. This should not be surprising as adoption of the newest technologies tends to be easier and cheaper than upgrading existing technologies. See for example Abramovitz, 'Catching-up', pp. 386–390. David, 'Dynamo', pp. 357–358.
61. The land that they rented was either waste land or land that needed clearing. Yet, from the fact that it allowed for cultivation of an array of crops from grains to sugar and indigo the quality of the land could not be too inferior. Cleared land in particular was found to be as very fertile. *S.C. on East India produce*, pp. 11–12.
62. *S.C. on East India produce*, p. 46.
63. *S.C. on East India produce,* pp. 46–47.
64. *S.C. on East India produce*, pp. 51–52; 63–65.
65. *First report of S.C. on Sugar and coffee*, p. 96.
66. *First report of S.C. on Sugar and coffee*, p. 47. In Calcutta muscovado made in vacuo from dhoosa, bhalee, or goor sold on average for 19s.3d. to 24s. 9d. and muscovado simply re-boiled from khar for 17s. 10d. to 24s. 9d. (the higher price was rarer as only the very best muscovado would fetch this price.
67. *First report of S.C. on Sugar and coffee*, p. 195.
68. *First report of S.C. on Sugar and coffee*, p. 63.
69. *Second Report S.C. on sugar and coffee*, p. 43.
70. *First report of S.C. on sugar and coffee*, pp. 45, 102.
71. Tirhoot was some 300 miles in a straight line from Calcutta and around 1,000 miles by river transport. *First report of S.C. on Sugar and coffee*, p. 12.
72. Tirhoot gained importance in sugar production, especially in the late nineteenth century. The biggest factory in the region was the Tirhoot Factory also known as the Ryam Sugar Company and in 1914 was incorporated as Tirhut Co-operative Sugar Co Ltd. The principal managing agency in Cawnpur Begg, Sutherland and Company, had a key role in the development of the Ryam Sugar Company. Bagchi, *Private Investment*, p. 188.
73. *First report of S.C. on sugar and coffee*, p. 12.
74. *First report of S.C. on sugar and coffee*, pp. 14–15, 20, 32–33.
75. *First report of S.C. on sugar and coffee,* p. 12.
76. *First report of S.C. on sugar and coffee*.
77. *First report of S.C. on sugar and coffee*, p. 13.
78. McCook, *States of Nature,* p. 80.
79. *First report of S.C. on sugar and coffee,* p. 13.
80. *First report of S.C. on sugar and coffee*, p. 51.
81. *First report of S.C. on sugar and coffee*, p. 13.
82. Water for irrigation was taken from deep wells or rivers with the use of oxen or manual labour. *S.C. on East India produce*, pp. 54, 86; *First report of S.C. on sugar and coffee*, pp. 53–56.
83. It seems that the factory servant was employed by the sugar factory on a longer term basis than coolies or superintendents, who were paid by day at Crooke's when in employment. *First report of S.C. on sugar and coffee*, p. 14.
84. *First report of S.C. on sugar and coffee*.
85. *First report of S.C. on sugar and coffee*, p. 15.
86. *S.C. on East India produce*, p. 50.
87. The native cane was even more difficult to break than the Otaheite variety. *First report of S.C. on sugar and coffee*, p. 14.
88. The actual price of 1 cwt of sugar would be 70s. but 24s. was a duty payable in Britain. There were no duties on the molasses trade within India. *First report of S.C. on sugar and coffee*, pp. 50–51.
89. Although, 330 miles in straight line, navigation by river made the distance close to 1,000 miles. *First report of S.C. on sugar and coffee*, p. 12.

