

Essays in the Economic History of India

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Abstract

This thesis examines three topics in the Economic History of India. The first chapter, a late contribution to the Great Divergence debate, examines South Indian living standards around 1800, which some have claimed were high. I show that the evidence used, the records of Francis Buchanan, instead suggests that living standards were low. Claims of high living standards rely on implausible assumptions about occupational distributions. Other indirect evidence supports the low living standard view. The second chapter looks at agriculture and land tenure. I argue that traditional tenancy institutions, consisting of many permanent tenancies, in Bengal have been misunderstood. I outline the implications of the tenancy system for the distribution of income, before assessing the path of rents over time. Inflation reduced the burden of the permanent tenants' rents over the long run, benefitting the middle classes at the expense of the landed elite. Land inequality in Bengal was not as high as is commonly assumed, or that high in comparison to other Indian regions, once you account for the property rights of the tenants. Finally, I argue that climate has been the main barrier to raising agricultural productivity. The third chapter examines Indian deindustrialization, the decline in employment in cotton textiles. I build on existing work and construct my own estimates of cotton textile employment. I then examine the big picture up to 1940, particularly the relationship between power loom and hand loom cloth, the path of handicraft earnings, and regional variation, in order to develop a coherent story for the cotton textile industry in this period. I then use a general equilibrium model to assess the relative contributions of trade and technology to deindustrialization. The simulations support the view that technology was the key driver of employment dynamics.

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Chapter 1

Introduction

Preface

Anyone writing a thesis faces a trade off between signalling and researching that which interests you. Do you write up three papers intended to clearly signal to any potential future employers your ability to adopt the tools of the trade and conform to the expected *Weltanschauung*? Or do you try to write a thesis in the proper (Lutheran?) sense of the term - a novel work of research conducted personally with the intention of challenging the conventional wisdom - which is the comparatively high risk option? I suspect that my thesis falls into the second camp. Nevertheless, I hope that it does serve as an informative signal of future potential in addition to contributing to our understanding of its subject, the Economic History of India.

Various people have helped me in my quest, but, of course, the blame for any deficiencies, as well as the opprobrium for whatever heresies, lies with myself. My supervisor, Stephen Broadberry, put up with very early and very rudimentary drafts of the papers, and has been a great help to me. Tirthankar Roy, Clive Dewey, and Peter Robb commented on early drafts of some sections. Susan Wolcott provided useful feedback on two chapters at a very late stage of development. Eric Chaney gave useful feedback in the confirmation of status process, and his History of the World Economy course for undergraduates, for which I was the graduate teaching assistant for two years, always provided food for thought about how Economists do Economic History. This work would not have been possible without the support of the Richards family, who funded my scholarship for 2021-2024. Finally, I'd like to thank my friends, family, and, above all, my parents.

Introduction

Economic Historians cannot change the past, but they can dig up new facts and change our interpretation of those already known. One important fact, which I do not dispute, but which I think the usual interpretation of is grossly inaccurate, is the stagnation of Indian living standards between 1800 and 1980.¹ For the purpose of this introduction it suffices to say that they were abysmally low (details are provided in Chapter One). While incomes remained constant, almost everything else changed. A simple, but very popular, *post hoc, ergo propter hoc* argument would blame the colonial government, but it in fact undertook the institutional reforms which one would think would lead to modern economic growth. The industrial revolution certainly did not bypass India; indeed it arrived there far earlier than elsewhere in Asia (see Chapter Three). Private property rights were generally secure, and the risk of arbitrary expropriation by the state – even an unrepresentative one - was approximately zero. While the British were rather happy to repress seditionists, ordinary subjects were at little risk. Fiscal reforms lowered marginal tax rates, which may as well have been zero in the colonial era (until the 1930s). The supposedly big bad landlords were defeated by the combined powers of custom and the courts (see Chapter Two). Markets were integrated intra- and inter-nationally.² These changes resulted in next to no Gross Domestic Product (GDP) per capita growth in comparison with the levels attained by the end of the 18th century, which was one of widespread warfare, oriental despotism (especially when occidentals were in charge), and next to no technological progress. This is the fundamental puzzle of Indian Economic History, and it is the reason why anyone without a particular reason to look at India should be interested: *plus ça change, plus c'est la même chose*.

To put it very bluntly, the problem is to explain why the average person woke up each morning and thought to themselves, whether consciously or not, that "I will not produce more today than I produced yesterday", and did so over multiple generations, in the face of major technological and institutional changes. We can search for answers from two bodies of literature. The first is that of the economics profession in general. They have their theories regarding the answer to the very important question of "Why isn't the Whole World developed"? I use the Indian

¹E.g. (Broadberry *et al.*, 2015), (Sivasubramonian, 2000), (Clark & Wolcott, 2012).

²(Studer, 2008).

historical experience as a case study to examine these. The second is that of the more traditional (Economic) History of India. I use economics to examine the customary tales of this subject. In both cases, I go against the grain by using the tools of one to argue against the conventional wisdom of the other.

The Economists

At the base level, most would agree that poor growth is the result of poor policies, which provide little in the way of incentives for people to produce more. What then are good policies? Although it is not so much a complete consensus, many people, and importantly many economists, do think that the policies of the "Washington Consensus" are those that lead to growth (or at least they did around the start of the 21st century). Table 1.1 compares the core elements of this "consensus" with the policies of the Raj. The only element missing was a spending priority by the state on education and health. 9 out of 10, however, is not bad. Unfortunately, this means that India's experience is a demonstration of the failure of the Washington Consensus policies, i.e. uncontrolled market economies in general, and should provide some relief to those skeptical of such policies.³ Was the one missing element from this list crucial? I do not have the space to go into detail about education here, but I doubt it.⁴

There are reasons to believe that more expenditure on health would have lowered GDP per capita in this period.⁵ This was because, before 1870 at the very earliest, this was the Malthusian era.⁶ The basic Malthusian model requires two assumptions, (a) the presence of a fixed factor of production (usually land) which cannot be substituted for by capital or labour, and (b) a positive relationship between fertility (net of mortality) and incomes.⁷ Consider a simple Malthusian model. First output:

³E.g. (Rodrik, 2006).

⁴Although literacy rates were low in India, its large population meant that the absolute number of educated people was large, which seems more relevant for externalities. Education was subsidized by the state; low expenditure was a result of a lack of demand.

⁵Another issue is that expenditure does not perfectly map into healthcare services. For modern times, see (Bhat & Jain, 2006). For the not that impressive results of very expensive health measures for the military in British India, see (Guha, 1993).

⁶Acemoglu and Johnson found that innovations which substantially reduced the cost of treating and preventing disease invented around the 1940s did raise population growth but if anything had a negative impact on GDP per capita internationally (Acemoglu & Johnson, 2007).

⁷(Clark, 2007, Chapter 2).

Table 1.1: The Washington Consensus and the Raj

| Element | Present During the Raj? | Notes |
|--|-------------------------|--|
| Fiscal Discipline. | Yes | The Tax to GDP ratio was low and deficits were small. |
| A redirection of public expenditure priorities toward fields offering both high economic returns and the potential to improve income distribution, such as primary health care, primary education, and infrastructure. | No | Substantial infrastructure investment, but little on health and education which were largely left to the private sector, albeit subsidized by the state. |
| Tax reform (to lower marginal rates and broaden the tax base). | Yes | Inelastic land paid the most tax via lump sum taxes, and much of the rest came from inelastically demanded commodities (salt, opium). Marginal tax rates for industry were basically zero. |
| Interest rate liberalization. | Yes | The financial system, including both its "modern" and "traditional" components, was virtually unrestricted (until the 1930s), except for private banknote issue. |
| A competitive exchange rate. | Yes | Nominal exchange rates were set via commodity standards, real exchange rates were very low owing to (a) Balassa-Samuelson effect and (b) interest and other payments abroad ("The Drain"). |
| Trade liberalization. | Yes | Free Trade until the 1920s. |
| Liberalization of FDI inflows. | Yes | Unrestricted foreign investment. |
| Privatization. | Yes | Except for some of the railways and industries associated with defense, the economy was virtually entirely ran and owned by the private sector. |
| Deregulation (in the sense of abolishing barriers to entry and exit). | Yes | Next to no barriers to entry and exit into industry and trade. |
| Secure property rights. | Yes | Virtually zero risk of arbitrary expropriation by the state. Tenant right secure against the big bad landlords, suggesting that rural property was largely secure too. |

Source: Elements from (Williamson, 2000).

$$Y_t = A_t L_t^\alpha \quad (1.1)$$

Where Y_t is output in time t , A_t is a productivity parameter, L_t is the workforce, and α determines degree of diminishing returns to labour, and in the Malthusian world is necessarily less than one. Suppose that there is a price taking firm that pays wages W_t to its labour force. Profit maximisation under perfect competition implies that:

$$W_t = \alpha A_t L_t^{\alpha-1} = \alpha Y_t / L_t \quad (1.2)$$

Now to characterise the second Malthusian assumption, suppose that:

$$\frac{L_{t+1}}{L_t} = C W_t^\beta \quad (1.3)$$

Where β (> 0) represents the responsiveness of population growth to income, and C is an arbitrary positive constant. In a stationary equilibrium, $L_{t+1} = L_t$, and so the last equation pins down W_t , which then pins down L_t and everything else. A one off permanent shock to A_t will not raise W_t in the long run. Better healthcare can be interpreted as an increase in β or C , lowering the equilibrium W_t . If we allow for dynamics, a steady-state growth path has a constant population growth rate, which therefore implies a constant W_t - entirely in accord with the facts. Putting the labour market clearing condition into growth forms we have:

$$g_W = 0 = g_A + (\alpha - 1)g_L \quad (1.4)$$

and so, since α is less than 1:

$$g_L = \frac{g_A}{(1 - \alpha)} \quad (1.5)$$

Productivity advance, therefore, does not show up in higher incomes, but as a larger population. This could explain stagnant living standards. That living standards were low in 1800 is the

argument of the first chapter of this thesis. I re-examine evidence used by others to claim that South India was wealthy, and show that it does not support such claims. The Great Divergence debate often ignores this aspect of the Malthusian world. Whether or not the richest parts of China or India had living standards similar to those in the richest parts of Europe in 1700, 1750, or 1800, tells us nothing about the potential for these societies to see modern economic growth once the new technologies of the Industrial Revolution came about.⁸ But there are other reasons to think that China was behind Europe on the fundamentals - thanks to the Qing dynasty. During the 19th century the Qing state actively blocked the adoption of new technology, e.g. railways, in cotton spinning, and silk reeling, for fear of the consequences for their grip on political power.⁹ But that is not my only issue with the debate. The original comparable living standards argument - which kick started at least 20 years of controversy over the Great Divergence - relies on an apples to oranges comparison between an English agricultural labourer (a pure proletarian) and a peasant in the Yangtze Delta, who not only earned implicit wages on his family farm but also implicit rents due to having a property right in his land.¹⁰ This unusual phrasing is because he was not an outright landowner: he was a tenant with permanent hereditary rights, and he had to hand over a rent to his landlord, which was below competitive levels but still rather high, at 40 to 50 per cent of the first crop - that is just how densely populated the Delta was.¹¹ He held only the "top-soil" rights, while his landlord, who had tax responsibility, held the "sub-soil" rights. Both of these property rights require protection, but, rather curiously, the Qing dynasty refused to support these rental contracts and ignored the existence of "sub-soil" rights (as did its successors until the late 1930s, and by then the communists were soon to abolish them).¹² The Great Divergence debate was sparked by an example where the Chinese state did not protect private property rights! Despite their formal insecurity, such rights seem to have been secured by informal institutions. These were relied upon far more by Chinese rulers (or rather, the Chinese people) than in Europe, and are probably not sufficient for the achievement of high levels of income. As we will see in Chapter 2, in British India similar types of tenant property rights

⁸For the Divergence Debate, see (Pomeranz, 2000), (Huang, 2002), (Broadberry & Gupta, 2006). Gregory Clark has pointed out this Malthusian logic (Clark, 2007).

⁹On railways see (Pong, 1973) and (Wright, 1967 - 1966, Page 177). On Cotton see (Morrell, 1989). On silk see (Ma, 2004, Pages 378-79).

¹⁰(Allen, 2009, Pages 544-548).

¹¹(Huang, 1990, Page 103).

¹²(Huang, 2001, Chapter 6).

received formal legal protection from the get go, in addition to being supported by custom. It is no puzzle that Imperial China failed to grow after 1800. It is one that India also failed.

To return to the main line of thought: the Malthusian model does a good job at explaining stagnant living standards. The Indian puzzle, however, is that population growth was not particularly fast in this period, which suggests that productivity growth was not either.¹³ Trade and Government relief eventually reduced mass mortality from famine (largely before representative institutions), but openness also brought disease, notably the Spanish Flu, which appear to have grimly balanced things out in terms of body count.¹⁴ So we are left with two conclusions: (a) the demographic regime in India, primarily determined by local customs, notably high fertility rates even at very low incomes, resulted in an abysmally low equilibrium wage, and (b) aggregate productivity growth was not very high. Labour productivity growth in many sectors, however, was rather large over the period, thanks to technological progress, such as in textiles (including, as we will see in Chapter Three, the hand loom sector in the early 20th century), transport, iron and steel, food processing and so on.¹⁵ Again, it must be stressed that the Industrial Revolution did not bypass India. It was in agriculture that productivity growth was non-existent, and since this formed a large share of GDP, aggregate productivity growth was low. Even those who owned lots of land outright and were educated (or could easily have become so) consciously chose to not increase output. The Malthusian trap was finally broken around 1970 thanks to (a) the Green Revolution, which enabled capital to substitute for land, in most places (see Chapter Two) and (b) a major decline in fertility (at each income level).

At a deeper level, Economists ask why poor policies (perhaps including the Washington Consensus ones above) persist. Their usual answer is due to politics. As asked by Daron Acemoglu, who frames the question excellently, why does political bargaining not lead to a Pareto efficient outcome - Why is there no Political Coase Theorem? In short, because there is no third party enforcer above the state, the promises of those in power (or those who could be in power in the future) are unlikely to be credible; Coase Theorems fail in the presence of transaction costs.¹⁶

¹³There was an increase in population growth compared to previous periods (Dyson, 2018).

¹⁴The famous 1943 Bengal famine occurred under an elected provincial government (although the war was the prime factor); the worse affected part of the same region, East Bengal, also saw a famine in 1974 (although it was then Bangladesh).

¹⁵(Broadberry & Gupta, 2010, Table A1).

¹⁶(Acemoglu, 2003).

This poses two problems: (a) current incumbents are unlikely to be able to commit to optimal tax schedules, and people will therefore not invest *ex ante* for fear of *ex post* expropriation, and (b) current political incumbents will block new technologies and growth promoting policies out of fear that they will result in their overthrow, since potential future incumbents cannot make credible promises about what they will do to the old ones when they are in power.¹⁷

This is an wonderful theory. It probably explains much about the world, e.g. Qing China. But it fails at explaining the Raj. *Ex post* fears about expropriation by the state were simply not rational. Many people, not members of the ruling group, invested in factories and did not get expropriated or arbitrarily taxed. Indeed, a government promise not to raise the land tax in certain parts of the country in 1793 (the Permanent Settlement) was upheld all the way up to independence: The colonial state was able to credibly commit. We are then left with the other side of the coin: the government may block new technologies or policies in order to prevent their overthrow by those who cannot make credible promises about their behaviour when in power. Unfortunately, history tends to trump theory here too. I am not aware of a single technology being blocked by the colonial government. The closest example, interpreting "technology" more generally as policy, is the colonial government's concern about debt and land transfer as reflected in legislation that restricted land transfers in the Punjab for fear of political unrest if money lenders foreclosed on peasant landowners who hadn't bothered to pay back their debts, and there were also statutory restrictions on land transfers in tribal areas.¹⁸ One may say that no technologies were blocked in practice because the expectation that they would be made them not be adopted *ex ante* on the equilibrium path. Unfortunately, there was a large scale adoption of modern technology in British India across a broad swath of society (i.e. not restricted to British businessmen) in absolute terms - the failure to adopt was only relative to developed nations. Indeed, restrictions on technological choice and private investment in manufacturing came after independence, in a democracy, in contrast to the predictions of the political economy theory - did the median voter actually support the license Raj? Perhaps the threat of revolution limited

¹⁷States that can credibly commit should be able to win wars - since military finance is overwhelmingly an intertemporal problem - against those that suffer from commitment problems, e.g. England vs France, the Dutch Republic vs Spain. The same applies for organising a revolution. Evolutionary pressures should select for credible governments.

¹⁸For the lack of consequences of the Punjab legislation see (Chaudhary & Swamy, 2020). Some tenants in other areas held land on non-transferable leases. Since these were contractual incidents rather than statutory restrictions (although legislation protected these rights), either the landlord or tenant could buy the other out.

foreign capital investment in India, and borrowing abroad by the government; Independence did coincide with Britain becoming a net debtor to India. The major grievance among the highly vocal classes in India, however, was that foreign investment was too high.¹⁹

Now let us consider the major Indian example from the institutionalist literature. In a well known paper, Banerjee and Iyer, attempt to test the importance of (supposedly "colonial") institutions by regressing post-independence outcomes on their metric of landlordism in the colonial era, using an instrumental variable based on the date of British conquest to claim exogeneity, arguing that these institutions were imposed depending on which ideology (landlord or peasant proprietor) was in vogue with colonial officials at the time.²⁰ In my second chapter, I take strong exception to this. First, land tenure regimes were not really exogenously imposed by the British: the date of conquest merely reflects the pre-existing state of landed property which the British found. I demonstrate this for Bengal, as the big bad landlords there in fact preceded the Mughals. Second, there is the classic "compression of history" critique of such persistence studies: it ignores what happened between the British conquest and the 1950s.²¹ I show that this is fatal, for the colonial courts and local custom united to break the power of the big landlords over the 19th century, resulting in a major redistribution of income towards the middle classes, a story completely opposite to what the institutionalists would have you think about "colonial institutions" - a larger summary is presented below.

The institutionalists, therefore, are not that helpful for explaining India's poor industrial or agricultural performance. Do the economists have anything else to offer? One argument, popularised by Jeffrey Williamson, is that a terms of trade boom resulted in industry becoming unprofitable in the "periphery" (as the economic failure countries are known as) owing to falling prices of manufactured goods and higher prices of raw materials thanks to trade with the industrialized "core" countries (as the successful ones are called).²² This "deindustrialization" is meant to have had long term negative effects that ultimately outweighed any static gains from trade. The precise mechanism, however is unclear, and Williamson suggests that it may probably be through

¹⁹After constitutional changes following the First World War, the Government felt it necessary to have a whole enquiry about the role of foreign investment in response to nationalist politics (GoI, 1925).

²⁰(Banerjee & Iyer, 2005).

