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Why Isn't the Whole World Developed? A Reply to Hanson

GREGORY CLARK

In "Why Isn't the Whole World Developed? Lessons from the Cotton Mills" I claimed that inefficient labor was the major obstacle to the industrial development of poor countries, at least in the late nineteenth and early twentieth centuries.¹ John Hanson, in his response, "Why Isn't the Whole World Developed? A Traditional View," has, it seems, two major objections to my claim. The first is that it is old news, and the second that it is incorrect news.²

I will not respond to the old news issue, since I do not wish to make any strong claim of originality. Indeed, to find precursors of the view expressed in my article Hanson could have gone further back than Daniel Buchanan in 1934 to such writers as Thomas Brassey and James Jeans in the 1870s and 1880s.³ Buchanan is in a long line of authors who have discussed the same phenomena, and much of his evidence is culled from the statements on labor efficiency by factory managers in India recorded by various British commissions.⁴ If labor efficiency varied as remarkably as I argued across countries we would expect people to have noticed already. The issue that is more important and difficult is whether we can show that these alleged differences in labor efficiency were real, and can show that they were the *main* obstacle to the industrialization of underdeveloped economies after the Industrial Revolution in Britain. My article addressed these issues.

I

Hanson challenges the importance of labor efficiencies to industrial development on two grounds. First, he argues that differences in labor efficiency between India and the West were not large. The differences, for example, in manning levels on the same equipment between India and best practice were only of the order of 3.5 to 1 for a set of 10 industries considered by Buchanan, instead of the 6 to 1 I find for textiles circa 1910. Second, the relative manning levels across 10 industries varied from 1.5 to 1 to 6 to 1, which would seem incompatible with Indian workers being uniformly less efficient than those in the United States or in Britain.

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The author is Assistant Professor of Economics, University of Michigan, Ann Arbor, MI 48109-1220.

The paper has benefited from comments by Gary Saxonhouse.

¹ Gregory Clark, "Why Isn't the Whole World Developed? Lessons from the Cotton Mills," this *JOURNAL*, 47 (Mar. 1987), pp. 141-74.

² John R. Hanson II, "Why Isn't the Whole World Developed? A Traditional View," this *JOURNAL*, 48 (Sept. 1988), pp. 668-75.

³ Thomas Brassey, *Foreign Work and English Wages* (London, 1879), pp. 157-96. J. S. Jeans, "On the Comparative Efficiency and Earnings of Labour at Home and Abroad," *Journal of the Royal Statistical Society* (Dec. 1884), pp. 623-24. Schulze-Gaevernitz even expressed a view somewhat similar to the one I put forward to explain England's supremacy in cotton textiles in the late nineteenth century. G. von Schulze-Gaevernitz, *The Cotton Trade in England and on the Continent* (London, 1895), see esp. pp. 85-130.

⁴ See, for example, British Parliamentary Papers, *Indian Factory Labour Commission*, Vol. 2: *Evidence*. Cd. 4519 (1909). Buchanan himself is unclear about how much of excess machine manning in India to attribute to lower labor efficiency and how much to capital-labor substitution in response to India's low wages. Daniel Buchanan, *The Development of Capitalist Enterprise in India* (New York, 1934).

As to the size of manning differences in cotton textiles between India and the most advanced countries, a study by Howard Pack of manning and output levels in the international textile industry in 1967 finds differences in manning levels on the same machinery just as great as those I report for 1910.⁵ With the same machinery the ratio of manning levels in spinning between the United States and India was 6.8 to 1, and in weaving 6.4 to 1.⁶ My figure for 1910 was 6.5 to 1. In the 1960s hourly labor costs were more than 10 times as high in the United States as in India, the same situation we find in 1910. Pack also finds another result that appeared in my paper, which is that while output per worker varied enormously across countries using the same technology in cotton textiles, output per machine varied by much less. In weaving, for example, output per machine varied by only 12 percent at a maximum across 11 countries, and there was no systematic tendency for low-wage countries to obtain higher output per machine. Cotton textiles may not be a representative industry, but the facts for Indian cotton seem to be as I portrayed them.