90. *First report of S.C. on sugar and coffee*, p. 15.
91. *First report of S.C. on sugar and coffee*, p. 14.
92. *First report of S.C. on sugar and coffee*, pp. 17–18.
93. *First report of S.C. on sugar and coffee*, p. 17.
94. This10% consisted of an interest of 8% and 2% commission. *S.C. on East India produce*: Index, p. 24. This amount is not dissimilar to interests paid by European indigo planters etc.
95. 10%. *S.C. on East India produce*, p. 62.
96. *S.C. on East India produce*, p. 62.
97. For the Dhobah East India Sugar Company the commission charges, when commission was carried out under the umbrella of the company, amounted to 7s. 6d. per cwt. However, they had to employ an outside broker. *First report of S.C. on sugar and coffee*, p. 62; *S.C. on East India produce*, p. 138.
98. Freights from West Indies – those for Cuba or Demerrara were lower. *First report of S.C. on sugar and coffee*, pp. 38, 166.
99. *First report of S.C. on sugar and coffee*, p. 19.
100. The costs of transport by steamboat amounted to £1 7s. 4d. a ton versus 19s. 7d. by a small boat. Ibid., 20.
101. The total price for insurance, freight and charges in London has been stated to be £9 per ton in 1847. Assuming freight to be £5 per ton, insurance amounts to around £4. The insurance charge seems to include also fire insurance in London. Charges in all probability consisted of dock and landing charges. House of Commons, *Sugar and coffee*: Index, p. 39. In 1839 insurance together with dock and landing charges amounted to 3s. 8d. per cwt, that is £3 13s. 5d. for a ton. *S.C. on East India produce*, p. 150.
102. *First report of S.C. on sugar and coffee*, p. 100.
103. *First report of S.C. on sugar and coffee*, p. 48
104. For comparison in the Straits of Malacca average muscovado production per acre was 20 cwt, in the West Indies also 20 cwt, and in Mauritius even 30-40 cwt with newly planted cane. *First report of S.C. on sugar and coffee*, pp. 21, 233.
105. *S.C. on East India produce*, pp. 54, 86; *First report of S.C. on sugar and coffee*, pp. 53–56.
106. *First report of S.C. on sugar and coffee*, p. 43.
107. *First report of S.C. on sugar and coffee*, p. 98.
108. *First report of S.C. on sugar and coffee*, p. 100.
109. This is based on a comparison between total aggregate costs in 1840 and dividends paid in the same year. It is not entirely clear how much sugar was produced exactly, though there is no reason to suppose that production was significantly larger or smaller than 7,000 tons. Even when using different estimates it seems that refining is included in the £7.5 or was in the range of shillings. Alternatively, the costs of refining might have been included in the buying price of sugar. The sources are not very clear on this, however what is apparent is that unit costs of refining were low if the scale of production was large.
110. Prices depended also on quality – sugar could be bought for as little as 4 s. per cwt. *First report of S.C. on sugar and coffee*, pp. 83, 98–99.
111. *First report of S.C. on sugar and coffee,* p. 99.
112. Unfortunately, the information about the Dhobah Company is sketchy as its records do not seem to survive so more detailed analysis is impossible.
113. *First report of S.C. on sugar and coffee*, p. 99.
114. *First report of S.C. on sugar and coffee*, pp. 128–129.
115. *First report of S.C. on sugar and coffee*, pp. 129–130.
116. *First report of S.C. on sugar and coffee*, p. 128.
117. The key complaint of the British West Indies planters was that free labourers were working only 5 days a week instead of seven and could not be made to labour for 12–18 hours a day. This together with the fact that wages of free labourers were higher than the costs of a slave's subsistence made them uncompetitive.
118. *S.C. on East India produce*, p. 225.
119. *First report of S.C. on sugar and coffee*, pp. 42, 118, 124.
120. The Importation Act also repealed Corn Laws.

121. Only refined sugar from the British Empire retained a certain small advantage (see Table 9). This Indian artisanal sugar was popular in the grocery trade so could compete on the markets. Ratledge, From Promise to Stagnation, p. 115.
122. Anthony Howe, *Free Trade and Liberal England, 1846-1946*, pp. 50–55. Bosma; *HL Deb 10 August 1846 vol 88 cc467-545*.
123. *HL Deb 10 August 1846 vol 88 cc467-545*.
124. Howe, *Free Trade and Liberal England*, p. 51.
125. See for example: Howe, 'Free Trade', pp. 401–402.
126. *First report of S.C. on sugar and coffee*, p. 49.
127. Howe, *Free Trade and Liberal England*, pp. 52–53; R. A. Lobdell, 'Patterns of Investment and Sources of Credit in the British West Indian Sugar Industry, 1838-97', *Journal of Caribbean History*, 4, 1972, pp. 31–53.
128. *First report of S.C. on sugar and coffee*, pp. 120–121, 135, 167. Their situation was worsened further by the 1848 financial crisis in Calcutta and the fall of the Union Bank that wiped out credit from the market. Bosma, *Sugar*, p. 78.
129. *First report of S.C. on sugar and coffee*, pp. 98–100.
130. *First report of S.C. on sugar and coffee*., p. 100.
131. Two of the factories were rented to one of the proprietors of the Company's stocks for a rent below the properties price. *First report of S.C. on sugar and coffee*, p. 100.
132. The Chairman of the East India Company brought attention to the fact that the trade volumes did not decline in the 1846-47 period since the sugar already made was imported to London despite the universal loss made in such trade. *First report of S.C. on sugar and coffee*, pp. 120–121.
133. Here the best example is Crooke, who never found his enterprise making any net profit over more than a decade that he was involved in sugar making in Bihar.
134. Bosma, *Sugar Plantation*, pp. 31–32.
135. House of Commons, *East India: Sugar importation and cultivation* (1899), p. 3.
136. More capital intensive technologies such as steam-based sugar production started to expand into India only in the twentieth century.
137. *Second report of S.C. on sugar and coffee*, p. 44.
138. The only exception was John Gladstone, father of William Evart Gladstone, who sold his Indian sugar business two year prior to the passing of the 1846 Sugar Bill. Yet, he still made a loss. *First report of S.C. on sugar and coffee*, p. 100–101.
139. *First report of S.C. on sugar and coffee*, pp. 100–101.
140. *Second report of S.C. on sugar and coffee*, p. 44.
141. *First report of S.C. on sugar and coffee*, p. 43. The East India Company officials were worried that if sugar ceased to be exported to Britain the remittances would have to be made in bullion and such outflows would undermine the monetary system: 'it will be the ruin of the country, of course, because the exchanges will go down, and rupees must be sent home'.
142. Gupta, 'Falling behind'; Broadberry and Gupta, 'Historical roots'.
143. Gupta, 'Falling behind', p. 814.
144. For the discussion of the transfer of revenue from India see *First report of S.C. on sugar and coffee,* pp. 115–116.

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