²¹On the "Compression of History", see (Austin, 2008).

²²(Williamson, 2011).

political economy, as trade empowers a narrow group of elites, such as landowners - and we are back in the realm of the institutionalists from which we know how to free ourselves in the case of India.

Setting aside politics, the "Dutch Disease" hypothesis, where booming exports in one sector results in a shift in output towards that sector and a real exchange rate appreciation through higher wages and local incomes (part of which gets spent on non-tradables) and therefore a decline in the competitiveness of other tradeable goods sectors, however, is doubtful in the Indian case, simply because Indian wages did not rise by much, and even if they had, they would have still been some of the lowest in the world.²³ In addition, trade tended to lower the Indian real exchange rate because the government borrowed money abroad and had to pay for services rendered in Britain, also known as the "Drain". Another uncomfortable fact for this hypothesis, is that, in India, the major factory cotton spinning and weaving centers - the cities of Bombay and Ahmedabad - happened to be located next to the cotton areas that should have been most impacted by a terms of trade boom (see Chapter 3). Likewise, the world jute textile industry was centered in Bengal, where almost the entire crop was grown.²⁴ Adding positive externalities to manufacturing production, i.e. increasing returns to scale which are external to the firm but just so happen to not spread internationally, reinforces the anti-trade message in theory; you need a "big push". Again, the Indian experience does not fit this story very well, because the modern Indian manufacturing sector was large in absolute terms but small relative to the population - externalities intuitively should be based on the former scale not the latter.

This "big push" idea has been given concrete theoretical foundations by Murphy, Schliefer and Vishny.²⁵ Their model contrasts a baseline constant returns to scale technology and an ultimately more productive, increasing returns to scale (IRS) one with a fixed cost. There are multiple equilibria here, because small market sizes may rule out the use of the IRS technology, but

²³(Corden & Neary, 1982). Corden and Neary note that "However, to the extent that the additional rental income accruing to the [booming] sector is repatriated [by foreign companies] the spending effect of the boom is diluted". Dutch Disease is therefore less likely to be a problem for local manufacturing in colonial economies.

²⁴(Wallace, 1928).

²⁵(Murphy *et al.*, 1989). The originator of the classic big push idea was Paul Rosenstein-Rodan, who pointed out the same problem as me: "India was firmly under the [sic] British Rule. There were neither insecurity nor balance of payments or transfer risks, and wages in India were very much lower than in Lancashire. Yet any textile mill project in India ... found an obstacle in the deficiency of Social Overhead Capital which ... was unsurmountable" (Rosenstein-Rodan, 1957). His diagnosis, however, was wrong - British India had a large factory sector.

the adoption of it increases market size. One way to motivate this is a factory wage premium, another is when investment today shifts consumption towards the future, expanding the size of the consumption market at that date and encouraging the adoption of IRS technologies by others today to meet it. Finally, large lumpy/high fixed cost infrastructure projects, such as railways, may not be undertaken when the size of the market is too small because (a) perfect price discrimination is difficult, and (b) uncertainty about the extent of demand after an investment has been made. How well do these conditions apply to India? Market size arguments, as the authors note, fail when exports are possible. Despite widespread poverty, a large population size made the Indian consumption market much larger than most developing countries. International trade (and a large home market) means that the first two justifications fail. Their final argument also does not apply since India got a large railway network. Despite the substantial industrial demand from this network, and the reduction in input and export costs it provided, few firms in India decided to invest in industry to supply it. This was not due to a lack of skilled labour: by 1910 there were just under 94,000 employees in railway workshops, more than in most countries.²⁶ A firm in India offering prices competitive with those of imports would not have been refused by the state. Indeed, the government long desired a local iron and steel industry long before the Tatas took the major step.²⁷ Their firm was reliant on tariffs and subsidies all the way to independence: this infant never grew up.²⁸ Entertainingly, the Tatas are still (as of Summer 2024) receiving subsidies from the British Government to this day, although now the uncompetitive steelworks are in the UK. More generally, the experience of the East Asian "growth miracles", where rapid growth had far more to do with capital accumulation and increased labour inputs than total factor productivity growth suggests that these externalities are not that important.²⁹

Williamson and his coauthor, Clingingsmith, however, suggest that "deindustrialization" in India was at its largest between 1790 and 1820, and was caused by supply side problems in agricultural production rather than a terms of trade shock via external demand.³⁰ My figures for cotton yarn

²⁶(GoI, 1920, Page 234).

²⁷(Dewey, 1979).

²⁸I don't mean to pick on Paul Rosenstein-Rodan, but in his introduction to Padma Desai's book on a Soviet assisted Indian government steel plant, he wondered why India didn't export steel, which he puts down to it being an infant industry: "The infant industry gestation period seems to extend to two or three decades, not to two or three five year plans" (Desai, 1972). Unfortunately, he once again gets his history wrong - the Tatas had been producing iron and steel since 1912. Since he was writing in 1972, we have 60 years of infancy!

²⁹(Young, 1995).

³⁰(Clingingsmith & Williamson, 2008).

consumption in Bengal in Chapter Three find little evidence of a major industrial decline in this period, but rather a minor and temporary fall (largely over by 1830) due to the loss of the export trade thanks to mechanization and protectionism abroad. There was little absolute deindustrialization, but as population growth probably accelerated in this period, there may have been a substantial relative one. Since Bengal was the most likely to have seen a large decline, being the largest early modern exporter, the fall across India as a whole must have been much smaller in relative terms. Trade was not the long term cause of Indian poverty. British India remains a puzzle for the Economists.

The Historians

Do the Historians do any better? Those in charge of the Indian government after independence had a particular reading of economic history, which rejected and condemned the policies of the Washington Consensus decades before they were explicitly formulated. So too were the indigenous financial and tenancy systems - strangely castigated as being foreign introductions. Instead, the state was to take a leading role, private industry was to be regulated, and foreign trade was to be restricted. Political freedom, paradoxically, turned out to mean economic restriction. In line with the fundamental ideological shift against markets after WW2 (which began in the 1930s), the historians have tended to see the past through the same lens as the state. In the traditional historiography, the people of India had to put up with:

1. **The Colonial Official:** Who over-taxed the people, snuffed out any Indian Industries, and drained the country of its wealth.³¹
2. **The Foreign Businessman:** Who destroyed Indian industries through imports, who monopolised the external trade and flooded the interior with foreign manufactures.³²
3. **The Landlord:** Who exploited the peasantry, dispossessed them of their rights, exacted rack rents from them, and refused to invest in agriculture.³³
4. **The Money Lender:** Who bled the peasantry and artisans dry through usury.³⁴

³¹(Iftikhar-ul Awwal, 1982), (Beckert, 2014).

³²(Misra, 1987), (Chatterjee, 1987), (Bagchi, 1976).

³³(Thorner & Thorner, 1962), (Islam, 1978), (Bhadhuri, 1999).

³⁴(Hardiman, 1996).

The latter two targets seem to originate from colonial officials themselves - an unfortunate colonial legacy. I, however, am not so sure about the usual guilty verdicts. Regarding the first, the "drain" should have increased output, if not consumption, in India through increased labour supply arising from income effects (this should also have raised local capital investment under plausible assumptions). Since India's problem was one of low gross national product per capita, rather than just low gross national income per capita, foreigners siphoning off all the income cannot directly have been the cause of India's poverty, especially when the vast majority of these payments, after 1800, were for things that contributed to the productivity potential of the Indian economy. It is entirely legitimate to castigate the British for not setting up an inclusive welfare state, for belatedly allowing elections, and for tolerating (and engaging in) conservative inegalitarian social practices that modern readers would find revolting. But this can be done even if we disprove the usual tales about the "drain", deindustrialization, landlords, or money lenders.³⁵

Two of the chapters of this thesis examine the middle two suspects. Chapter Two looks at the notorious landlords of Bengal, the *zamindars*, and finds them not guilty of rack-renting nor dispossession. It is true that they did not invest much in agriculture, but the proximate reason for this was because they were really landlords in name only, and had sold away the majority of their rights in land to their tenants and therefore the incentive to invest. In short, while the British respected the *zamindars'* property rights in land from the time of the Permanent Settlement of the land tax, they also protected, via the common law, the rights of certain tenants who held perpetual tenancies. In the course of time, the overwhelming majority of the big landlords chose to give their land out on these perpetual tenancies, and there were often multiple layers of these, as they were content with letting the rents flow in with little work, or effort, from themselves (they seem to have busied themselves by writing poetry). This was, for them, ultimately a fatal mistake, but a blessing to the agricultural middle classes. Crucially, they set their rents in nominal terms, and so when inflation started to erode the value of money after 1850, the real value of the rents payable by the permanent tenants, and received by the *zamindars*, declined. In response to the increased value of tenant right, the colonial state passed tenancy legislation

³⁵I will not discuss the money lender here, beyond pointing the interested reader to (Wolcott, n.d.).

providing further legal security for it. I think that tenancy legislation is a bad idea 99 per cent of the time. This, however, was the 1 per cent exception, as it really just upheld existing market contracts, and the rent laws were rather accommodating in practice - *zamindars* were less restricted than post-independence landowners, and the permanent tenants were even less so (unless subject to contractual conditions that could be renegotiated). Having dug their own graves, the *zamindars* were then made to lie in them because there was a third party enforcer - the colonial state - who did not permit them to renege on their tenancy agreements. By 1939, the landlords were getting a small share of the aggregate rental, which was distributed widely throughout society according these multiple layers of rights in land much like the stock and bond markets do to profits in modern economies, let alone the gross produce. The tenant was the real landowner, and he not infrequently let out his land on short term competitive rents far above those he paid himself - the land rental market was still active despite tenant right. Superior landlords did not invest because they had in fact all but sold the land to the tenants; if they wanted to do so, they could buy him out - just as anyone is supposed to do when they would like something someone else owns in societies with private property rights. Bengal was therefore really more-so a land of peasant proprietors than one of tyrannical landlords. Entertainingly, some of the supposedly "peasant proprietor" regions of British India turn out to have had similar, or sometimes higher, land inequality than Bengal. The fundamental reason for this very long standing misunderstanding has been a failure to carefully distinguish between land tax and land tenure regimes. Virtually everyone has followed along with the anti-landlord propaganda spread by some of the British officials: a case of "colonial institutions" actually turns out to be one of colonial ideology!

Chapter Three looks at the cotton textile industry and argues that imports were not particularly disruptive, and that both the Indian factory and traditional textile sectors, with the notable exception of hand spinning, were alive and well way before protectionism. Far from blocking colonial industrialization, the British abolished the traditional taxes on industry in India and financed key overheads, such as defence, through lump sum taxes on land, an indirect poll tax (salt), and via the Chinese consumer (opium). Industrialists in India therefore were subsidised by the state: they paid next to nothing in the way of tax, but benefitted far more from government

expenditure than small peasants - even before interwar protectionism. With rock bottom wages, low taxes, and the free movement of capital into the country, the stage was set for a rapid industrialisation.

With the opportunity of the century in front of them, almost all of the people of India decided to stick to farming. Yet, thanks to the large population, even if a small share of the population decided to join the modern world (to put it bluntly), they would form a large number in absolute terms. This is precisely what happened. The problem is why it only got so far: why it was the hare to the Japanese tortoise? Given the large size of the modern sector, the industrial ball should have already been rolling if you believe in the importance of external economies of scale. Agglomeration effects may encourage you to invest in the North of England, rather than, say, East Anglia, but the East Indies were really an East Anglia, in this period, with low wages, and, by 1900, a large industrial sector in absolute terms to boot.³⁶ India's poverty mattered not thanks to a large population and export opportunities, and indeed in many industries there was still ample room to displace imported manufactured goods despite the growth of domestic production. But industrialists and workers in India decided this was worth doing only to a certain degree, and not enough to dominate the world markets. Since they could not prove a major competitor, they were determined to play the protectionist.

And so industrial employment in India declined as a share of the workforce between 1800 and 1940, and in certain industries did so in absolute terms - which gets called "deindustrialization". But industrial employment in 1800 did not mean the same thing as in 1900: a rural hand spinner working part time is by no means whatsoever equivalent, in terms of "industrialization", to someone tending machinery in a modern state-of-the-art spinning mill. Technological change in this period dramatically raised labour productivity, and so employment declined even as output rose. The entire debate about employment declines, much like the debate on the landlords, really ignores the elephants in the room, which in this case is the survival of the majority of the hand loom weavers, and the growth of modern industry. Since local tastes demanded many types of cloth which the power loom could not profitably replicate, the majority of the hand loom

³⁶Agglomeration/acquired advantages were important for the location of the Cotton textile industry within the UK, see (Crafts & Wolf, 2014). The textile industries, however, were more regionally concentrated than most others (Crafts & Mulatu, 2005, Table 4).

weavers - unlike in Europe - were able to survive both the growth of imports and the competition of Indian weaving factories. But, in the 20th century, the hand loom weaver started to adopt the flying shuttle, raising labour productivity and, since this was not enough to challenge the territory of the power loom, this resulted in another employment decline in absolute terms even as output rose. Technology came for the trade resistant type of weaver.

I have left to the end the best attempt so far, which is both historically and economically informed. This is Tirthankar Roy and Anand Swamy's book on law and the economy.³⁷ They argue that the colonial legal system interacted with the traditional tenancy, family, and financial systems in unfortunate ways and that it was too slow. Chapter Two of this thesis addresses some of their tenancy arguments - if the law was the problem either party could have bought the other out or renegotiated the agreement to clear things up. That they did not suggests that it was not. Family law and complex partible inheritance systems I will not discuss, but I agree they complicated things. Chaudhary and Swamy's two papers on legal interventions into credit markets found little effect.³⁸ So they point to frictions, but the absence of any comparative case studies weakens the conclusions of the book. Compared to the rest of Asia, then or even now, the Raj does not come off poorly. The legal system provided by the Imperial Chinese state did not address private sector needs. Tenant right there, as we saw above, had no legal protection yet it was alive and well - better to have a complicated law that deals with reality than a simple one which does not.³⁹ The Japanese also underwent a legal transplant while retaining much of their customs. It remains to be researched whether their courts systematically performed better than the Anglo-Indian ones. In agriculture at least, the law appears to have mattered less than village custom, and the state used conciliation rather than legislation to deal with the problem of landlord and tenant - with the result that the tenants won.⁴⁰ The courts in Japan, before and after WW2, have made urban eviction very difficult, and they have also created "occupancy rights" to jobs in major firms.⁴¹ This hasn't stopped the Japanese from seeing rapid economic growth. In the Japanese colonies, some have claimed their legal reforms drastically improved

³⁷(Roy & Swamy, 2016).

³⁸The Punjab one was discussed above, but that in Bombay Presidency found limited effects too (Chaudhary & Swamy, 2017).

³⁹On Chinese law, see also (Ma, 2009).

⁴⁰(Smethurst, 1986).

⁴¹(Ramseyer, 2015, Chapter Six).

the performance of credit markets, but once you look into real interest rates there (even after such reforms), those in rural India appear normal.⁴² Indeed, rural interest rates in colonial India were apparently similar to curb market rates that industrial firms were borrowing at in Taiwan and South Korea during their "growth miracles".⁴³ The other potential object of comparison is post-Independence South Asia, and Roy and Swamy do also have a book on law and the economy in post-colonial India.⁴⁴ Despite the post-colonial state effectively outlawing two of the major reasons for court cases in colonial india, tenancy and money lending, court congestion and the length of suits has dramatically risen.⁴⁵ This is a puzzling thing given that the people in a democracy can just vote for more resources to be allocated to the courts. Indeed, if the law's delay was a major problem we would expect the constitutional reforms after 1919 to have solved it.

So the historians appear to do even worse than the economists, and many of the errors of the latter tend to be the result of an uncritical acceptance of the standard stories produced by the former. Roy and Swamy are a refreshing exception, but I'm not entirely persuaded. This thesis mainly examines the accusations against the usual suspects, and finds them unconvincing. It largely wipes the slate clean. More positive arguments for the origin and persistence of poverty will have to be left for future research.

⁴²Kelly Barton Olds speaks of a "financial revolution" in Taiwan after WW1, that series of real interest rates only declines after 1930 (seemingly due to inflation). Unsecured loans paid 25-30 per cent, and large collateralised ones 10-20 per cent in real terms before then (Olds, 2018). Another paper by Yoo and Steckel argues that Japanese cadastral surveys (the equivalent of which had been done or were in progress in India) in Taiwan and Korea resulted in major interest rate declines (Yoo & Steckel, 2016). However, examining their figures for interest rates from the working paper version, shows that interest rates in Korea, (including those offered by a bank focusing on mortgages after the cadastral survey) were in the range of 30 to 40 per cent, declining to 20 by WW2 (Yoo & Steckel, 2010, Figure 3a).

⁴³(Song, 1997, Table 9.4), (Smith, 2000, Table 2.11).

⁴⁴(Roy & Swamy, 2022 - 2021).

⁴⁵(Roy & Swamy, 2022 - 2021, Page 5).

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Chapter 2

South India and the Great Divergence: Another Look at Francis Buchanan's Evidence

2.1 Introduction

In parallel with arguments that the “Great Divergence” between North Western Europe and East Asia took place later than commonly supposed, a “revisionist” view has emerged about early modern Indian living standards with claims that they were on par with (North West) Europe.¹ Recent work has found that living standards in Northern and Eastern India declined over the 18th century before stagnating after 1800, and that those in Western India were already extremely low between 1500 and 1650.² What, then, about South India, given the focus on regional variation (in the Chinese case, the Yangtze Delta vs the rest)? The classic statement of the revisionist case is by Parthasarathi who claims that South Indian grain wages were on par with those of North Western Europe in the late 18th century.³ This is meant to be backed by high agricultural labour productivity in non-tradable grains resulting in low silver wages that resulted in competitive textile exports to the rest of the world. Broadberry and Gupta are critical of these arguments and suggest that these grain wages are inconsistent with time series evidence and that lower nominal wages in India meant also lower real wages once internationally traded goods were accounted for.⁴ What were textile exports paying for? The usual characterisation of the Indian textile trade is “bullion for goods” - textile exports were paying seigniorage revenue to the owners of silver mines in the New World (the Spanish Crown and friends), and were therefore a symptom of something that probably lowered Indian living standards rather than being a source of prosperity.⁵

Tirthankar Roy provides a critical review of revisionist claims about living standards in the 18th century.⁶ In his account, states were too busy fighting to invest much (did the Mughals invest in much beyond large tombs even in times of peace?), although he suggests that warfare mattered little for the peasantry. Since technology did not change there is little reason to believe that productivity rose (although aggregate productivity changed little despite significant technological change in the following two centuries). Grain wages only get you so far. Sashi Sivramkrishna

¹For opposing views on China, see (Pomeranz, 2000), (Huang, 2002).