II

Hanson is correct, however, in arguing that relative manning levels on the same machinery varied across industries when comparing India with Britain. In 1910, for example, a crude index of machines per worker in cottons shows a difference in manning between Britain and India of 4 to 1 in the cotton industry, whereas in jute the difference was only 2.25 to 1.⁷ This difference in manning levels was associated with the relatively greater size of the jute industry in India. In 1911 Indian jute mills employed nearly as many people as cotton mills, and India had more than double the number of jute looms Britain did, while the British cotton industry was about ten times the size of the Indian cotton industry.

The Indian jute industry took a long time, however, to extinguish the British industry. The first successful jute mill was established in India in 1859, only about twenty years after the start of the industry in Dundee in Scotland. Yet by 1912, 53 years later, British mills still supplied most domestic demand for jute goods, and exported about 45 percent of production. Indeed the British industry hung on at nearly its 1912 size until the Great Depression finally caused a serious decline.⁸

Yet when we look at the figures on the comparative costs of inputs, the rapid demise of the British jute industry after 1859 seemed assured. In all markets where British goods sold, including Britain, the total transport and tariff costs of Indian producers were as low as or lower than for British manufacturers. The raw jute used by British mills was all grown near the Indian mills. Hourly wages in Bengal were about one sixth of those in Dundee. The jute mills in Calcutta had access to cheap local coal, while Dundee was one of the higher cost areas for coal in Britain. The mills in India were able to recruit 500 managers and technicians from Scotland by 1914, about 8 per mill, who

⁵ Howard Pack, *Productivity, Technology and Industrial Development: A Case Study in Textiles* (New York, 1987).

⁶ *Ibid.*, pp. 139–46. It should be noted that Pack interprets these differences in a completely different way than I do, putting much more emphasis on capital-labor substitution in determining manning levels.

⁷ Buchanan argues that once we correct for shift working the ratio would actually be only 1.33 to 1 in jute. Buchanan, *Capitalist Enterprise in India*, p. 368.

⁸ W. A. Graham Clark, *Linen, Jute and Hemp Industries in the United Kingdom with Notes on the Growing and Manufacture of Jute in India*. U.S. Department of Commerce, Bureau of Foreign and Domestic Affairs, Special Agents Series, No. 74 (Washington, D.C., 1913), pp. 101–3, 168–72. As late as 1925–1929 Britain was still manufacturing 186,000 tons of jute per year, compared to 217,000 tons a year in 1896–1900. On exports, see Great Britain, Board of Trade, Working Party Reports, *Jute* (London, 1948), pp. 116, 121.

TABLE I
IMPLIED JUTE MANUFACTURING COSTS, DUNDEE AND CALCUTTA, 1899-1913

Cost per Loom per Year	Britain (55 hours per week)	India (55 hours per week)	India (90 hours per week)
Raw jute	\$ 824	\$ 824	\$1,348
Manual labor	353	59	97
Management	35	35	57
Machinery: depreciation	55	72	72
Machinery: supplies, repairs	40	61	100
Insurance	11	14	14
Fuel	41	37	61
Batching and lubrication oil, sizing	49	49	80
Total cost	1,408	1,165	1,846
Value of output	1,626	1,626	2,661
Profit	218	464	814
Capital	2,188	2,299	2,653
Implied profit rate	9.9%	20.7%	31.5%

Notes: The capital required to operate a new jute mill in Dundee in 1912 was estimated by machine builders at \$2,188 per loom. Of this, \$1,460 was for the machinery and the building, and the rest for work in progress and stocks of jute and supplies. Even though machinery costs were about 50 percent higher in India, because the machines had to be shipped out from Britain, both the buildings and work in progress were cheaper, so that total capital requirements were about the same. I assume depreciation costs were independent of the hours of operation of the mill, being mainly obsolescence costs.

The cost of raw jute in Britain was about 10 percent higher than in India because of transport charges, but I have not included this advantage in the Table since I want to calculate what the relative costs and profits would be for Britain and India in the markets where Britain did sell in 1912, where total transport costs were about the same for both countries.