²(de Zwart & Lucassen, 2020), (Carvalho *et al.*, 2023).

³(Parthasarathi, 1998).

⁴(Broadberry & Gupta, 2006).

⁵(Prakash, 1976). This issue with silver imports was pointed out long ago by Shireen Moosvi (Moosvi, 1987, Page 93).

⁶(Roy, 2013).

argues that Francis Buchanan's evidence, from the South Indian region of Mysore, supports revisionist claims based upon estimated welfare ratios.⁷ We all know that living standards in South India were low around 1900, so this would suggest a large drop, which would then need to be explained. Dharma Kumar examined grain wages in Madras presidency (which Mysore bordered) over the 19th century, and found a remarkable stability between 1800 and 1873.⁸ The standard official figures for grain wages then start to fall, but this was due to a failure to update the nominal wage figures in line with inflation rather than a real fall - wages could hardly get any lower.⁹ So it would also need to be explained why Mysore was exceptionally rich at the start, and why it declined.

What determined living standards? A candidate theory for this period is the Malthusian one.¹⁰ Equilibrium South Indian living standards were set at some subsistence level depending on demographic customs and mortality rates. The long term stability in grain wages that Dharma Kumar found is consistent with the Malthusian model: increases in the demand for labour were absorbed by population growth. A Mysorean decline would therefore need to be explained within the Malthusian framework. High incomes there would suggest high mortality or widespread fertility restraint. I doubt that fertility (conditional on income) suddenly shot up after 1800. On mortality, who knows? Modern medicine made some headway in South India and the last famine was in the 1870s, but perhaps extended interaction with the rest of the world spread disease. Whatever the case, death rates were high in India before they began to fall in 1920s, so higher living standards in 1800 would then probably have required extraordinarily high death rates.¹¹ Perhaps 18th century wars caused such depopulation that the survivors lived in plenty. But this could have only been a transitory phenomenon.

High living standards would also imply high labour productivity. However, Indian industry was notorious for its labour intensity and low productivity in this period. Iron was still being produced by the bloomery method, spinning was performed by the hand spindle or the *charkha* (spinning wheel), flying shuttles were unknown in weaving, and, where water conditions permitted, labour

⁷(Sivramkrishna, 2009).

⁸(Kumar, 1965, Chapter IX).

⁹(Roy, 2007).

¹⁰E.g. (Clark, 2008, Chapter 2).

¹¹On demography see (Dyson, 2018).

intensive transplanted rice was grown.¹² These are signs of a society with low wages and high interest rates. Only a low labour to land ratio could have resulted in high living standards, and, given the Indian fertility regime, this could not have lasted.

Fortunately, we do not have to rely on such speculations. This paper shows that Francis Buchanan's evidence does not support revisionist claims. In addition to re-examining the data for Mysore, I present welfare ratios calculated for Coimbatore, Malabar and South Kanara, other parts of South India visited by Buchanan. Both South Indian nominal and grain wages were low by North Western European standards. Sivramkrishna's high aggregate figures conflict with his own estimates for labourers and are the result of an extremely unlikely occupational and class distribution. In addition, slave prices and (from a slightly later date) anthropometric evidence also suggest South Indian labour produced little above subsistence. The Great Divergence was already underway by 1800.

2.2 The Basics of Buchanan

First, a little context: who was Francis Buchanan and why did he leave so much data on India? He was a Scottish doctor, who went out to India to work for the East India Company in the late 18th century. He was selected by the government to tour certain parts of India and write descriptive and statistical reports. The first is the subject of this paper: "*A Journey from Madras through the Countries of Mysore, Canara and Malabar*" undertaken in 1800. It was written chronologically as his journey progressed and information and statistics are jumbled throughout. He can be compared to Arthur Young.¹³ Buchanan took his Mother's surname after her death which is why he is also referred to as "Buchanan-Hamilton".

Figure 2.1 sketches out the approximate path of Buchanan's journey on top of a map of South India from the early 20th century. His account of the journey was written in three volumes. In the first volume Buchanan starts out in Madras, a coastal city and the capital of the EIC's South Indian territories, and travels inland into the territory of the Princely State (internally

¹²(Habib, 2017 - 2008).

¹³Multiple participants at the Oxford Economic and Social History graduate seminar pointed this out to me.

self governing but externally dependent territories ruled by local monarchs) of Mysore.¹⁴ The rest of the book is spent touring around the country in the aftermath of the rule of the famous (or infamous, depending on who you ask) prince, Tipu Sultan. Volume 2 takes him south to Coimbatore, which had recently been conquered by the EIC (less a commercial concern, and more a government by this time) and then onto the coast in Malabar.¹⁵ The final volume covers Buchanan heading North to Kanara before travelling inland to Mysore before returning to Madras.¹⁶ I will reference these books as "(Vol X, Page Y)" in the text. On the map the red line covers Volume One, the blue line Volume Two and the green line Volume Three. They are not perfectly accurate but give an indication of when he visited where. Mysore (and the other princely states) are yellow and the pink regions were part of Madras presidency. The brief section in the upper left corner into the uncoloured area was North Kanara.

2.3 Sivramkrishna's Evidence

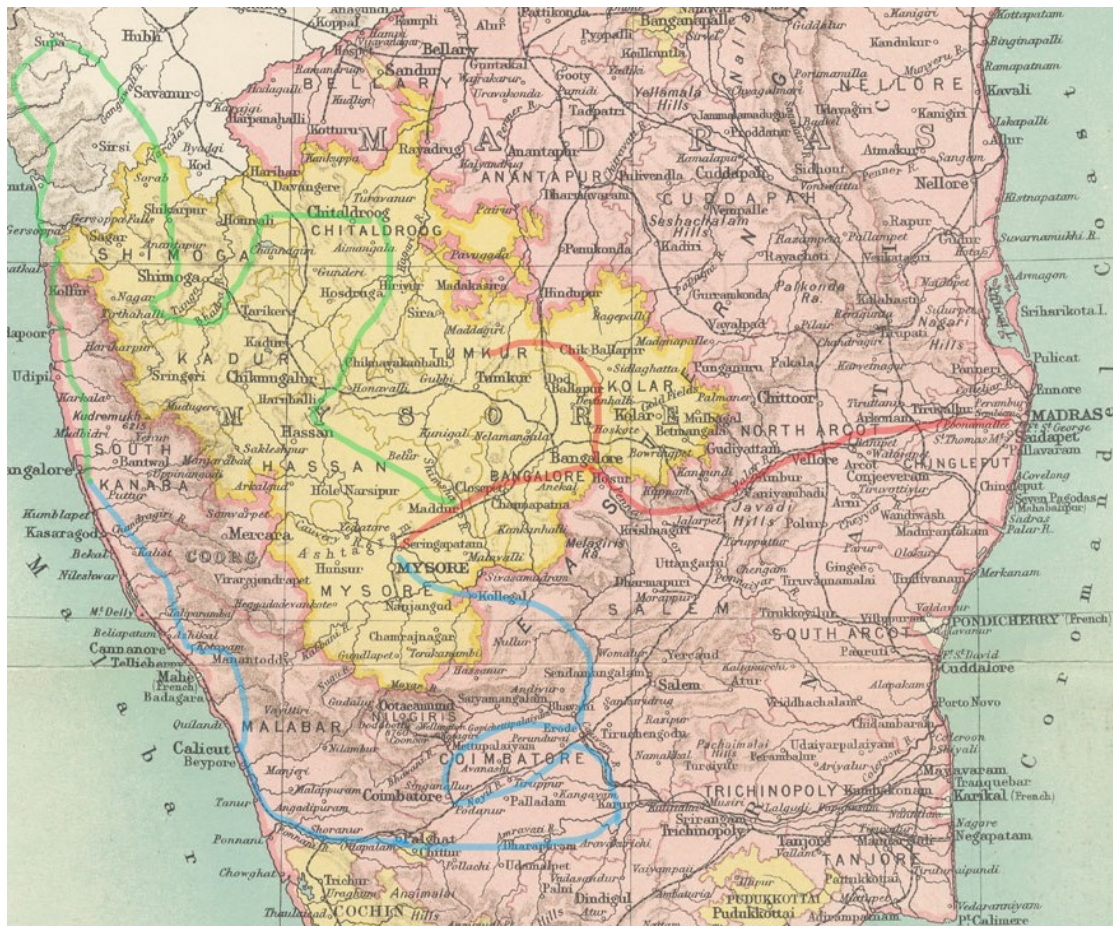
Buchanan provides a considerable number of wage observations and a few rental observations from which we can determine the incomes of different classes. For Mysore, I will use Sivramkrishna's estimates (to deal on his own terms). Since the point of production is ultimately consumption, income only matters in terms of its purchasing power over desired goods. The simplest measure of consumption ability is the grain wage/income since foodstuffs formed the bulk of household consumption until relatively recently across the globe. This is not the full story, however, as man does not live by grain alone. The next step up is a welfare ratio based upon nominal incomes divided by the cost of a specific bundle of goods (almost always including a large proportion of grain). The staple grains in South India were rice and millets. Since these make up the bulk of the subsistence budgets, I discuss these two types of grains in Appendix 2.A. The long-story-short is that the staple grain in most of Mysore was *Ragi*, a millet, but millets are extreme inferior goods; only the poor eat them, and as soon as incomes rise people tend to substitute away from them in favour of rice and wheat. Diets and subsistence bundles primarily

¹⁴(Buchanan, 1807a).

¹⁵(Buchanan, 1807b).

¹⁶(Buchanan, 1807c).

Figure 2.1: A Sketch of Buchanan's Journey in South India.



Source: Route hand-drawn, map from the Imperial Gazetteer of India (Imperial Gazetteer, 1931).

consisting of millet suggest widespread poverty in Mysore.

Sivramkrishna constructs two budgets from the prices provided by Buchanan at Bangalore in Mysore. The first is a *ragi* (millet) budget containing 0.5 kg of *ragi*, 0.1 kg of lentils, 0.01 kg of ghee (clarified butter) for each day of the year and a 9.6 square meters of coarse cloth per person annually.¹⁷ This bundle costs 187 pence per person, or 561 pence for a family equivalent to three adults. A welfare ratio measures the ability of an income of an individual to purchase a bundle of goods for a family, so those with welfare ratios below one would be able to support themselves but not raise children.¹⁸ The second bundle replaces the *ragi* with an equal weight of coarse rice which costs 307 pence per person per year or 921 pence per family. As he notes the best kind of rice was three times as expensive as the coarse kind so even this budget is hardly luxury.¹⁹

These budgets provide a bare bones level of calories and little else. A family living on this budget will not have any fuel to cook their food, housing to sleep in, or soap to clean with. There are no spices or salt to flavour the food, or even any fresh vegetables. Petty luxuries like sweets, alcoholic beverages or tobacco are, of course, excluded. On the other hand, the amount of cloth is in excess of Allen's minimum of three meters per person a year which partially accounts for the lack of other items. For the rice bundle, the grain is purchased out of the husk and therefore can be cooked straightaway. *Ragi* was sold unground and, to this extent, the *ragi* bundle overstates the net calories available.

Indeed, the budget is rather similar to a 19th century famine relief budget, which no one will consider to be a sign of affluence. Table 2.1 compares the *ragi* subsistence budget with two famine relief wages: the "full" wage, for adults on the relief works, and the "minimum" wage, for adults on gratuitous relief, as recommended by the 1898 Famine Commission. The famine budgets were designed to do no more than keep people alive until the labour market and food prices recovered from crop failures (and sometimes they weren't entirely successful at doing that). The "grain equivalent" is the quantity of grain procurable if the entire budget was spent on it

¹⁷(Sivramkrishna, 2009, Page 708).

¹⁸(Allen, 2015).

¹⁹At Bangalore *ragi* cost 14 (0.618) pence per bushel (kg), coarse rice cost 33 (1.166) pence per bushel (kg) and wheat 66 (2.428) pence per bushel (kg) (Vol 1, Page 195).

alone. The Mysorean *ragi* budget, expressed in grain equivalents (0.826), is near the average of the famine wages (0.889) so as a subsistence budget it is in accordance with the extremely low standard of famine relief. The margin and rounding up proposed by the Famine commission is meant to be sufficient to cover the cost of converting grain other than *ragi* into flour. The commission proposed to limit *ragi* to at most two thirds of the grain ration because of the expense of processing it.²⁰

Are there any other benchmarks? I compared this subsistence diet with the least cost diet meeting a set of baseline requirements for calories, protein and fat calculated with linear programming, as proposed by Robert Allen.²¹ This diet needs to meet 2100 calories per day, 50g of protein per day and 34g of fat per day. Sivramkrishna reports that his proposed budget provides 2113 calories, 60.2 g of protein a day. I calculated that it provides 18.99 grams of fat a day. The least cost diet that meets Allen’s requirements costs 210.64 pence per person per year (as opposed to 150.5) and consists of 0.5 kg of *ragi*, 0.05 kg of pulse and 0.025 kg of ghee (rounded quantities). As Allen notes, merely meeting these requirements still leaves people deficient of vitamins. A *ragi* welfare ratio of one (or just above one) does not mean people are well off.

2.4 Incomes in Mysore

2.4.1 Individual Incomes

After proposing a subsistence budget, Sivramkrishna estimates annual incomes from 70 of Buchanan’s observations in Mysore. Of these, 39 are agricultural, 30 “proto-industrial” and the remaining one classified as “tribal”.²² Within the non-agricultural observations, 20 refer to iron workers, 7 to textile workers (mainly weavers but also one spinner) and the rest to quarry and stone workers. Eleven are women and the rest male. Table 2.2 shows the average of his estimate *ragi* and rice welfare ratios by several categories.

These figures - Sivramkrishna’s own - do not support the claim that Mysore had high living

²⁰(GoI, 1898, Page 272).

²¹(Allen, 2017).

²²Proto-industry has a specific meaning, which does not really apply to Mysore. It is essentially the expansion of rural handicrafts which are produced part time by peasants for export in order to supplement their incomes and import food and goods from other regions when agriculture fails to meet their needs and wants (Mendels, 1981).

Table 2.1: Ragi Subsistence Wage Compared with Famine Wages

| Item | Ragi Budget (kg) | Full Wage (kg) | Minimum Wage (kg) |
|--------------------------|------------------|---------------------|----------------------|
| Grain | 0.5 | 0.68 | 0.425 |
| Pulse | 0.1 | 0.11 | 0.057 |
| Ghee or Oil | 0.01 | 0.028 | 0.014 |
| Salt | 0 | 0.014 | 0.014 |
| Condiment and vegetables | 0 | 0.028 | 0.028 |
| Grain Equivalent | 0.826 | 1.121 (1.32) | 0.657 (0.679) |

Sources: (Sivramkrishna, 2009, Page 708) and (GoI, 1898, Pages 271-72). **Notes:** Grain equivalent is the purchasing power of the entire budget expressed in units of grain plus a 5 per cent margin (i.e. money value of the entire budget divided by the price of grain). The grain equivalent of the *ragi* budget is its cost excluding the cloth component expressed in kg of *ragi* procurable. Figures in parentheses are the rounded-up to the nearest ounce grain equivalents proposed by the Famine commission.

Table 2.2: Summary of Sivramkrishna's Welfare Ratios

| Class | Average Ragi | Average Rice | No. | Share Ragi Over 1 | Average Income (d.) |
|-------------------------------|--------------|--------------|-----|-------------------|---------------------|
| All | 1.443 | 0.88 | 70 | 0.529 | 810.5 |
| Agricultural | 1.04 | 0.64 | 39 | 0.333 | 585.1 |
| Agricultural – Men | 1.20 | 0.733 | 29 | 0.45 | 675 |
| Agricultural – Women | 0.578 | 0.35 | 10 | 0 | 324 |
| “Proto-industrial” | 2.00 | 1.22 | 30 | 0.8 | 1125 |
| “Proto-industrial” – Iron | 1.56 | 0.95 | 20 | 0.8 | 875 |
| “Proto-industrial” - Textiles | 2.83 | 1.72 | 7 | 0.86 | 1588 |

Source: (Sivramkrishna, 2009).

standards around 1800. Overall, the average (mean) *ragi* ratio is at 1.443 but the rice ratio falls below one at 0.88. The mean is a misleading figure, however. The proportion of non-agricultural workers in the sample (42 per cent) is too high to be representative, although occupational structure in early modern India has been a disputed subject. Roy suggests 25 per cent as a potential figure for the non-agricultural employment share, for example, but the bulk of this consists of cotton spinning women, who in fact worked part time and were poorly paid, even by the standard of the time.²³

Although they form a large share of the sample of professions, it is highly likely that iron working and silk weaving did not occupy a large proportion of the workforce. Table 2.3 presents estimated productivity and employment per iron works in Mysore from Buchanan's observations. On average a man produced 0.307 tons of iron per year. A furnace produced, on average, 6.23 tons per year. By contrast, English bloomeries after 1400 were producing 25 tons a year, while the blast furnaces introduced after 1500 brought the per furnace figure up to 200 tons (although this iron required further working) and furnace productivity was only to go up thereafter - India was far behind the West and China here.²⁴ What was aggregate output and employment like? The 1863 Mysore administration report put the output of iron as 1,109 tons per year.²⁵ Assuming that output was the same in 1800 (1863 was before the import invasion, so this is an overstatement for 1800), $1,109/0.307$ implies 3,908 workers in the industry. With an aggregate Mysorean workforce of, say, 0.9 million (the population was around 2.5 million), iron workers would make up 0.43 per cent of the total, while they form a 28.57 per cent of the Mysorean sample - they are over-represented by factor of 66.45. Given that iron working was arduous, part of these higher than average income figures represent compensating differentials.

Next, consider only textile workers. With the exception of the woman hand spinner all of the textile worker observations come from Bangalore and tend to represent producers of the finer types of cloth and not the coarse cloth included in the *ragi* and rice bundles.²⁶ The *puttegar* weavers Buchanan consulted at Bangalore worked with silk (or cotton textiles with silk borders)

²³(Roy, 2005, Page 102). See also Chapter Three. The same issue occurs in the Yangtze Delta data (Li & van Zanden, 2012).

²⁴British figures taken from (Schubert, 1957, Appendix IV). The bloomery process used in India was a technological dead end.

²⁵(Government of Mysore, 1864, Page 72).

²⁶The spinner also seems well paid compared to my figures in Chapter Three.

and were "chiefly accustomed to work goods for the use of the court at Seringapatam" (Vol 1, Page 221). Such luxury goods required skills that the elite were willing to pay handsomely for. The average weaver outside of the capital was likely to produce coarse non-silk cloth for common consumption. Buchanan reports 571,200 lb of cotton wool being imported into Bangalore (Vol 1, Page 207). Given my productivity estimates (from Chapter Three), the resulting yarn would take 10,420 spinners to make, and would employ around 3,100 looms and 6,200 weavers full time, perhaps more part time.²⁷ He puts the import of silk into the city at 47,437.5 lb a year. How much silk did a weaver use each year? Statistics on silk are harder to find than for cotton, but the Tariff Board report in the 1930s provided data for two types of silk saris woven in Mysore.²⁸ The average of these figures suggest that a loom wove 47 lb of silk a year, which would give us 1,012 looms in operation, and perhaps 2,024 weavers.

These numbers are somewhat supported by Mysorean Government figures from 1804 which put the number of cotton weaving families at 10,180, silk manufacturer families at only 318 and weavers of "*Cummel*, or the coarse woollen mantle, universally worn by the lower orders" at 34,800 in the entire country. While the silk number seems like an understatement, it shows that cotton and wool predominated. The woollen weavers were all, apparently, also cultivators.²⁹ The same return gives the total number of looms in the country at around 30,000, while one account put looms in Bangalore at 5,000 - not far from my estimate. The aggregate number of silk weavers is unlikely to have exceeded two thousand by much. The privileged weavers with relatively high incomes formed a small share of the total weaving population and were not representative.³⁰

In Buchanan's time textile technology was the same as that in use before the industrial revolution: hand spindles, spinning wheels, and throw shuttle looms. A common woollen cloth took around a week to weave.³¹ The woollen cloth market was also limited: it was only large enough for two mechanised woollen mills to be established in Bangalore towards the end of the 19th century.³² In Coimbatore (South of Mysore) most weavers were not rich enough to trade for themselves and were consequently bound in debt to local merchants (Vol 2, Page 240), as has always been

²⁷See Chapter Three of this thesis.

²⁸(GoI, 1940, Page 110).

²⁹(Wilks, 1864, Page 45).

³⁰(Heyne, 1864, Page 54).

³¹(Heyne, 1864, Page 60).

³²(GoI, 1935, Page 8).

common in India. The average weaver would not have been well off. According to Buchanan the coarse weaver "cannot make above 3d a day" (Vol 1, Page 217), less than half of what the silk weavers could get. Large intra-occupation income variation was also a phenomenon that persisted into early 20th century handloom weaving.³³ Chapter Three of this thesis finds that, excluding those working with silk, the rice equivalent wages of these weavers reported by Buchanan-Hamilton were approximately the same as those of weavers in the early 20th century. Since the price of manufactured goods fell relative to food grains, welfare ratios presumably rose (but not by much).

Next, consider agricultural workers. While the average (mean) *ragi* ratio for men was reasonably in excess of one, less than half of these men had *ragi* ratios above one. Of agricultural workers with *ragi* ratios above two, one was a *gauda* (a village headman, so not really an agricultural worker), another a *yatam* (irrigation device) operator – hard work irrigating the fields – and one is an agricultural labourer in Kellamangallam who somehow earned twice the wages of his equivalent in nearby Kolar.³⁴ These details do not suggest that the average agricultural worker was particularly well off.

One easily forgotten good in the subsistence budget is leisure. Two workers with cash (or in kind) incomes sufficient to purchase the subsistence budget have very different living standards if one has to work only 6 months of the year while the other only gets a week off each year. The standard number of working days assumed when calculating welfare ratios is 250.³⁵ Sivramkrishna uses a mix of assumptions on the length of the working year. Annual contracts detail payment over the length of an entire year which presumably accounts for days of leisure. For monthly contracts, except for agricultural labour, he bases his income figures on 10 months of work. This gets us close to 250 days worked if these workers had a day off each week in addition to two months of holidays. Likewise, daily agricultural labourers are assumed to work 240 days a year (4 per cent understatement relative to 250) and women workers are assumed to work only 180 days a year (28 per cent understatement). Most female daily wage observations are for periods of peak labour demand (e.g. at harvest) and this perhaps balances things out. The most problematic

³³(Roy, 1999, Page 68).

³⁴Kellamangallam and Kolar are only around 80km away from each other.

³⁵(Allen, 2015).

assumption is that non-agricultural workers with daily earnings are assumed to work 320 days a year. This overstates welfare ratios of this class by 28 per cent relative to the baseline of 250 days. This is true even if non-agricultural workers did work 320 days a year. Calculating non-agricultural worker's incomes on the basis of 250 days a year results in a decline in their average (including those whose working year has not been adjusted) *ragi* ratio from 2 to 1.8.

2.4.2 Aggregate Incomes

Having found that labourers' incomes in Mysore were, as a rule, at or below subsistence, Sivramkrishna constructs an "aggregate welfare ratio" from an average of the (*ragi*) welfare ratios of different classes weighed by their estimated share in the population. As a measure of living standards this is open to the same criticism as GDP per capita since it ignores inequality. Indeed, the "aggregate welfare ratio" is nothing more than an estimate of real GDP per capita estimated in terms of the *Ragi* bundle. His aggregate welfare ratio turns out to be 4.87, a remarkably high figure. Sivramkrishna's table is reproduced here (Table 2.4) with the addition of the coarse rice ratio (Rc) I have calculated from his figures.

The core of the occupational distribution is taken from Buchanan's caste wise population figures for South Kanara in the first few pages of Volume Three. The occupational distribution and the result are, however, rather odd. For a start, take the average welfare ratio of a labourer to be equal to one (from the table agricultural labourers have welfare ratios below one, but adjust this upwards to account for some skilled labourers). This is just over one-fifth of the aggregate welfare ratio. Let the labour share of income (α) be by definition:

$$\alpha = \frac{W * L}{Y}$$

Where W is the average wage, L is the workforce, Y is aggregate output (W and Y measured in *Ragi* bundle terms). This is equivalent to stating that the labour share of income is equal to the average wage divided by output per worker. Since the workforce was smaller than the population we have:

Table 2.3: Productivity and Employment in Mysorean Iron Smelting

| Forge | Output (Tons) | Workers | Output per worker per year (Tons) | Volume | Pages |
|----------------|---------------|-------------|-----------------------------------|--------|--------|
| 1 | 5.05 | 16 | 0.316 | 1 | 172-5 |
| 2 | 5.68 | 23 | 0.247 | 1 | 177 |
| 3 | 5.62 | 20 | 0.281 | 2 | 35-8 |
| 4 | 7.04 | 22 | 0.32 | 2 | 22 |
| 5 | 4.97 | 22 | 0.226 | 2 | 139-40 |
| 6 | 9.02 | 20 | 0.451 | 3 | 362 |
| Average | 6.23 | 20.5 | 0.307 | | |

Source: Buchanan's Journey, volume and page numbers given in table.

Table 2.4: Sivramkrishna's Aggregate Welfare Ratio

| Class | Population Share | Rg | Weighted | Rc | Weighted |
|---|------------------|-------|-------------|------|-------------|
| Small Cultivators | 0.09 | 2.9 | 0.261 | 1.77 | 0.15898 |
| Medium Cultivators | 0.17 | 7.68 | 1.3056 | 4.68 | 0.79526 |
| Large Cultivators | 0.09 | 15 | 1.35 | 9.14 | 0.82231 |
| Agricultural Daily Wage Labourers | 0.01 | 0.815 | 0.00815 | 0.50 | 0.00496 |
| Extractors of Palm Juice | 0.14 | 5.63 | 0.7882 | 3.43 | 0.48010 |
| "Proto-industrial" Proprietors, Merchants etc | 0.12 | 8.5 | 1.02 | 5.18 | 0.62130 |
| Servants (Agricultural) | 0.14 | 0.93 | 0.1302 | 0.57 | 0.07930 |
| Servants ("Proto-industrial") | 0.005 | 1.635 | 0.008175 | 1.0 | 0.00497 |
| Others | 0.235 | 0 | 0 | 0 | 0 |
| Average | | | 4.87 | | 2.97 |

Source: (Sivramkrishna, 2009, Table 5). **Notes:** Rg is the Ragi welfare ratio, and Rc is the Coarse Rice welfare ratio.

$$\alpha = \frac{W}{(Y/L)} < \frac{W}{(Y/N)}$$

Where N is the total population. The ratio between the average wage and output per capita is therefore an upper bound on the labour share of income. The average wage was approximately 1 in *ragi* bundle terms.³⁶ From Table 2.4 this upper bound is 20.5 per cent. The rule of thumb figure for the labour share in modern economies is usually 66 per cent; 20.5 per cent is an implausibly low figure for an upper bound. Since we have evidence from Buchanan that W was around one, this is indirect evidence that the “aggregate welfare ratio” was less than 4.87.

How well does this test fit other data? What amounts to an “aggregate welfare ratio” has been calculated for England in 1688 from Gregory King’s social tables.³⁷ This “aggregate welfare ratio” (in terms of barebones subsistence baskets) was 4.8 while the welfare ratio for workers was 2.8. This gives us an implied upper bound on labour’s share of 0.583. Independently estimated values for labour’s share in England’s national income are 0.58 in 1680 and 0.591 in 1590 - broadly consistent - which suggests that the aggregate welfare ratio calculated for Mysore in 1800 is much less plausible than that for England in 1688.³⁸

Consider the ratio of agricultural workers (daily wage labourers plus servants) to cultivators: 3 to 7. Small farmers might be expected to generally use family labour but Sivramkrishna puts these at only a quarter of the total number of cultivators. Medium and large cultivators owned multiple ploughs and would have had to hire permanent servants, let land to tenants, or have families larger than the equivalent of three adults. In addition, some Brahmins were forbidden by custom to undertake certain forms of agricultural labour - they would have had to have servants. A general rule that repeatedly crops up in Buchanan’s descriptions of the stock and size of farms is the (at least) one-plough-one-servant figure, plus additional hands for harvest and weeding (e.g. Vol 1 Page 123, Pages 389-390, Page 415, Vol 2 Page 217, Page 372, Vol 3 Page 35, Page 139, Page 299, Page 398). This figure was also mentioned in Bengal around the same

³⁶Agricultural wage labourers and servants have incomes below 1, but let us round up to account for non-agriculturalists. The average *ragi* bundle wage in Table 2 is 1.443, but this comes from an unrepresentative sample, including silk weavers and iron workers. Using this figure gives us an implied labour share of 0.296 which is still rather low.

³⁷(Allen, 2008).

³⁸(Clark, 2009, Table 13).

time.³⁹ Even if all of the small and medium farmers hired no servants there would still only be 1.56 servants to each large farmer – an implausible figure. From Sivramkrishna’s own figures, if ploughs were directly proportional to *ragi* ratios and small farmers had only one plough, then medium farmers had 2.64 ploughs and large farmers had 5.17 ploughs. This would give us 2.86 servants per farmer on average rather than the 0.43 figure his occupational distribution implies - the ratio between the two figures is 6.65! Assuming for generosity’s sake that small farmers had only one plough (very plausible), medium farmers had two (somewhat plausible), and large farmers had only three (a low figure), on average one farmer would be accompanied by two agricultural servants.

It is difficult to determine what the agrarian structure of Mysore actually looked like in the early 20th century, let alone in 1800. Nevertheless some data does exist.⁴⁰ Land in Mysore was customarily split between wet (essentially irrigated) and dry (rainfed). Wet land was far more valuable than dry land, but was less extensive, and acreages can therefore be misleading. In terms of the land tax, Mysore was a *Ryotwari* province, which meant that the land tax was levied upon individual ”survey” fields in most of the country. A landowner (often) held multiple survey fields and each of these were entered in his *patta*, or tax receipt. There was also a certain amount of *inam* land, held at a quit rent for historical reasons and this was not included in the normal statistics. The 1931 Census showed Mysore to have few tenants and agricultural labourers relative to owner cultivators.⁴¹ However, the government figures for landholding tell a rather different story, and are presented in Table 2.5. Around half of all occupants (those with 5 acres or less) held only 17 per cent of all land under the standard government survey tenure in the 1920s.⁴² There is little reason to believe that land inequality was substantively lower in 1800. Indeed, Figure 2.2 finds two rather similar Lorenz curves for land inequality almost a century apart in Mysore - one in 1830s and the other in the 1920s. The Lorenz curve from the 1920s is based upon area as in Table 2.5, and therefore understates inequality because larger landowners often held more valuable land. The Lorenz curve from the 1830s is based upon the distribution of tax payments (which relate to landownership) on cash tax paying land only,

³⁹(Colebrooke, 1884, Page 60).

⁴⁰For land inequality elsewhere in India see Chapter 2 of this thesis.

⁴¹(Iyengar, 1931, Vol II, Table X, Pages 89-90).

⁴²(Hayavadana Rao, 1927, Vol 3, Page 19).

which was "independent of the *Buttayee* cultivation [land paying taxes in kind/share of the crop, usually wet], and of lands held by the wealthier Potails [Village headmen] in the names of their relatives and dependants. The Account is also imperfect, as it only shews the highest amount paid by one individual in any one Village, whereas some hold lands in different parts of the country".⁴³ The two distributions are remarkably similar, despite the incentive for land to be held for purely financial reasons rising between the two periods, since the share of the economic rent taken as tax declined considerably over the 19th century. The implied Gini coefficient for the 1920s is 0.542, and that for the 1830s is 0.611, both being understatements.⁴⁴

Wet land, which earned a disproportionate share of land rents, was "almost invariably let" in the 1920s.⁴⁵ M. N. Srinivas, an anthropologist who stayed at a Mysorean village in the 1950s, allows us to reconcile the census data with the land distribution figures: "There were very few households each of which owned twenty irrigated acres or more, followed by a substantial number which owned less than five such acres. *The 'landowner' category was hospitable enough to include even those who had an acre or less of dry land [emphasis added]*".⁴⁶ This suggests that the small holdings did not consist of valuable land. Dry lands were apparently owner cultivated, as a rule, but the largest 22,262 landowners (with holdings over 50 acres) almost certainly employed permanent servants or let to tenants, as they held more land (1,657,533 acres, 74 acres per holding, double the entire amount of paddy land in the state) than the 583,696 landholders with less than 5 acres per holding (1,342,379 acres, 2.29 acres a holding).⁴⁷ Buchanan suggests that five ploughs (so five servants) would suit a farm of 13.76 acres of wet land and 36 acres of dry land (Vol 1, Page 124). This is approximately 10 acres a plough. Although most families owned some quantity of land, these figures suggest that the median farmer would have had to either rent land from their better endowed neighbours, or work for them as servants in addition to cultivating their own fields.

⁴³(Chalmers, 1864, 37).

⁴⁴On *inams*: The 1890s Mysore Gazetteer states that *inam* land was valued at 12 lakhs on normal revenue lines, but was assessed at just under 4 lakhs. The total land revenue was approximately 70 lakhs, $70 + (12 - 4) = 78$, and $12/78 = 0.154$ which is a measure of their importance in the total value (Rice, 1897, Pages 967 and 702).

⁴⁵(Hayavadana Rao, 1927, Vol 3, Page 54).

⁴⁶(Srinivas, 1976, Page 211).

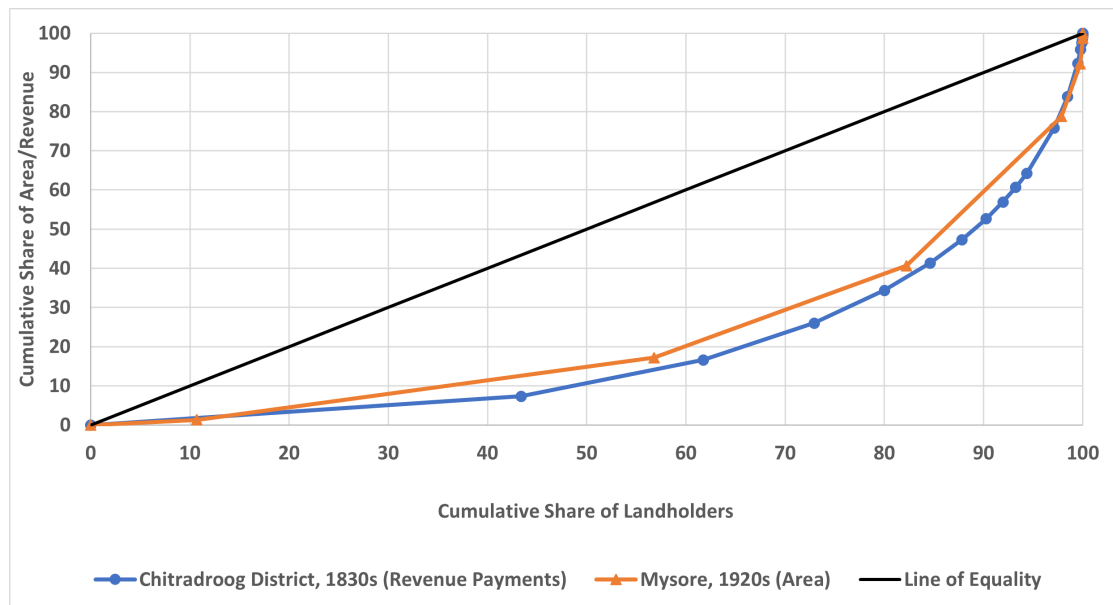
⁴⁷(Hayavadana Rao, 1927, Vol 3, Page 19).

Table 2.5: The Distribution of Survey Tenure Land in Mysore, 1920s

| Holding Size (Acres) | Number of Pattas | Acres | Percentage of Holdings | Percentage of Area |
|----------------------|------------------|------------------|------------------------|--------------------|
| <1 | 109,755 | 101,365 | 10.68 | 1.3 |
| 1-5 | 473,941 | 1,241,014 | 46.12 | 15.9 |
| 5-10 | 261,326 | 1,829,524 | 25.43 | 23.44 |
| 10-50 | 160,312 | 2,974,176 | 15.6 | 38.11 |
| 50-100 | 19,350 | 1,042,174 | 1.88 | 13.36 |
| 100-500 | 2,804 | 516,242 | 0.27 | 6.62 |
| 500< | 108 | 99,117 | 0.01 | 1.27 |
| Total | 1,027,596 | 7,803,612 | 100 | 100 |

Source: (Hayavadana Rao, 1927, Vol 3, Page 19).

Figure 2.2: Mysorean Land Inequality Over Time



Sources: 1920s from Table 2.5, and 1830s from (Chalmers, 1864, Page 38). **Notes:** Chalmers reports the number of people paying revenue between certain bounds. In calculating the revenue paid by each group, I assume that the average within the group equaled its midpoint, so, for example, those in the 15 to 20 pagodas group were assumed to have paid, on average, 17.5 pagodas as tax. The implied Gini coefficient for the 1920s is 0.542, and that for the 1830s is 0.611.