Sources: Daniel Buchanan, *The Development of Capitalist Enterprise in India* (New York, 1934), pp. 250-51; H. R. Carter, *Jute and Its Manufacture* (London, 1921), pp. 177, 181-83; W. A. Graham Clark, *Linen, Jute and Hemp Industries in the United Kingdom with Notes on the Growing and Manufacture of Jute in India*, U.S. Department of Commerce, Bureau of Foreign and Domestic Affairs, Special Agents Series, No. 74 (Washington, D.C., 1913), pp. 96-97, 106-7, 131-35, 161-68.

controlled the technical and managerial aspects of the industry. The important comparative advantage Calcutta had in jute manufacturing through cheap local jute and coal is illustrated by the fact that, while by the 1930s the Indian cotton mill industry was under severe pressure from the Japanese and Chinese industries, in jute manufacture Japan had only 2 percent, and China 0.6 percent, of the capacity of India in 1939.⁹

The first column of Table 1 shows the calculated manufacturing cost for jute cloth in Britain for a new mill built in the period from 1900 to 1912. At the prices of raw jute and jute cloth from 1899 to 1913, this mill would have made average profits of about 9.9 percent on the capital employed in this period. Column 2 shows the results if the mill had been built in India and operated in the same way as in Britain. Now, principally because most labor cost one-sixth that in Dundee, implied profits would average 20.7 percent from 1899 to 1913.¹⁰ In practice, until July 1912 many Indian mills operated for about 90

⁹ Great Britain, Board of Trade, Working Party Reports, *Jute*, p. 13.

¹⁰ The profit rate calculated for India represents a lower bound, since if the mill operated there it might have been able to use more cheap labor to economize on more expensive factors such as machinery.

hours per week. In this case, as the third column shows, the implied profits in this period are 31.5 percent in India compared to 9.9 percent in Dundee.

Despite these phenomenal implied profits, the dividend payments of a sample of Indian jute mills averaged only 9.1 percent on nominal capital from 1905 to 1914, which Morris D. Morris suggests was close to the net profit rate.¹¹ Many of the Bengal jute mills were British-controlled, and this apparent low rate of return is in line with the finding of Lance Davis and Robert Huttenback that the rate of return to capital for British "goods producing firms" located in the British Empire was about 6 percent from 1900 to 1912, about the same as the rate of return for the "goods producing" sector in Britain at that time.¹²

In the case of cotton textiles the apparently large differences in the efficiency of workers, of the order of 4 to 1, went a long way towards explaining why the profit rates were in fact much closer than the relative input costs would suggest.¹³ Also in cotton textiles there was no superior access to raw materials in India, and coal was much dearer in Bombay than in Calcutta and cheaper in Lancashire than in Dundee. But the degree of overmanning in the jute industry was at maximum 2.25 to 1, and perhaps as little as 1.33 to 1.¹⁴ When we adjust the labor costs and capital inputs in India to reflect calculated overmanning of 1.8 to 1, the rate of profit from 1899 to 1913 falls only a little, to 18 percent if the mills opened the same number hours as in Dundee, or 28 percent, assuming that they opened for 90 hours. This seems to imply that we have missed some other obstacle to the development of the Indian jute industry, one much more important than the inefficiency of labor in India.

III

Suppose, however, that indeed all workers in India are inefficient compared to those in Britain by a constant margin, so that in the time required for a British worker to perform a set of tasks an Indian worker will only perform a fraction e of the tasks. If all tasks are infinitely subdivisible this will result in a machine-to-worker ratio in Britain compared to India of 1 to e in all industries. In cotton textiles, for instance, a spinner who was assigned 600 spindles would have to monitor each and repair broken threads when they occurred. Slower or less competent workers could have their tasks made easier by assigning them fewer spindles, as was done in India.¹⁵ But some tasks are less divisible; operating a sewing machine, for example, or a lathe. In this case if Indian workers are less efficient it will not show up in the ratio of machines to workers, but instead in lower machine productivity. If output per machine is directly proportionate to the efforts of the worker, output per machine-hour in Britain and India would be in the

¹¹ Morris D. Morris, "The Growth of Large Scale Industry to 1947," in Dharma Kumar, ed., *The Cambridge Economic History of India* (Cambridge, 1983), p. 572. At the same time the net profits of Bombay textile mills averaged only 10.3 percent.

¹² Lance Davis and Robert A. Huttenback, *Mammon and the Pursuit of Empire: The Political Economy of British Imperialism, 1860-1912* (Cambridge, 1986), p. 107. If the profit rate in Indian mills was only 10 percent per year, then at the same price for outputs British profits on circulating capital would be -2 percent, even if the fixed capital in buildings and machinery was a free good for British manufacturers in 1912 because it had no value in other uses. Consequently all the British jute manufacturers should have liquidated their circulating capital and exited the business long before 1912.

¹³ Clark, "Why Isn't the Whole World Developed?" table 3.

¹⁴ Buchanan, *Capitalist Enterprise in India*, p. 368.

¹⁵ Another good example of such a task would be sweeping the floors, where if Indian workers were slower it would be easy to use more of them without this having any influence on machine productivity.

ratio 1 to e . Inefficient Indian labor could potentially show up both in manning levels and in machine productivity.¹⁶

The costs of this second type of labor inefficiency to the enterprise would be much greater than for the first type. Set

$$Q = \pi K + wL,$$

where Q equals net value of output, K equals value of capital, π equals profit and depreciation on capital, L equals labor input, and w equals the wage rate. Rewriting,

$$\begin{aligned}\pi &= (Q/K) - w \cdot (L/K) \\ &= (Q/K)[1 - w \cdot (L/Q)]\end{aligned}$$

Suppose also that in Britain, with efficient labor, Q/K equals a , Q/L equals b , and output per worker and per machine there is solely determined by the efficiency of workers.¹⁷ In countries with lower labor efficiencies, both Q/K and Q/L can be affected. Suppose that only Q/L is affected by labor efficiency, and Q/L equals b times e , where e is the index of labor efficiency. Then profit (as a function of e in this case) will be

$$\pi_1 = a \cdot [1 - (w/b)/e],$$

assuming wages per worker are constant. If, instead, both output per worker and per machine depend on labor efficiency, then Q/K equals a times e , and profit will be

$$\pi_2 = a \cdot e \cdot [1 - (w/b)/e].$$

Hence, π_1/π_2 equals $1/e$. That is, as e declines, the relative profitability of the two techniques diverges, the first becoming relatively more profitable. Figure 1 shows how the profit rate would vary as e , the relative efficiency of Indian labor, declines for both techniques. Also shown is π^* , the opportunity cost of capital in terms of depreciation and the alternative rate of profit. Even if labor cost nothing in an economy with low labor efficiency, insofar as labor efficiency determines capital efficiency, the profit rate may well fall below the opportunity cost of capital.

Thus we have to consider the effects of labor efficiency on both output per worker and output per machine. Even in the cotton textile industry, where manning levels per machine were much higher in India than in Britain, output per spindle-hour and per loom-hour was somewhat lower in India than in Britain on the same yarns or fabrics around 1910. In 1908 output per spindle-hour on ring spindles producing 20s yarn averaged 0.54 ounces in 16 Indian mills.¹⁸ Production per spindle-hour in England for rings on 20s (warp yarns) is reported by Graham Clark in 1914 at 0.65 ounces, by Winterbottom in 1921 at 0.66 ounces, and by the manager of an Indian mill in 1908 at 0.65 ounces.¹⁹ Thus Indian production per hour was only 83 percent of British. In weaving,

¹⁶ In Britain workers of different abilities could get very different outputs out of the same looms; for example, in one loom shed with 13 experienced weavers each operating 3 cotton looms, the average efficiency of weavers varied from 70.2 to 92.6 percent. Looms operated by the same weaver had very similar outputs, almost all the differences in loom efficiency stemming from differences in weavers. In silk weaving on one class of cloth the efficiency of weavers varied from 55.0 to 82.2 percent, and on another from 39.3 to 70.6 percent. S. Wyatt, *Variations in Efficiency in Cotton Weaving*, Great Britain, Medical Research Council, Industrial Fatigue Research Board, Report No. 23 (1923).

¹⁷ That is, no substitution of labor for capital is possible if wages are lower.

¹⁸ British Parliamentary Papers, *Indian Factory Labor Commission*, pp. 20, 23, 36, 65, 77, 79, 85, 90-92, 125, 139, 181, 315, 354, 377.

¹⁹ W. A. Graham Clark, *Cotton Goods in Japan*. U.S. Department of Commerce, Bureau of Foreign and Domestic Affairs, Special Agents Series, No. 86 (Washington, D.C., 1914), p. 191. James Winterbottom, *Cotton Spinning Calculations and Yarn Costs* (2nd ed. London, 1921), p. 213.