Large farmers represented the rural elite and almost certainly had *ragi* welfare ratios considerably above one but it is highly unlikely that this peasant aristocracy represented 9 per cent of the population or even a quarter of the cultivators. If we take the 1920s figures, they (those with over 50 acres, i.e. five ploughs) were only 2 per cent of all landholders. Consider a small farmer cultivating only with the help of his family. His income is the produce of his fields (plus whatever odd jobs undertaken on the side). We can think of his agricultural income (on average) to be a return to labour expended, a return to his capital stock, and the rent of his land. Labour income from agriculture, as we saw above, was likely to result in a welfare ratio somewhere just below one. Mysorean farmers, like those elsewhere in India, used capital sparingly. Buchanan's descriptions of the average farm stock were bleak (e.g. Vol 1 Page 126, Vol 2 Page 218, Vol 3 Page 240, Page 349). Later evidence on the cost of agricultural implements in Mysore suggests that they were rudimentary and low in value, as one would expect with rural India's high rates of interest.⁴⁸ However, it is likely that, unless you were exceptionally thrifty or a substantial farmer, much of this income went to the moneylender who financed agricultural enterprise. This leaves us with the rent of land. The small farmer was unlikely to have earned much by way of land rents. One reason for this, beyond the small size of farms, was because the main source of government income in India was the land revenue. On wet land suitable for paddy cultivation the tax was collected in kind and often amounted to half of the crop, while on dry land it was a fixed yearly sum which, by most accounts, absorbed most of the economic rent of the soil in India (until the 1850s). Buchanan described farmers taking advances from merchants to pay the land tax and in return handing over half the produce at harvest (Vol 1, Page 265). A small farmer would not be drastically better off than an agricultural labourer except perhaps in social status.

Buchanan's income observations in Mysore did not include any "Extractors of palm juice" so it is odd to find these people making up 14 per cent of the occupational distribution. This category refers to people who drew juice from palm trees and either converted it into *jaggery* (sugar) or

⁴⁸A list of agricultural implements and their prices in the Nagara division of Mysore from the 1830s puts a the cost of a full set at only 14.25 rupees or approximately 1.425 pounds (Stokes, 1864, Page 94). "Young bullocks" sold for between 6 to 12 rupees a head. Assuming an average of 1.5 yokes per plough, this is around 27 rupees or 2.7 pounds (Stokes, 1864, Page 34). This total of 41.25 rupees per plough at a 20 per cent interest rate represents 8.25 rupees per year or 198 pence. This is less than the nominal earnings of an agricultural male labourer in Buchanan's time.

toddy (palm wine). That this group represents a large share of the population is purely a result of using an occupational distribution based upon coastal south Kanara, with an abundance of palm trees, for upland Mysore. One commentator in the 1830s remarked that “the palmyra is almost an exotic in the [sic] Mysore”.⁴⁹ The 1931 census of Mysore found a grand total of 3,486 toddy drawers (principal earners, working dependants and subsidiary earners) in a population of around 6.5 million.⁵⁰ This group gets allocated high welfare ratios by Sivramkrishna, which raises the average. Why anyone would work as a farm servant (or even a small cultivator) when a *ragi* ratio of 5.63 was available for drawing palm juice (although climbing up the trees seems to take some skill) is a good question. There are additional reasons to believe that Toddy-Tappers were not well off. Wealth often brings status to a profession. The census reports, however, reveal members of the castes for which toddy-tapping was the historical occupation as trying to improve their status by rejecting or changing their background. In 1901, “Toddy-drawers have moreover taken to describing themselves euphemistically as “tree pattadars” [pattadar meant landowner] this year” and “returned themselves as agriculturists instead of as followers of their own despised callings”.⁵¹ By 1921, the Madras government had removed the “traditional occupation” category from the census due to lobbying from one historically toddy-drawing group!⁵²

Sivramkrishna gets this high figure by assigning them an annual income of 13 l. 6 s. 4 d. (3,196 pence) based upon figures reported by Buchanan near Madras, far away from Mysore. However, on Page 10 of the first volume, which he cites, Buchanan in fact puts their annual income at 10 pagodas 3.5 fanams (Vol 1, Page 10). At the exchange rate used on the same page this income comes to 969 pence or 1.73 *ragi* bundles – a large difference from 5.63. Indeed, Buchanan himself thought their welfare ratio was below one: “I suspect, that by this account the produce is under-rated. If it were true, I can hardly see, how the Shanan [tapper] could maintain a family in a country where provisions are by no means cheap” (prices may have been higher near Madras which was the largest city in South India at the time). Below I will show that toddy drawers were not particularly well off in Malabar or Kanara.

The ratio between proto-industrialists and proto-proletarians in the table is also implausible.

⁴⁹(Heyne, 1864, Page 31).

⁵⁰(Iyengar, 1931, Page 115).

⁵¹(Francis, 1901, Pages 188 and 198).

⁵²(Boag, 1921, Page 154).

The former make up 12 per cent of the population while the latter are only 0.5 per cent. This also serves to exaggerate the “aggregate welfare ratio” (their individual ratios are 8.7 and 1.6 respectively). If these figures are true, then somehow the Mysoreans managed to upturn the pyramid of the capitalist system, since instead of a few capitalists exploiting a much larger number of workers, we have 24 capitalists to each worker. Buchanan’s evidence suggests that these figures are not accurate. Glassworks had at least seven workers to each furnace (Vol 1, Page 150). Iron forges near Bangalore had at least twelve workers per employer (Vol 1, Page 170), see also Table 2.3. In Malabar some forge owners had slaves collect iron sand in addition to employing free labourers (Vol 2, Page 440). Other iron forges in Mysore had 21 people working as labourers and steel production required at least thirteen men (Vol 2, Pages 17-21). The relative proportions of proprietors and servants needs to be considerably adjusted.

Using more accurate but generous assumptions allows us to calculate a better estimate of the “aggregate welfare ratio”. First, assume that there were two agricultural servants on average to every cultivator and that the share of the workforce in agriculture is unchanged. Subsume day labourers into the permanent servant category (which has a higher *ragi* ratio) while leaving the relative proportions of each size of cultivator unchanged. Then set the toddy drawer *ragi* ratio at the figure of 1.73 (if anything an overstatement), and then adjust the ratio of non-agricultural proprietors to workers to 1:4 (an understatement) while maintaining the non-agricultural share of the population. The resulting occupation distribution and “aggregate welfare ratio” is shown in Table 2.6.

Table 2.6: Adjusted Figures

| Class | Population Share | Rg | Weighted | Rc | Weighted |
|--|------------------|------|-------------|------|-------------|
| Small Cultivators | 0.04 | 2.9 | 0.12 | 1.77 | 0.07 |
| Medium Cultivators | 0.08 | 7.68 | 0.64 | 4.68 | 0.39 |
| Large Cultivators | 0.04 | 15 | 0.63 | 9.14 | 0.38 |
| Extractors of Palm Juice | 0.14 | 1.73 | 0.24 | 1.05 | 0.15 |
| ”Proto-industrial” Proprietors, Merchants etc | 0.03 | 8.5 | 0.21 | 5.18 | 0.13 |
| Labourers (agricultural) | 0.33 | 0.93 | 0.31 | 0.57 | 0.19 |
| Servants (proto industrial) | 0.1 | 1.64 | 0.16 | 1 | 0.1 |
| Others | 0.24 | 0 | 0 | 0 | 0 |
| Average | | | 2.31 | | 1.41 |

Source: Adjusted (as outlined in the text) figures from Sivramkrishna (2009), Table 5

An aggregate *ragi* welfare ratio of 2.31 results in an upper bound on the labour share of income of 43.4 per cent. This is much more likely to have been the case than the previous figure, but it is still rather low. It is below even the smallest labour share of income in England during "Engel's pause", when labour saving technical change depressed wages.⁵³ As these assumptions are designed to overstate the aggregate welfare ratio (which is in terms of a meagre bundle of goods) we can conclude that Mysore was not particularly rich in 1800. It is plausible that the 2.31 figure can be taken as an upper bound for anywhere in South Asia.

2.5 Welfare Ratios Elsewhere in South India

Besides Mysore, Buchanan spent time in Coimbatore, Malabar, and Kanara. His income observations from these regions allow us to put the Mysorean ones in a regional perspective. Prices of the staple grain, some type of lentils and some fat are available for each region. Prices of cloth are also on occasion provided by Buchanan but otherwise he describes the minimum expenditure needed for clothing. Evidence on housing costs comes from the ground rent of the people's homes. So we can estimate welfare ratios for these regions. Buchanan either mentions the cash income or the in-kind payment of workers. I assume 250 days worked per year. Where payment is in kind I convert this into a cash sum using the same prices as when calculating the cost of the subsistence budget. I describe the poverty budget, income data and the results for each region.

2.5.1 Coimbatore

Coimbatore district is south of Mysore. The staple crops were *cambu* (pearl millet) and other millets although rice was grown on the small but highly productive irrigated area. Agriculture was much the same as in Mysore, owing to similar climates. Buchanan reports prices for most grains and some pulses. I use *cambu* as the main grain even though *ragi* is a small percentage cheaper since the former required less intensive processing after purchase. This grain cost 9.75 pence per bushel or 0.43 pence per kg (Vol 2, Page 323). *Ragi* sold for 9.5 pence per bushel or 0.42 pence per kg, while the cheapest husked rice cost 0.545 pence per kg (this is the price of paddy divided by 0.72 and therefore excludes the cost of processing) (Vol 2, Page 313). Toor

⁵³(Allen, 2009).

Table 2.7: Coimbatore Subsistence Budget

| Item | Daily Quantity | Annual Quantity | Daily Cost (d.) | Annual Cost (d.) |
|-----------------------------|----------------|-----------------|-----------------|------------------|
| Cambu (Pearl Millet) | 0.5 kg | | 0.215 | 78.6 |
| Pigeon Peas | 0.1 kg | | 0.054 | 19.8 |
| Oil | | | | 6.55 |
| Housing | | Ground Rent | | 6 |
| Cloth | | 3 Square Meters | | 12.35 |
| Total | | | | 123.26 |
| Three Person's Worth | | | | 369.8 |

Source: See text.

dal (pigeon peas) are the standard lentils and cost 14.75 pence per bushel or 0.54 pence per kg (Vol 2, Page 323). The price of oil or ghee, however, is not mentioned. Rather than using the Bangalore price I take the (low) figure of 6.55 pence annually from Malabar as the per person oil expenditure (Vol 2, Page 407). This is an underestimate of the price of oil (I think it more correctly corresponds to the cost of oil for lighting) but to bias the results upwards I will use it.

Buchanan reports the ground rent of a house as between 1 to 2 shillings (12 to 24 pence), I use the average of 18 pence as the per family cost, resulting in a per person cost of 6 pence per year (Vol 2, Page 315). For cloth, Buchanan lists the prices of five different types of cloth woven near Coimbatore, I use the price of the cheapest one. This turned out to be 4.12 pence per metre squared while the most expensive listed cost 6.52 pence per metre squared (Vol 2, Page 262). The clothing expenditure turns out to be 20 per cent more than that of male slaves in Malabar who were allowed a cloth “just sufficient to wrap around his waist” so factoring Coimbatore’s different climate this is not a particularly high standard of expenditure (Vol 2, Page 407). The table above details the annual cost of the Coimbatore subsistence budget. The cost of this bundle is less than that of Sivramkrishna’s *ragi* bundle (369.8 versus 561 pence per family per year). Part of the difference comes from the smaller quantity of clothing in this budget and the undermeasurement of the quantity of oil needed. This should bias the welfare ratios in an upwards direction.

Table 2.8 shows incomes and welfare ratios. Only those doing extraordinary work, i.e. the pickaxe man, the earthworker and the porter, have welfare ratios exceeding one. The welfare ratios for agricultural workers in Coimbatore using the *cambu* budget are not particularly different to those

using the *ragi* budget in Mysore. It seems that lower food prices were matched by lower incomes.

Table 2.8: Coimbatore Welfare Ratios

| Person | Annual income (d.) | Cost of family budget (d.) | Welfare Ratio | Notes |
|----------------------|---------------------------|-----------------------------------|----------------------|----------------------|
| Male Annual Servant | 273.45 | 369.79 | 0.74 | |
| Harvester | 304.69 | 369.79 | 0.82 | Assume 250 days work |
| Weeder | 203.13 | 369.79 | 0.55 | Assume 250 days work |
| Pickaxe worker | 1000 | 369.79 | 2.7 | Assume 250 days work |
| Earthwork labourer | 750 | 369.79 | 2.03 | Assume 250 days work |
| Porter | 2000 | 369.79 | 5.41 | Assume 250 days work |
| Male Annual Servant | 290 | 369.79 | 0.78 | |
| Female Wage labourer | 225 | 369.79 | 0.61 | Assume 250 days work |
| Male Wage labourer | 337.5 | 369.79 | 0.91 | Assume 250 days work |
| Male Annual Servant | 363.5 | 369.79 | 0.98 | |

Sources: Vol 2, Pages 217, 315, 320.

2.5.2 Malabar

Passing through the Palakkad gap from Coimbatore takes you into Malabar. This region makes up the northern part of the modern state of Kerala. High rainfall resulted in the main crop being rice but extensive cultivation of spices, pepper in particular, on plantations and gardens also took place. Slavery was uncommonly prevalent by Indian standards in Malabar but slaves do not seem to have been the majority of the population. Although land inequality in Mysore was fairly substantial, it was probably greater in Malabar.

Table 2.9 calculates the cost of a subsistence budget based upon prices at the town of Calicut. These prices were calculated from the appendix of the third volume (Vol 3, Page 480). Rice turned out to be the cheapest grain at 0.92 pence per kg (exclusive of husking costs, which I ignore) as Sorghum (Jowar) cost considerably more at 1.49 pence per kg. Out of the various pulses for which prices are reported, *toor* (pigeon peas) turned out to be the cheapest at 0.99 pence per kg. The price of *toor dal*, the same pea but split, was listed but cost around a third more than the standard pulse. Buchanan's figures allowed me to calculate the cost of butter, sesame oil and coconut oil of which the last was the cheapest at 5.29 pence per kg. Housing expenditures I set as 12 pence per family and clothing expenditure was set at 2 fanams' worth or around 12 pence, both based upon remarks by Buchanan as to the minimum expenditure on these items.

Table 2.9: Malabar Subsistence Budget

| Item | Daily quantity | Annual Quantity | Daily Cost (d.) | Annual Cost (d.) |
|-----------------------------|----------------|-----------------|-----------------|------------------|
| Husked Rice | 0.5 kg | | 0.46 | 167.862 |
| Pigeon Peas | 0.1 kg | | 0.099 | 36.258 |
| Coconut Oil | 0.01 kg | | 0.053 | 19.338 |
| Housing | | a house | 0 | 4 |
| Cloth | | 2 fanams worth | | 13.1 |
| Total | | | | 240.558 |
| Three Persons' Worth | | | | 721.675 |

Source: See text.

In nominal terms this budget is almost twice as much as the Coimbatore budget, while Sivramkrishna's Bangalore budget is somewhere in between. Expenditure on housing and cloth is a very

small share of this budget and it is the prevalence of husked rice that accounts for the higher price (although millets were also expensive in this region). I have not, however, included the cost of husking in the price of rice here, instead I adjusted the price per kg of paddy by $1/0.72$ to account for the loss of weight by husking (see Appendix 2.A). This serves to bias the welfare ratios upwards. The income figures provided by Buchanan include the wages of normal agricultural servants, iron workers, salt makers, toddy drawers and the allowances of slaves. Table 2.10 shows these incomes and the corresponding welfare ratios.

The first three observations (of slaves) seem erroneous. Buchanan said as much himself but also noted that these slaves got $1/21$ st of the harvest. The income I have assigned to them includes this bounty (with the assumption of 25 per cent of the land being double cropped) although the welfare ratios are still strikingly low. The ratio between the nominal incomes (including clothing etc rather than just food) of the first two slaves and the cost of a single person's subsistence budget (0.34 and 0.36) is quite close to the value of $2/7$ ths (0.29), the ratio suggested by Buchanan (between these earnings and the cost of subsistence) - my subsistence budget is similar to what he had in mind.

The two figures provided for toddy drawers correspond to different assumptions about the number of trees attended to by one man. The proprietors of the trees and the drawers themselves disagreed about the number of trees per drawer. The lowest figure was 12 trees and the highest figure for an active man was 48 trees. Only in the higher figure is the toddy drawer near subsistence and this result reinforces the argument that Sivramkrishna overstates the income of toddy drawers. Ironworkers are, as in Mysore, above subsistence but not by much. By contrast salt makers seem to be remarkably well off with high welfare ratios for only five months of work. In part this is because the income given is the result of joint work between a man and his wife (and presumably their children). These people were not the owners of the salt lands and instead only provided the labour and equipment while the landowner provided advances to tide them over the production process.

Table 2.10: Malabar Welfare Ratios

| Person | Annual income (d.) | Cost of Family Budget (d.) | Welfare Ratio | Notes |
|-------------------------------|--------------------|----------------------------|---------------|---|
| Slave (Male) | 81.22 | 721.68 | 0.11 | |
| Slave (Female) | 87.24 | 721.68 | 0.12 | |
| Slaves (Old and Young) | 27.5 | 721.68 | 0.04 | |
| Superintendent of slaves | 760.64 | 721.68 | 1.05 | |
| Working Slave | 502.38 | 721.68 | 0.7 | |
| Active working slave | 530.51 | 721.68 | 0.74 | |
| Working slave (Old and Young) | 251.19 | 721.68 | 0.35 | |
| Toddy drawer | 288 | 721.68 | 0.4 | Assuming 12 months and 12 trees per man. |
| Toddy drawer | 1152 | 721.68 | 1.6 | Assuming 12 months and 48 trees per man. |
| Bellowsman | 812.5 | 721.68 | 1.13 | Assuming 48 hours per smelt, 250 days per year. |
| Head iron workman | 1562.5 | 721.68 | 2.17 | Assuming 48 hours per smelt, 250 days per year. |
| Hammerman | 812.5 | 721.68 | 1.13 | Assuming 48 hours per smelt, 250 days per year. |
| Salt makers | 1240 | 721.68 | 1.72 | 5 months of work. |
| Salt makers | 1076.82 | 721.68 | 1.49 | 5 months of work. |
| Slave | 387.53 | 721.68 | 0.54 | |
| Slave | 272.78 | 721.68 | 0.38 | |
| Slave | 189.75 | 721.68 | 0.26 | |
| Hired servants | 428.29 | 721.68 | 0.59 | Based on 250 days worked. |
| Hired servants | 529.88 | 721.68 | 0.73 | Based upon Buchanan's 312 days worked. |
| Hired servants | 463.35 | 721.68 | 0.64 | |

Sources: Vol 2, Pages 370-2, 406, 418, 440, 475, 481-2, 491, 495, 523-5, 562.