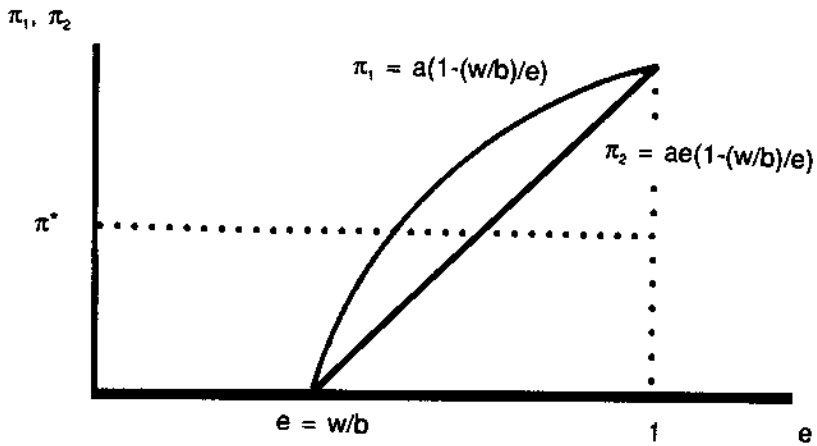


FIGURE 1

PROFIT RATE AS A FUNCTION OF LABOR EFFICIENCY WITH AND WITHOUT
CONSTANT CAPITAL UTILIZATION

Notes: e is the efficiency of labor compared to the advanced countries. π_1 is the profit rate where the productivity of capital is independent of the efficiency of labor. π_2 is the profit rate where the productivity of capital is directly dependent on the efficiency of labor.

Source: See text.

managers alleged a similar shortfall in Indian loom production per hour, one manager estimating that Indian workers obtained only 74 percent of the output per loom-hour that would be obtained in Britain.²⁰

Mill managers in India were very clear that at least part of the low levels of output for machinery was a consequence not of technical failures or of poor cotton inputs, but of the performance of Indian mill operatives.²¹ I did not take this factor into account in my article, but it would be another important way poor labor performance depressed profits in the Indian cotton textile industry.

Since in cotton textiles, for example, British weavers had four looms each, there was plenty of room to accommodate to the inefficiency of Indian workers by reducing the number of machines per worker. But since British jute workers had only one or two looms, there was less room for this type of accommodation (it was not feasible to have more than one worker per loom). Yet workers could potentially exert a big influence on machine productivity by inserting new weft yarn less quickly or by detecting and repairing thread breaks less promptly.

IV

Good evidence indicates that output per machine was very low by British standards in the Indian jute industry, and that this formed the main reason why Indian production costs were not much below British.²² The difference in capital productivity in jute shows up in two ways. First, we can measure it by the pounds of jute consumed per spindle per hour, or per loom per hour. Using years where capital was fully utilized, we can then measure the efficiency with which machinery was employed in India and Britain.

²⁰ British Parliamentary Papers, *Indian Factory Labor Commission*, pp. 91, 149.

²¹ *Ibid.*, pp. 5, 79, 91, 94-95, 149-50, 204, 206, 214, 347.

²² I should note that Buchanan believes output per machine was close to that in Britain in India, but I think the evidence to the contrary is persuasive. See Buchanan, *Capitalist Enterprise in India*, pp. 369-71.

Information on jute consumption, the stock of spindles and looms, and the hours worked per mill is available for India in 1904 and 1912. Comparing this with Britain in 1906 and 1912 gives the following result:²³

	Date	Pounds per spindle per hour	Pounds per loom per hour
India	1904	0.63	12.8
	1912	0.63	12.5
Britain	1906	0.74	14.3
	1912	0.80	15.4

The raw data on weights of output suggest that British output per hour was nearly 20 percent greater than in India.²⁴ India, however, produced coarser and hence heavier goods, so that these figures overstate the efficiency with which capital was employed. Sacking looms, for example, should have produced about twice the weight of cloth per loom-hour as did hessian looms.²⁵ While in India, in 1912, 43 percent of the looms made sacking, in Britain the proportion was more like one-eighth sacking. Adjusting for this difference, output per loom-hour in India was only about 67 percent of that in Britain.