2.5.3 Kanara

Kanara is North along the coast from Malabar. Agriculturally, however, it shares many features with Kerala and paddy was the main crop. The main port in Kanara was Mangalore. The price of husked rice taken from the custom house receipts (exclusive of export duty) was similar to the price of high quality rice in the countryside (Vol 3, Pages 1-10). This seems too high. As a result I have taken the price of inferior rice in the countryside as the representative figure for calculating the cost of the subsistence bundle. The price of husked rice, not counting the husking cost, was therefore 0.694 pence per kg (Vol 3, Page 234). The price of cleaned rice Buchanan lists on the same page was 0.936 pence per kg, although the cheapest pre-cleaned rice anywhere in Kanara was 0.75 pence per kg (Vol 3, Page 142), so this is a generously low figure.

The record of the price of oil in 1800 from the custom house statement provided by Buchanan seems to be erroneously low, since the value of import duty paid exceeded the price exclusive of duty. I instead calculated an ad valorem rate of import duty from 1795 figures and adjusted the 1800 price (corrected import plus duty) correspondingly (Vol 3, Pages 1-10). This resulted in oil at 4.16 pence per kg. This is still below the price of oil in Malabar, so it is unlikely to be too high. The recorded price of ghee was more than twice as high as that of the standard oil (presumably coconut) mentioned so it did not make it into the budget. Rather than *toor dal*, the only pulse price mentioned in Kanara is for Horse gram at 1.68 pence per kg (Vol 3, Page 241).⁵⁴ The cost of housing and clothing are taken from Calicut (in Malabar), owing to the similar climate, and were discussed above. Table 2.11 details the subsistence budget for Kanara. The cost of the budget is above that of Coimbatore and Bangalore but below the Calicut budget. The prime reason for this is the lower cost of rice here. As in Malabar slave and free labour coexisted and the income estimates contain a large proportion of slave allowances.

⁵⁴This assumes 60 lb to a bushel.

Table 2.11: Kanara Subsistence Budget

| Item | Daily Quantity | Annual Quantity | Daily Cost (d.) | Annual Cost (d.) |
|-----------------------------|-----------------------|------------------------|----------------------------|-----------------------------|
| Rice | 0.5 kg | | 0.347 | 126.705 |
| Horse Gram | 0.1 kg | | 0.168 | 61.438 |
| Oil | 0.01 kg | | 0.042 | 15.192 |
| Clothing | | A house | | 4 |
| Housing | | 2 fanams worth | | 13.1 |
| Total | | | | 220.435 |
| Three Persons' Worth | | | | 661.304 |

Source: See text.

Table 2.12: Kanara Welfare Ratios

| Person | Annual income (d.) | Cost of family budget | Welfare Ratio | Notes |
|------------------------|--------------------|-----------------------|---------------|----------|
| Male Wage labourer | 375 | 661.3 | 0.57 | 250 days |
| Female Wage labourer | 151.93 | 661.3 | 0.23 | 250 days |
| Male Wage labourer | 206.72 | 661.3 | 0.31 | 250 days |
| Female Wage labourer | 418.3 | 661.3 | 0.63 | 250 days |
| Male Hired servant | 576.38 | 661.3 | 0.87 | |
| Female Hired servant | 468.28 | 661.3 | 0.71 | |
| Garden keeper and wife | 891 | 661.3 | 1.35 | |
| Male Hired servant | 580.5 | 661.3 | 0.88 | |
| Male Hired servant | 580.25 | 661.3 | 0.88 | |
| Toddy drawer | 483.5 | 661.3 | 0.73 | |
| Male Slave | 250.37 | 661.3 | 0.38 | |
| Female Slave | 202.37 | 661.3 | 0.31 | |
| Male Slave | 536.05 | 661.3 | 0.81 | |
| Female Slave | 378.7 | 661.3 | 0.57 | |
| Male Slave | 564.95 | 661.3 | 0.85 | 250 days |
| Female Slave | 495.97 | 661.3 | 0.75 | 250 days |
| Child Slave | 583.5 | 661.3 | 0.88 | 250 days |

Sources: Vol 3, Pages 35-6, 106, 139, 140, 154, 158, 181, 226, 243.

These results suggest low living standards. With 250 days work, all family members would have to labour to reach the subsistence budget, or, alternatively, people would be forced to work for more days in the year. The only case in which the welfare ratio exceeds one is from the joint income of a garden keeper and his wife. Assuming that the man would receive two thirds of the uncombined income his welfare ratio would be 0.898 and his wife's portion would be 0.449. Women would be required to work for the market in addition to their household work in order to push welfare ratios above one and therefore to be able to raise a family. The toddy drawer of Kanara is much poorer than Sivramkrishna supposed. Free labourers appear to not be much better off than slaves, materially speaking.

2.6 Statistical Analysis

In this section I combine Sivramkrishna's individual welfare ratios with those I have calculated for elsewhere and run a regression on the 120 welfare ratio observations. I include a variable "*NonAdultMale*" which is equal to zero if the observation is an adult male and one otherwise, a variable "*NonAgricultural*" which is equal to zero if the observation earns income from agriculture and one otherwise, a variable "*Slave*" which is equal to one if the observation is a slave and zero otherwise and a final "*Special*" variable which equals one when the observation refers to supervisory roles such as slave superintendent, a *gauda* (village headman), or iron foreman. The regression equation is:

$$Welfare\ Ratio_i = \beta_0 + \beta_1 NonAdultMale_i + \beta_2 NonAgricultural_i + \beta_3 Slave_i + \beta_4 Special_i + u_i \quad (2.1)$$

There are two things to note. The first is that the slave welfare ratios apply to their allowances rather than their production (which would go to them entirely as income if they were free). The value of the coefficient on the slave variable is therefore an estimate of the gap between slave output and consumption, which we can compare to a similar measure estimated in the next section. The second is that some of the observations refer to the joint income of a man and a wife, as is the case for the salt makers and a gardener couple. I have split their joint incomes into a man's income and a woman's income by assigning 2/3rds of the income to the man and

the remainder to the woman. This is in line with Buchanan's comments on the gender wage gap and with the other female observations, as well as the regression results if we do not split up these couples (but include them in the special category).⁵⁵ Table 2.13 outlines the results of this regression. The "No." column gives the sample size in the intercept row and the number of observations where the corresponding variable is equal to one for the other rows.

The regression results assign a welfare ratio of 0.986 to an adult male working in agriculture who is not a slave (the intercept). A woman in the same situation would have around 47 per cent of this welfare ratio (i.e. a welfare ratio of 0.464). A man and a woman both working and combining their incomes could afford around 1.5 of the subsistence bundles designed for a family of three adult male equivalents (i.e. with two children), so they would have some limited room for petty luxuries like booze, festival expenditure, or maybe even rice (if you usually ate millets). If they had a third child these things would be even more difficult to afford.

Non-agricultural adult males would have a welfare ratio of 1.949 and those in supervisory roles, outside of agriculture, would have a welfare ratio of 2.551. A high skill premium in India relative to Europe has been documented before.⁵⁶ An adult male slave would have a welfare ratio of 0.7151 or around 72.5 per cent of his free equivalent. The coefficient on the slave dummy is not significant. It would be even smaller if we exclude the three observations Buchanan thought to be erroneously low. In this case the slave coefficient becomes -0.2066, and the agricultural male welfare ratio becomes 0.9874. A welfare ratio of approximately one is not evidence of high living standards and given the low standard of consumption that the subsistence budgets contain we can conclude that South Indian workers were not well off around 1800, not only in Mysore but also in neighbouring regions.

2.7 Slave Prices and Rental Values

The purchase price of a slave should be the capitalised value of the sequence of expected differences between their output and their living allowance in each year. They tell us something about

⁵⁵In that case, the adult male coefficient is 0.99 and the non adult male coefficient is 0.44, so the total for a couple is 1.43 bundles.

⁵⁶(Van Zanden, 2009).

the marginal product of labour and therefore living standards. Since slave prices are a capitalised value we need a rate of return by which to determine the annual equivalent flow of income. I use 12 per cent since that was the "common interest of money" in Malabar (Vol 2, Page 430).⁵⁷ I am going to ignore capital gains and inflation. The ratio between the annual value of the price of slaves and the cost (for the appropriate number of people) of the subsistence budget for a year measures the annual gain to the owner in terms of subsistence budgets per slave (see Appendix 2.C for a justification of this approach). The sections on Malabar and Kanara above detail slave allowances. Since slave allowances were, as a rule, the bare minimum, this is a measure of the excess over subsistence of the marginal product of labour.

$$\text{Slave Earnings}_i - \text{Slave Consumption}_i = r \text{ Slave Price}_i \quad (2.2)$$

Where r is the (nominal) interest rate. Divide both sides by the cost of a subsistence budget. Then:

$$\frac{(\text{Slave Earnings}_i - \text{Slave Consumption}_i)}{\text{Cost}} = r \frac{\text{Slave Price}_i}{\text{Cost}} \quad (2.3)$$

Table 2.7 presents Buchanan's observations on slave prices, the annual value of these, the number of people, the cost of the relevant subsistence budget and the ratio described above.

⁵⁷This is a low rate by the standards of small farmers, but I assume that slave owners had good credit.

Table 2.13: Regression Analysis of Welfare Ratios

| Coefficient | Estimate | Standard Error | Significance | No. |
|--------------------|-----------------|-----------------------|---------------------|------------|
| Intercept | 0.9861 | 0.1073 | *** | 120 |
| NonAdultMale | -0.5226 | 0.1794 | ** | 26 |
| NonAgricultural | 0.9366 | 0.1592 | *** | 40 |
| Slave | -0.271 | 0.2213 | | 16 |
| Special | 1.5652 | 0.3994 | *** | 4 |

Source: See text. **Notes:** ** indicates significance at the 0.01 level, *** at the 0.001 level.

Table 2.14: Annual Value of Slaves in terms of Subsistence Baskets inferred from Prices

| Type (1) | Price (d.) (2) | Cost of basket (3) | No. of basket (4) | No. of People (5) | Cost of baskets (6) | Return at 12% (7) | Ratio (6) / (5) (8) | Notes |
|-------------------------|-------------------|-----------------------|----------------------|----------------------|------------------------|----------------------|------------------------|-------|
| Man with wife | 1489.5 | 240.56 | 2 | 481.12 | 178.74 | 0.37 | min | |
| Man with wife | 1787.5 | 240.56 | 2 | 481.12 | 214.5 | 0.45 | max | |
| Two or three children | 595.75 | 240.56 | 1 | 240.56 | 71.49 | 0.3 | | |
| Man, wife, 2/3 children | 2979 | 240.56 | 3 | 721.68 | 357.48 | 0.5 | min | |
| Man, wife, 4/5 children | 3575 | 240.56 | 4 | 962.23 | 429 | 0.45 | max | |
| Man | 655 | 240.56 | 1 | 240.56 | 78.6 | 0.33 | | |
| Man with wife | 1310.4 | 240.56 | 2 | 481.12 | 157.25 | 0.33 | | |
| Children | 98.25 | 240.56 | 0.5 | 120.28 | 11.79 | 0.1 | min | |
| Children | 262 | 240.56 | 0.5 | 120.28 | 31.44 | 0.26 | max | |
| Man | 114.5 | 240.56 | 1 | 240.56 | 13.74 | 0.06 | min | |
| Man | 344 | 240.56 | 1 | 240.56 | 41.28 | 0.17 | max | |
| Woman | 57.6 | 240.56 | 1 | 240.56 | 6.91 | 0.03 | min | |
| Woman | 171.6 | 240.56 | 1 | 240.56 | 20.59 | 0.09 | max | |
| Good male slave | 1008 | 220.44 | 1 | 220.44 | 120.96 | 0.55 | "Four guineas" | |
| Bride | 1547.5 | 220.44 | 1 | 220.44 | 185.7 | 0.84 | | |
| Average | 1066.37 | 237.88 | 1.47 | 350.14 | 127.96 | 0.32 | 15 observations | |

Source: See text.

On average, admittedly based upon a small number of observations, a slave was worth around 87 pence per year to their owner (The average of 128 pence per observation per year referred to the equivalent of 1.47 people). This was approximately a third of the cost of the subsistence budget. The final observation, the bride price for a female slave, seems to be an outlier as it is higher than some of the prices for whole families. Excluding this observation puts the average ratio at 0.283. Slave owners are likely to have worked their slaves more than the standard 250 days a year and required more members of a slave family to work than they would have if they were free, so this is an upper bound on the surplus over subsistence. From the regression above, our coefficient on the *Slave* variable was approximately -0.3. Since the intercept (i.e. the welfare ratio of a normal adult male agricultural worker) was approximately 1, we get 0.7 as the value of slave consumption in subsistence bundles. Our average return on owning a slave was 0.32 subsistence bundles a year, but this includes women and children. The average of the three observations of a man only (excluding the very low one) is 0.35. Since:

$$\frac{Slave\ Earnings_i}{Cost} = r \frac{Slave\ Price_i}{Cost} + \frac{Slave\ Consumption_i}{Cost} \quad (2.4)$$

The implied level of slave earnings in terms of subsistence bundles is $0.35 + 0.7$, or 1.05, which is very similar to the earnings from free labourers. Exploitation of labour by slavery (or otherwise) was not particularly remunerative simply because labour was not particularly productive. If a man wanted to maintain his family at the subsistence budget level and do no work he would have to enslave around eight or nine people. Buchanan also mentions the hire price of slaves on two occasions in Malabar (Vol 2, Pages 371 and 495). The first price is 47.5 pence per year and the second is 22.92 pence per year and in both cases the hirer is required to pay for the maintenance of the slave (i.e. the price net of maintenance). These prices represent 19.7 per cent and 9.5 per cent of the cost of the subsistence budget for one person respectively. In each case, according to him, a woman lets for half as much of a man (i.e. 9.85 and 4.75 per cent of the cost of the subsistence budget). These figures are below those inferred from slave prices. This is further evidence that labour produced little (at the margin) above the amount necessary for its reproduction.

We can compare these slave prices with those in the West Indies around the same time. The average price per slave (treating one adult or two children as one person) from Buchanan’s observations was 623 pence. Between 1800-4 the average price of a slave in the Caribbean was £62.59 or 15,022 pence.⁵⁸ In nominal terms a slave was worth around 24 times as much in the West Indies than on the western coast of India. One study puts the maintenance costs of a slave in urban Jamaica as £6.5 (£4.33 in rural areas) which represented 31.7 per cent (27 per cent for rural areas) of their marginal product valued at £14 (3,360 pence). So West Indies slave owners appear to have extracted two thirds of the output of a slave. This was in 1774 when the pound was worth considerably more than in 1800, owing to inflation associated with the French wars.⁵⁹ By contrast, Buchanan’s rental figures suggest that male slaves in India retained somewhere between 90 and 81.3 per cent of their marginal product.⁶⁰ Caribbean slaves were, it seems, worse off but more productive than those in the Indian ocean. The limited profitability of slavery in Malabar and Kanara probably explains why it ended with a whimper rather than a bang over the 19th century.

2.8 Male Heights

An additional piece of evidence on living standards in Mysore comes from H. Stokes, a civil servant sent by the government in 1838 to examine the Malnad region of Mysore after the state was taken over by the British (for a number of decades) following an insurrection against the Mysore Raja.⁶¹ Stokes measured and reported male heights in intervals equivalent to 8 cm. Out of the 1,023 men measured, 550 were from the Shimoga (one of the districts) jail and the remainder were “*Asham* peons”. These latter types were “Military peons employed in the principal towns and garrisons”.⁶² Figure 2.3 plots a histogram of the recorded heights.

Taking the midpoint of each interval (and 183 cm for the single person in the tallest category) as

⁵⁸(Eltis *et al.*, 2005).

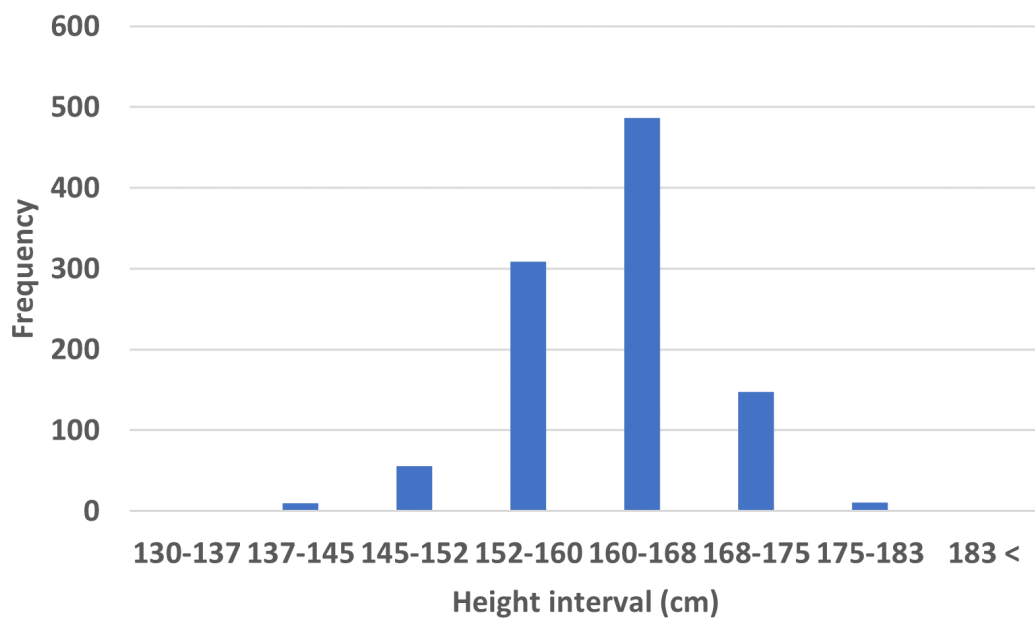
⁵⁹(Burnard *et al.*, 2019, Page 68)

⁶⁰Using the average figures inferred from prices in Table 2.7 sets the retention rate at 75.2 per cent, or 77.8 per cent excluding the bride observation.

⁶¹(Stokes, 1864, Pages 15-17).

⁶²(Bombay (Presidency) Police Branch, 1853, No. 2, Page 2).

Figure 2.3: Histogram of 1,023 Male Heights in the Malnad, 1830s.



Source: (Stokes, 1864, Pages 15-17).

the height of each person in that interval (or as the interval average), the average height over all 1,023 men is 161.74 cm. This is a low average height by international standards, except compared with the Japanese and some South American populations - which does not indicate high living standards.⁶³ It is, however, entirely in line with later Indian standards, even if we add a few centimetres. A sample of male emigrants to Fiji from Madras Presidency between the ages of 16 to 40 over the period 1903-1916 returned an average height of 162.5 cm.⁶⁴ In the early 20th century Indian male heights varied from a low of around 161-163 cm in the east to 165-167 cm in the North, although the study does not cover South India.⁶⁵ For the 1931 census of Mysore, the heights of 100 adult men were measured, half of which were Brahmins, the rest from "the upper stratum of the Kanarese Non-Brahmin population". Among the Brahmins, the average height was 64.5 inches (163.83 cm), and among the non-Brahmins the average was five feet six inches (167.64 cm) - heights similar, if a bit higher, to both the 1830s figures and later ones elsewhere in India.⁶⁶ The little anthropometric evidence we have does not support the argument that Mysore had high living standards, at least in the decades following Buchanan's tour.