A second way to show low capital productivity is to consider that the model mill in Table I would make profits of 31.5 percent per year from 1899 to 1913 in India on the assumption that the average value added per loom-hour was \$0.35. In the years 1911 to 1913, value added per loom-hour would be \$0.34, given the jute and output prices of those years.²⁶ From 1911 to 1913 the gross value of output per loom per hour in India was only \$0.55.²⁷ There are no figures on the average cost per pound of jute used by Indian mills, but it would be somewhat less than in Britain because about two-fifths of the Indian looms were producing coarse sacking. Even if India used exclusively the cheapest types of jute used in Dundee—"rejections" and "cuttings" used only for coarse sacking—for all sacking looms the average cost per loom-hour would be about \$0.35 in India. This yields a value added per loom-hour in India of only \$0.20, or about 60 percent of value added in Britain, implying a corresponding difference in capital productivity.²⁸

²³ British mills operated 55 hours per week in 1906 and 54 hours in 1912. Indian mills operated 90 hours per week in 1904 and 83.25 hours per week in 1912. The spindlage, looms, and jute consumption figures are from Clark, *Linen, Jute and Hemp Industries*, pp. 103, 148, 157.

²⁴ Not all the raw jute went to the looms since some was sold as yarn, but there is no reason to believe this proportion was any greater in India than in Britain, since the ratio of spindles to looms was the same.

²⁵ This is calculated using the fact that the maximum weight of output per loom-hour in pounds on different types of cloth is given by

$$Z = (ppm/ppi) \cdot width \cdot weight \cdot 1.67,$$

where *ppm* equals picks per minute, *ppi* equals picks per inch, *width* equals the width of the cloth in yards, and *weight* equals pounds per square yard of cloth. Sacking looms produced cloth weighing about twice as much per square yard. The cloth was narrower than hessian, but this was offset by higher *ppm* and lower *ppi*. See Clark, *Linen, Jute and Hemp Industries*, p. 165, Board of Trade, *Jute*, p. 16.

²⁶ Clark, *Linen, Jute and Hemp Industries*, pp. 96, 101-3, 137.

²⁷ *Ibid.*, pp. 148, 168-72. Buchanan, *Capitalist Enterprise in India*, p. 245. We can calculate the value of total output in the Indian mills from the value of exports, since from 1911 to 1920 exports represented 80 percent of Indian mill output.

²⁸ Value added per loom in India was not lower because of lower prices for the same output in India than in Britain. As noted above, the Indians had access to markets where Britain sold, except that the effective price to British producers would often be lower because of higher transport costs.

If output per machine-hour in Indian mills was only two-thirds of that in Britain, the calculated profit rates in India from 1899 to 1913 would narrow sharply from 28 percent (taking into account differences in working hours and workers per machine) to 15 percent. Thus the expected profit rates of 31.5 percent in Indian jute mills failed to appear for two reasons: there were twice as many workers per loom as we would expect, accounting for about one-sixth of the drop in profit rates, and output per loom-hour was one-third less than expected, which is responsible for the other five-sixths. The lower profit rate is consistent with the observations that Indian mills were not making extravagant profits, so that British mills were able to compete to some degree. But the lower output per unit of capital is most plausibly also the result of labor inefficiencies.

v

Indian industrial wages per hour in 1910 were about one-sixth of those in Britain in both the cotton and jute industries. In assessing how important labor inefficiencies were to the development of India, we can ask how much of this gap is explained by the inefficiency of workers and how much by other constraints on development, such as imperfect capital markets, transport barriers, and increasing returns to scale. The apparent overmanning of the jute industry by a factor of 1.8 to 1 seems to explain only about one-third of the wage gap between British and Indian workers. But if output per loom-hour in India was really only two-thirds of that in Britain for the same type of cloth, say as a result of slow and inattentive workers, then we can explain a very large part of the wage gap. In jute Indian wages per 55 hours were \$0.74 compared to \$4.38 in Britain. Suppose Indian jute mills were able to operate for 90 hours per week as opposed to the 55 hours of Britain, and had achieved output per worker and per machine comparable to those in Britain. Then despite the disadvantages from machinery that cost about 50 percent more than in Britain, they could still have achieved a rate of profit as high as in Britain while paying wages of \$4.9 per week.²⁹ Thus, labor inefficiencies in the jute mills can potentially explain all of the gap in living standards between Indian and British jute workers.

Even in the jute industry, India's relatively most successful, labor inefficiencies most powerfully explain the low wage levels of Indian workers. To understand fully the cost of worker ineffectiveness in poor countries we have to examine not only the number of machines per worker but also output per machine. This is a second lesson from the mills.

²⁹ They could have paid higher wages per hour because longer hours economized greatly on capital.