2.9 Conclusion

I have provided four pieces of evidence in favour of the view that South India had low living standards in 1800. The first is a critical examination of Sivramkrishna's arguments. His own estimates of welfare ratios based upon workers' incomes are often below one, even with the sparse - famine relief - subsistence budget he proposes based upon *ragi* (finger millet) consumption. When it comes to rice the welfare ratios are clearly inadequate for all but the most skilled of workers. This much should have been clear from his own paper, yet he calculates an "aggregate welfare ratio" of the high figure of 4.87.

The calculation of this mean is open to criticism. The share of well off large and medium cultivators relative to poor small cultivators, agricultural servants and labourers is far too high. The exact same problem occurs between "proto-industrial" proprietors and non-agricultural servants.

⁶³(Allen, 2015).

⁶⁴(Brennan *et al.*, 1994).

⁶⁵(Guntupalli & Baten, 2006).

⁶⁶(Iyengar, 1931, Vol I, Page 358).

In addition, the income of the class of toddy drawers (who did not really exist in large numbers in Mysore) is considerably overstated. All of these tend to overstate the mean welfare ratio which even on somewhat generous assumptions I recalculated to have an upper bound figure of 2.31.

The second piece of evidence consists of estimated welfare ratios in neighbouring regions. While there is a considerable variation in the cost of living between these regions, primarily due to the use of millet or rice, only a few lucky workers have welfare ratios above one. This was despite generally making assumptions that would tend to bias the results upwards. In South India, at this time, it would be very difficult to raise a family on the earnings of an adult male who worked 250 days a year. More days of labour in a year, womens' work, or some non-labour source of income (e.g. owning land or cattle) would have been necessary for even petty luxuries. From these figures, it does appear that the high-rainfall, coastal areas (Malabar and Kanara) had slightly lower living standards than the drier upland areas (Mysore and Coimbatore), perhaps a compensation for the greater risk of famine and a diet of millets rather than rice. Slaves, as you would expect, had low living standards – not that much below free workers it turns out - and their allowance combined with their prices and rental value provides us with the third piece of evidence about living standards. The implied annual value from slave prices and hire prices are low relative to the cost of the subsistence budgets. Finally, heights were low by international standards in the 1830s.

South Indian workers were not well off at the start of the 19th century. The real puzzle is why living standards were not any higher at its end. South India saw a century of peace. Property rights were considerably more secure than before, and marginal tax rates very low by modern standards. Modern communication technology integrated the markets, within India, but also with the rest of world. In a sense there was no Great Divergence, for prices (except that of labour), technology, and knowledge tended to converge internationally. However, none of these things seems to have mattered much if you were to look at the GDP per capita or real wage figures. A traveler following in the footsteps of Buchanan in the 1930s would notice major changes to almost everything, except living standards (and agricultural technique).

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2.A Rice and Millets

Rice was for the better off in Mysore and Coimbatore. M. N. Srinivas described the situation in Rampur, a rice growing village in Mysore in the 1950s this way: “Rice was a commercial or cash crop for the majority of villagers. *Ragi* or finger millet was their staple diet, and only a minority of rich landowners, and brahmins, ate rice regularly. Before rationing was introduced early during World War II, resulting in a ban on the private sale of food grains, it was usual for a few villagers to go, after harvest, to nearby *ragi*-growing villages to barter cartloads of rice for *ragi*.”⁶⁷ However, along the coast rice was the basis of all classes’ diets owing to its overwhelming position in local agriculture. Strictly speaking, rice refers to the husked grain. Unhusked rice is called paddy (confusingly, so are the rice fields), or rough rice, which is what is sown and harvested by the cultivators. The common figure for the weight of one bushel of paddy is 45 lb (around 20.41 kg). For human consumption paddy has to be processed into brown rice by removing the husk. In Buchanan’s time dehusking was done by pounding the paddy in a large pestle. Buchanan reports that one bushel of paddy resulted in half a bushel of cleaned rice. When this was done by hired labour the practice was for one fifth of the cleaned rice to be given as payment so that one bushel of paddy resulted in only 0.4 bushels of cleaned rice if its owner didn’t process it themselves. Part of this cleaned rice was broken which did not result in a loss of nutrients but was looked down upon by the consumer who could afford it (Vol 1, Page 92).

A 1930s report put the paddy to rice conversion ratios by weight (not volume) in the range of 0.62-0.72, but the lower figure was that from mechanised rice mills, so the upper figure is more representative for hand pounding rice.⁶⁸ Assuming that one fifth of the cleaned rice represents the cost of pounding, one kilogram of paddy results in 0.576 kilograms of cleaned rice (again including broken rice). I ignore husking costs here.

For those with small budgets other grains were more appropriate where a lack of water limited rice cultivation. Chief among these were millets, cereals that do relatively well with limited moisture under rain-fed cultivation. To paraphrase Dr Johnson, these were grains which in America were usually given to horses but in parts of Africa and Asia supported the people. These are inferior

⁶⁷(Srinivas, 1976, Page 122).

⁶⁸(GoI, 1942, Page 235-6 and Appendix V).

goods and expenditure on them declines rapidly as incomes rise owing to consumer preference for the taste of rice and wheat.⁶⁹ Widespread consumption of millets is therefore an indicator of widespread poverty. *Ragi* (Finger millet or *Eleusine corcana*) was the staple crop of Mysore while *Cambu* (Pearl Millet), *Bajra* (Bulrush millet) and *Jowar* (Sorghum) were also important, especially in Coimbatore.

Contemporary accounts also picture millets as an inferior good.⁷⁰ *Ragi* “is not, in general, a popular food, being considered difficult of digestion, productive of flatulence, and astringent”.⁷¹ Here is M. N. Srinivas again: “The eating of rice was prestigious, and there was a reluctance to admit to eating *ragi*.”⁷² The Famine Commission even recommended that where *ragi* was the cheapest grain, the relief payment should include other cereals.⁷³ Clearly, *ragi* would not be the average person’s choice if income was not a limiting factor.

Millets are often husked by hand pounding but *ragi*, owing to the small size of the grain, is instead ground into flour. This was a hard task that took time and just like husking paddy it was delegated to the womenfolk. The Famine Commission suggested that *ragi* “loses 20 per cent in bulk in being converted into meal”.⁷⁴ Purchasing *ragi* did not result in an immediate meal. When mechanised hullers were introduced, women were glad to give up the labourious traditional process.⁷⁵ Despite the costs of processing, to bias the results upwards I do not take this into account.

⁶⁹(FAO, 1995, Page 29).

⁷⁰I bought some *ragi* flour to cook with and, although there is no accounting for taste, I would put myself firmly into the rice or wheat camp.

⁷¹(Church, 1886, 90).

⁷²(Srinivas, 1976, 122).

⁷³(GoI, 1898, 272).

⁷⁴(GoI, 1898, Pages 16, 79, 272), see also (GoI, 1936, Page 356).

⁷⁵(Srinivas, 1976, 235).

2.B Subsistence Budgets Compared

Table 2.15: Comparing the Subsistence Budgets

| | Coimbatore | | Malabar | | Kanara | | Mysore (Sivramkrishna) | |
|--------------|-----------------|---------------|-------------------|--------------|------------------|--------------|------------------------|------------|
| Item | Annual Quantity | Cost | Annual Quantity | Cost | Annual Quantity | Cost | Annual Quantity | Cost |
| Rice | 0 | 0 | 182.5 kg | 167.9 | 182.5 kg | 137 | 0 | 0 |
| Millet | 182.5 kg | 78.6 | 0 | 0 | 0 | 0 | 182.5 kg | 84.8 |
| Pulse | 36.5 kg | 19.8 | 36.5 kg | 36.3 | 36.5 kg | 61.4 | 36.5 kg | 44.5 |
| Oil | A Fanam | 6.55 | 3.65 kg | 19.3 | 3.65 kg | 15.2 | 3.65 kg | 21.2 |
| Clothing | 3 sq m | 12.35 | “2 fanams’ worth” | 13.1 | “2 fanams worth” | 13.1 | 9.6 sq m | 36.5 |
| Housing | Ground rent | 6 | Ground rent | 4 | Ground rent | 4 | 0 | 0 |
| Total | | 123.26 | | 240.6 | | 220.4 | | 187 |

Note: Cost is given in pence (d.).

Expenditure is in pence per year. The cost of one of the budgets is very similar to Sivramkrishna’s budget but of the other two one is 28 per cent more expensive and the other is 34 per cent cheaper. In part this reflects the use of rice for Malabar and Kanara. To the extent that rice was preferred over millets the coastal people were better off than elsewhere. Substantial interregional differences in the prices of grains are reasonable since goods markets in precolonial India were poorly integrated. This was due to political fragmentation, poor infrastructure, and the presence of multiple transit duty stations, each demanding a separate payment, along trade routes. Buchanan often also alludes to the presence of robbers and looters and most villages had some sort of redoubt - signs of insecurity of property (Vol 1, Page 32).

I used the linear programming method proposed by Robert Allen to find the least cost bundle that would satisfy 2,100 calories, 50 grams of protein and 34 grams of fat a day for each region (except Coimbatore where there was no oil price listed). In Malabar (Calicut) the least cost bundle consisted of 0.47 kg of rice, 0.057 kg of pulse and 0.02 kg of coconut oil. This would cost approximately 220 pence per person per year rather than the 223.5 pence per person per year that the simple food budget I used, a difference of only 1.45 per cent. For Kanara (Mangalore) the least cost budget consisted of 0.474 kg of cleaned rice, 0.058 kg of pulse and 0.02 kg of oil per day. This cost 182 pence per person per year and was 3.3 per cent cheaper than the standard 0.5, 0.1, 0.01 bundle. These percentages are smaller when we consider the whole budget including the non-food items.

2.C Slave Asset Pricing

The price of a slave should be equal to the expected net present value of the gain to the owner from owning them (the sequence of the differences between their production and consumption). Let us ignore uncertainty, and assume that the payoff from owning a slave accrues to the owner at the end of the period:

$$P_t = \sum_{s=0}^{\infty} \frac{x_{t+s}}{(1+r_{t+s+1})} \quad (2.5)$$

Where x_{t+s} is the annual surplus from owning a slave, r_{t+s} is the interest rate between periods t and s . Assume that $(1+r_{j+1}) = (1+r)$ for all periods, i.e. the one period interest rate is constant across time. This implies, by arbitrage, that $(1+r_{t+j}) = (1+r)^j$. Assume also that $x_{t+s} = x$ for all s . Then the slave asset pricing formula becomes:

$$P_t = \frac{x}{(1+r)} \sum_{s=0}^{\infty} \frac{1}{(1+r)^s} \quad (2.6)$$

By the standard sum of an infinite geometric series, we have:

$$P_t = \frac{(1+r)}{r} \frac{x}{(1+r)} \quad (2.7)$$

I.e.

$$rP_t = x \quad (2.8)$$

Instead of assuming that x_{t+s} is constant (but maintaining the constant one period interest rate assumption), let us assume that there exists a rent charge/consol of price P_t which pays off Z every period. By the standard formula for pricing a consol:

$$P_t = Z/r \quad (2.9)$$

I.e.

$$rP_t = Z \tag{2.10}$$

Thus rP_t is equal to the annualised risk free equivalent of the net present value of the surplus of a slave's production over their consumption over the course of a year.

Both of these approaches support my method in the main text.

Chapter 3

Custom to Contract: The Evolution of the Traditional Bengali Land Tenure System

3.1 Introduction

Exogenous sources of institutional variation are desirable to economists and economic historians in order to test the importance of institutions for economic performance and the trajectory of societies. Institutions matter because commitment problems rule out the possibility of Pareto efficient bargaining between those who have political power and those who do not.¹ As wealth and political influence in one period can be used to secure political influence (and therefore more wealth) in future periods, institutions, and the economic inefficiencies from these commitment problems, tend to persist. The key question is therefore *Quis custodiet ipsos custodes?* The result is that the state needs to be constrained by the people, and the wealthy prevented from using their resources to capture it, in order to secure broad economic prosperity rather than to preserve political power for the few at the expense of the many.²

Colonialism and foreign rule are attractive candidates for sources of exogenous institutional variation, as the institutions of foreign rule can often be said to be imposed on the people, and the state is not constrained by the local populace but instead by whichever foreign interests have power in the metropole. There are obvious examples where this story is persuasive, such as the settlement of the New World.³ Likewise, differing initial distributions of wealth, which usually meant landed property in the pre-modern world, are meant to shape responses to common exogenous shocks at "critical junctures", and the legacies of these responses can have extremely persistent effects. The debate over the contrasting responses of Western and Eastern Europe to the population declines resulting from the Black Death is a classic example here.⁴

This chapter examines a case of landlords under colonial rule, and finds that neither the state nor the landlords were both willing and able to play the roles outlined for them above. The setting is Colonial Bengal, the most populous province in the most populous colony, and so it is not entirely a fringe case. These days, Bengal, now split into the Indian state of West Bengal and the independent nation of Bangladesh, remains one of the most densely populated zones of poverty in the world. While present day policy may be the proximate cause of present poverty, a dynamic

¹(Acemoglu, 2003).

²(Acemoglu & Robinson, 2000)

³(Sokoloff & Engerman, 2000).

⁴E.g. (Brenner, 1976).

institutionalist view would identify these as the persistent legacy of the past. The story may go as follows: Foreign rulers let local collaborators exploit the mass of the population alongside taking what they could themselves, and the collaborator class survived decolonisation to poison politics away from socially productive undertakings. The first half of this tale is consistent with a common view of landlords in Bengal. These landlords, known as *zamindars*, have been unpopular with many contemporary commentators as well as later writers. For example, some have called it "an agrarian structure characterized by absentee landlordism, subinfeudation, and extreme rackrenting"⁵ or else state that "The unfortunate peasants of Bengal were supporting an impressive string of middlemen, speculators, and absentee landlords."⁶ Even an imperialist like Lord Curzon could write that "the Bengal cultivator was rack-rented, impoverished, and oppressed" by the *zamindars*.⁷

A well known paper in the "persistence" literature by Banerjee and Iyer attempts to test this view that past landlordism is bad for present development by using post independence data in India. They regress post independence agricultural and public good outcomes on their classification of landlordism during the colonial era and a series of controls.⁸ They claim that their results support the idea that landlordism is bad for development even after land reform, and they stress the political economy angle as a lack of social cohesion undermined productive politics. Their results suggest that the divergence occurs sometime after independence, particularly during the Green Revolution. This evidence completes the second half of the story above, by linking more recent developments with former distributions of wealth and power. However, they have not gone unchallenged. Iverson, Palmer-Jones and Sen (IPS) disagree.⁹ They claim that Banerjee and Iyer's designation of the Central Provinces (modern Madhya Pradesh) as a landlord region is incorrect and when the data is adjusted for this, the post independence divergence disappears. Both parties, however, put Bengal into the "landlord" camp.

There is another view of the nature of the Bengali land tenure system. The key to this is the presence of tenant right, which has been ignored or relegated to footnotes (except by IPS for

⁵(Boyce, 1987, Page 157).

⁶(Thorner & Thorner, 1962, Pages 53-4). See also (Islam, 1978), (Bhadhuri, 1999), (Stepanek, 1979, Pages 91-95).

⁷(GoI, 1902, Page 6). We will see that, given subinfeudation, absenteeism was no bad thing.

⁸(Banerjee & Iyer, 2005).

⁹(Iverson *et al.*, 2013). See also Banerjee and Iyer's brief response (Banerjee & Iyer, 2013).

the Central Provinces) in the econometric literature. In this view the tenants were in control, rents were far from rack rents, and the landlords practically pensioners. R. C. Dutt, well known nationalist polemicist, espoused this view in his open letters to Lord Curzon.¹⁰ A few historians have also taken this alternative view. Ratnalekha Ray's "Jotedar thesis" is the classic example, where big peasants, themselves tenants, were dominant.¹¹ In West Bengal, Chitta Panda found the Midnapore *zamindars* in decline during the late 19th and early 20th century.¹² Perhaps the most succinct account of this alternative view is that of W. H. Nelson, a senior civil servant, in his evidence to the Land Revenue (Floud) Commission, henceforth FC, in the late 1930s.¹³

This chapter argues that the alternative view is correct. I outline the implications of the tenancy system for the distribution of income, then cover the legal situation before assessing the path of rents over time. Landlords effectively sold out to the tenants, subject to a quit rent. Inflation reduced the burden of this over the long run, resulting in an accidental land reform, benefitting the middle classes at the expense of the landlord elite. Land inequality in Bengal was not as high as is commonly assumed once you account for the property rights of the tenants. Finally, I argue that climate has been the main barrier to raising agricultural productivity.

3.2 The Traditional Land System of Bengal: A Brief Introduction

Traditional tenancy customs in Bengal are easily misunderstood. As a result of these, A. E. Porter, a colonial official, could write that "the actual term land-owner is not a term bearing any definite meaning in the land law of Bengal" in his report on the 1931 census.¹⁴ This was because the traditional system of land tenure in Bengal resulted in almost everyone, including most "landlords", paying rent to someone. This was due to the custom of permanent (sub)letting, otherwise

¹⁰(Dutt, 1900).

¹¹(Ray, 1979) Jotedar was a term used in East Bengal for any tenant holding directly from the *zamindar*, but the sense here is of a wealthy middle class peasant, with control over land thanks to their permanent lease. See also (Abdullah, 1980).

¹²(Panda, 1997) I wish to thank Tirthankar Roy for this reference.

¹³This was a government report which enquired into the land system. Its name was a misnomer, as it had little to do with revenue and much more to do with tenure. It is often called the Floud Commission, after its chairman, Sir Francis Floud, and I will refer to it as this (FC). (FC, 1940)

¹⁴(Porter, 1933, Page 298).

known as subinfeudation or tenant right. Fortunately, there are book length government reports on the intricacies of local land tenure for each district in Bengal, known as settlement reports.¹⁵ I present a distillation of the details.

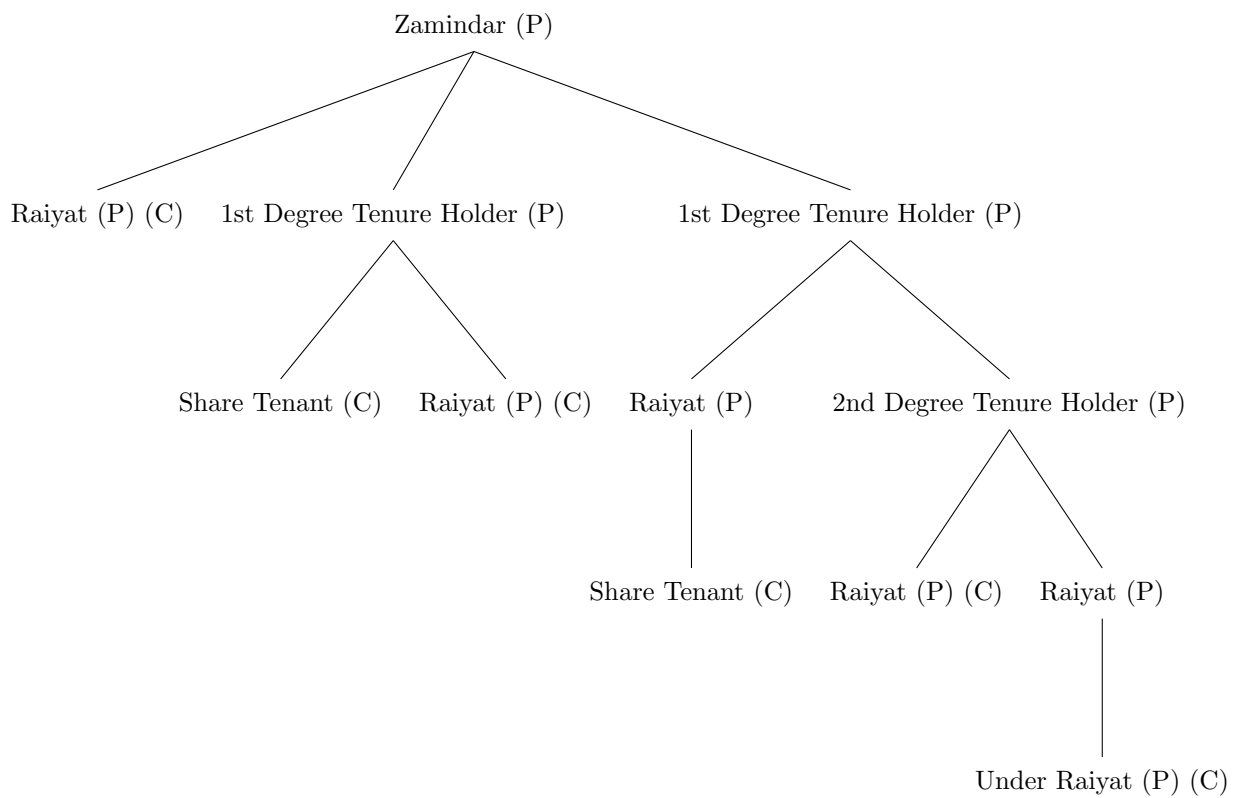
In general, the system from the perspective of the *Zamindar* was as follows: The highest estate in land was known as *zamindari* right, which, when not encumbered by other rights, aligned with modern proprietary rights.¹⁶ However, the *zamindars* had permanently leased out the majority of their land. In the majority of cases there was a occupancy *raiyati* interest in the land. He could not be evicted at will, as he had purchased occupancy rights and either had to be bought out or have his holding put up for auction for persistent refusal to pay rent. The *raiyat* held a perpetual tenure on a rent that was below the economic rent but could be periodically revised. He had a heritable and transferable (depending on the tenancy agreement) interest, and he was able to sublet, including on a perpetual tenure like his own called occupancy under-*raiyati*. The under-*raiyat*, in turn, could sublet further. Between the *zamindar* and the holder of *raiyati* rights there may be any number of different permanent rights in land, lumped together in the term "tenures". "Highest" here does not mean most valuable (per acre), for, by the 20th century, in the majority of cases *raiyati* right held this distinction, rather it means the position in the tenure tree, an example of which is presented in Figure 3.1. From the perspective of the (occupancy) *raiyat*, the real land owner by 1900, the system was much simpler: so long as he paid his rent and adhered to any other incidents of his hereditary tenancy, contractual or customary, the land was his to cultivate or sublet as he saw fit. The complexity comes from trying to understand the system as a whole, which few people had to do except for government officials.

Figure 3.1 uses terminology from the tenancy act classifications, although the vernacular terms varied from district to district and rights of different classifications may have gone under the same name, depending on whether or not they had subinfeudated on a large scale themselves; a *jotedar*, for example, simply meant anyone holding directly under a *zamindar* but here we have one *raiyat* and two 1st degree tenure holders in that position. In this case, although there is a single *zamindar* as

¹⁵These are included in the bibliography. The go-to account was written by Major J. C. Jack, author of the settlement report for Bakarganj district, where tenures were the most complex (Jack, 1915, Pages 43-72).

¹⁶The term *zamindar* is of Persian origin and literally means "land holder/owner". In the majority of cases it meant someone with rights in the land who paid the land tax to the state, covering both small fry paying peanuts and the owners of estates the size of small countries.

Figure 3.1: Example Tenure Tree (Tenancy Act Classifications)



Note: (P) stands for permanent rights, (C) for the actual cultivator.

the proprietor of the hypothetical estate, which covers six acres, there are ten separate permanent property rights in the estate.¹⁷ Each interest could have multiple shareholders, usually members of the same family, but this is ignored here for simplicity's sake. Permanent rights required less than economic rents, for otherwise they would have no value. But since there were many other permanent, valuable interests in land besides the *zamindar*, landed property was more widely distributed than it seems at first glance, or when looking at tax classifications (which would suggest that the *zamindar* had absolute control). Only temporary tenants, who were usually sharecropper subtenants of some degree, actually paid competitive rents. Whether the lowest person with permanent rights cultivated himself or through a temporary tenant, he paid some cash rent to the person above him and earned the difference between this and the competitive rent. The person above him received that rent, and paid on some (smaller) cash rent to the person above him in turn. And so on, all the way up to the *zamindar*, who paid rent to no one, but who had responsibility for the land tax, which is ignored here. In Figure 3.1, out of the six people actually cultivating, four of them (two thirds), have permanent interests in the land. Their incentives were more like peasant proprietors than tenants-at-will.

To see what this meant for the distribution of income, let us take values from the 1930s, being most relevant for the persistence argument. Suppose that each cultivator cultivates one acre, and the value of the produce is 50 Rupees.¹⁸ Since there are six cultivators, the total value of output is 300 Rupees. The cost of cultivation gets paid to the cultivator for his efforts (agricultural labourers are ignored here). The residual income, i.e. the economic rent, is then to be distributed by right according to the tenure tree. Share tenants often paid half of the crop, but part of this represents risk (and perhaps input) sharing. Assume therefore that the economic fixed cash rent, i.e. the value of output minus the cost of cultivation, was forty percent of gross output (an upper bound), or 20 Rupees an acre. In the 1930s, the average rent per acre paid by a *raiyat* to his superior in the tenure tree was 3.5 Rupees, while the average rent paid by an under-*raiyat* to his *raiyati* landlord was approximately 7 Rupees an acre.¹⁹ Assume that the 1st degree tenure holders paid 1.5 Rupees an acre to the *zamindar*, and the 2nd degree tenure holder

¹⁷Six acres was smaller than the average estate, but the principles are no different.

¹⁸See Table 3.6.

¹⁹See Table 3.6.

paid 2 Rupees an acre to the 1st degree tenure holder above him.²⁰ The results of the rather tedious calculations of the distribution of income, even in this fairly straightforward example, are presented in Tables 3.1 and 3.2. The details of the calculations are presented in Appendix 3.A.

The big landlord, the *zamindar*, winds up with 8.12 per cent of rental income, and a mere 3.67 per cent of gross agricultural income. This is in stark contrast to the 100 per cent and 40 per cent implied by the usual meaning of the term "landlord". If we expand the landlord class to include the tenure holders, the landlord share of rent comes up to just under 30 per cent, and their share of income to just over 13 per cent on this estate, which, as we will see below, is higher than my estimate for the all-Bengal average. Within the landlord class, the 1st degree tenure holder who rents out an acre to a share tenant does much better than the pure absentee rentier types; taking an interest in your estate was far more remunerative than being an absentee in the long run. The majority of both rental and agricultural income is in the hands of the peasantry. There is, however, differentiation within this group, as the share tenants are much worse off than either *raiyats* or even under-*raiyats* with permanent rights. The question of inequality within the *raiyat* class is examined in Appendix 3.B, which suggests that there was a good, but not extreme, deal of it. The big landlords were defeated over the long run, but this was really a victory for a set of smaller landlords and this still left many people functionally landless and impoverished. Mortality in the 1943 famine would have been even greater had the *zamindars* actually monopolised land.

So there were big landlords in Bengal - this much is true - but in terms of control over land, in theory, these were neutered by tenant right. The *zamindars* were landowners without really having land. A recent article by Jordi Caum-Julio estimates land inequality in Bengal by using the number of *zamindars* as the only land owners. This results in a high Gini coefficient (close to 0.8), but this is misleading, because it ignores the fact that land ownership was split into multiple types of interest, not just those recorded as "proprietors".²¹ Since most cultivation was done by people with valuable and permanent possession of the land, Bengal was really more so

²⁰Faridpur SR puts the average rate of rent paid to the *zamindar* by 1st degree tenures holders at 1.5 Rupees an acre (Jack, 1916, Page 26).

²¹(Caum-Julio, 2024). His estimates of land inequality in the other regions are substantial underestimates too, see Appendix 3.H.

Table 3.1: Example Tenure Tree: Class-wise Statistics and Cultivation Income

| Class | Number | Acres with Rights in | Acres Cultivated | Value of Output (Rs.) | Cultivation Earnings |
|---------------------------|--------|----------------------|------------------|-----------------------|----------------------|
| Zamindar | 1 | 6 | 0 | 0 | 0 |
| 1st Degree Tenure Holders | 2 | 5 | 0 | 0 | 0 |
| 2nd Degree Tenure Holders | 1 | 2 | 0 | 0 | 0 |
| Raiyats | 5 | 4 | 3 | 150 | 90 |
| Under Raiyats | 1 | 1 | 1 | 50 | 30 |
| Share Tenants | 2 | 0 | 2 | 100 | 50 |

Note: Derived in Appendix 3.A.

Table 3.2: Example Tenure Tree: Class-wise Distribution of Rents and Income

| Class | Net Rental Income | Total Income | Aggregate Rental Income | Aggregate Income | Share of Aggregate Rental Income | Share of Aggregate Income |
|---------------------------|-------------------|--------------|-------------------------|------------------|----------------------------------|---------------------------|
| Zamindar | 11 | 11 | 130 | 300 | 8.46 | 3.67 |
| 1st Degree Tenure Holders | 28.5 | 28.5 | 130 | 300 | 21.92 | 9.5 |
| 2nd Degree Tenure Holders | 3 | 3 | 130 | 300 | 2.31 | 1 |
| Raiyats | 74.5 | 164.5 | 130 | 300 | 57.31 | 54.83 |
| Under Raiyats | 13 | 43 | 130 | 300 | 10 | 14.33 |
| Share Tenants | 0 | 50 | 130 | 300 | 0 | 16.67 |

Note: Derived in Appendix 3.A.

a land of peasant proprietors, by and large, than one of big exploitative landlords and oppressed tenants. Perpetual leases are hard to square with the *zamindars* having monopoly power in the land market, which seems like it would be an obvious indication of landlord influence.²² Coase-Julio argues that there is some link between revenue classifications (which we know are completely misleading, see Appendix 3.H) and wage to income ratios, due to the oligopsony power of the supposedly few landlords depressing wages and any market power in the land market raising rents. This cannot have been the case in Bengal, as actual land use rights (and therefore the decisions about whether or not to hire labour given prevailing wages) were in the hands of the millions of *raiyats* in addition to the limited number of landlords who had home farms, and the choice of tenures is inconsistent with any large amount of land market power. Such was the rather complicated, when viewed as a whole, traditional theory of land tenure.²³ What about the law?

3.3 The State and the Law

In 1793, Lord Cornwallis, brought out to India as Governor General in order to clean up the messy state of affairs left by the servants of the EIC, made the Permanent Settlement which fixed the land tax in Bengal in nominal terms in perpetuity. A marginal tax rate of zero is rather hard to square with the notion of "extractive institutions". Since this promise to keep taxes fixed was kept until independence (154 years), despite certain sections of the colonial bureaucracy grumbling against it, it does not seem likely that the colonial state suffered from commitment problems - the fundamental reason why institutions are supposed to matter.²⁴ Despite the lack of representative institutions and similar constraints on the executive, as stressed by the institutionalists, somehow arbitrary expropriation by the state was not the problem here. What is more controversial, was that this settlement was made with the *zamindars*, who were recognised as landowners. This, it is true, was a rather potent cocktail for extreme inequality: the land

²²Lest they create future competition for themselves, monopolistic landowners should restrict the amount of land leased out to sub-competitive levels, and only give land out on insecure short term rental agreements, see (Coase, 1972).

²³It was much simpler to the actual participants because they only needed to know who they paid rent to, and/or who they got it from.

²⁴In fairness, they are supposed to matter thanks to a double-sided commitment problem: potential future governments may not be able to.

tax was fixed forever, the *zamindars* were a rather small class at the time, and Bengal was overwhelmingly an agrarian society, which, unknown to those at the time, would not see much structural change in the future. A series of coincidences, however, and the tenurial choices of the *zamindars*, meant that this was not to be the case.

Banerjee and Iyer argue that the tenurial systems were imposed by the British. Indeed, they have to in order to claim causality. The problem here is that the British did not start with a blank slate, as they inherited precolonial institutions, which in theory they were bound to respect. Thus, a Victorian update to the work of the famous English legal commentator Blackstone stated that "In a conquered or ceded country, which prior to conquest or cession had already laws of its own, the sovereign may alter and change those laws; but till he does actually change them, the ancient laws of the country remain in force."²⁵ There is therefore no presumption that (British) "colonial" institutions were exogenously imposed, e.g. while a common law legal system was exported to India, English laws were generally not. The laws themselves, in colonial legal theory, as embodied in judicial rulings and precedent, derived from local custom and usage subject to "justice, equity and good conscience" as well as by statute, i.e. acts of the legislature.²⁶ This was generally the case in British (non-settler) colonies.²⁷ Much of the statute law in India was not arbitrary, but deeply reflected the customs and usages of the various parts of the country. In our case, the traditional system of land tenure formed the foundation that later laws were built upon - "colonial" institutions were actually indigenous ones. The Bengal *Zamindars* existed multiple centuries before colonialism.²⁸ Their pre-existing rights and influence was why pre-colonial regimes had accommodated them, and it was why the British did so too, although by taking an interest in subordinate (non-tax paying) rights in land the colonial state went beyond its predecessors.

Appendix 3.C goes over the arcane aspects of Bengali and legal history relevant to the *zamindars* (including their pre-colonial origin) and land tenure. Here is a simplified summary for the main

²⁵(Broom *et al.*, 1875, Book 1, Page 89), Compare the original (Blackstone, 1766, Book 1, Page 107).

²⁶(Rankin, 1946, Page 2). Subinfeudation, for example, had been made illegal in England in 1290 by the statute of *Quia Emptores*. However, this was not the case in Scotland where something similar to the Bengali system existed until 2000. The 1908 Tagore Law Lectures examined the role of custom in the British-Indian legal system, although this was after much codification (Roy, 1911).

²⁷E.g. (Elias, 1951).

²⁸On the precolonial origin of the Bengali *zamindars*, see also (Ray, 1979, Pages 14-18), (Harington, 1805, Vol III, Fourth Part, Section I), (Eaton, 1993), (Raychaudhuri, 1969), and (Datta, 2000, Chapter 3).

text: The property rights of *zamindars* and the tenant right of some of the tenants existed before the Permanent Settlement. Although the latter had no tenancy legislation to protect their rights immediately after 1793, the colonial courts upheld them through the common law. The colonial regime did not really disrupt the pre-colonial nature of private rights, but did introduce novel procedural institutions. The expectation was that landlords would shift to non-permanent tenancies, and that this class of tenant would wither away with time. The first piece of tenancy legislation in 1859 was intended to shift the legal presumption in favour of the tenants, because, rather than fading away, tenant right had survived and most new tenants had now acquired rights from their landlords by mutual agreement. This act did not restrict contractual choice, it merely changed the legal presumption. The well-known 1885 tenancy act provided further protection to these rights, as a consequence of their increased value (as we shall see) following a major decline in the real value of rents, and was more comprehensive regarding the many different types of rights in land in Bengal. This act did restrict contractual choice, as short term fixed rent tenancies could no longer be created by *zamindars* (but they could use share tenancies, and *raiyats* could use short term fixed rents for their subtenants). Non-share rent tenancies under *zamindars* were reserved for permanent leases. Table 3.3 outlines the key legal milestones during the Colonial era. Legislation was not about creating rights at the stroke of a government pen, but protecting those created by the people themselves.

The Bengal *Zamindars* had been given at least 92 years (1793-1885) within which to convert their permanent tenants into temporary leaseholders, and this they refused to do. They instead dug their own grave. Land that was waste at the time of the Permanent Settlement, where there were no existing rights whatsoever, was settled by perpetual leases and subinfeudation, even when European capitalists were involved.²⁹ After 1885, short term rack rented tenancies directly under *zamindars* were still possible through share-of-the-crop arrangements, but most land was still held by tenants with rights (even if they sublet themselves). This is the fundamental oddity of the Bengali land tenure system: There were major changes to almost everything - the introduction of a third party enforcer, the distribution of income between classes, and commercialisation - between 1793 and 1939 but at its theoretical core it remained the same. Tenants did not bother

²⁹One such capitalist purchased 47,000 acres of waste and enticed cultivators with perpetual fixed rent tenures after financing land clearance before any tenancy legislation (Indigo Commission & Seton-Karr, 1860, Page 234).

to buy out landlords on a wide scale, except perhaps to purchase fixed rent rights or to "upgrade" to tenure holder status.³⁰ Likewise, landlords did not buy out their tenants in order to manage the land themselves. Since they were getting far less than the market rent, the persistence of such tenancies was not in their interest. The Colonial State much preferred peasant proprietors after 1860 or so. The main barrier to change was the raiyat himself: If you were deeply unsatisfied with the fact that you paid rent to some landlord, or if your tenure was horribly inefficient, why would you continue to do so for decades, if not centuries? Since chance had shifted most of the economic rent towards him and away from his landlord, this was clearly a matter of "wouldn't pay" rather than "couldn't pay": Tenant right appears to have passed the market test, given its persistence - it cannot have been the cause of Bengal's poverty.

Economic Historians often think survival is not enough proof, however, because commitment problems may get in the way.³¹ I'm not so sure about relevance of this here, because landlords and tenants had a third party enforcer. As we shall see, inflation caused a substantial change in the distribution of income, but caused little changes in much else, counter to what a strong institutionalist view would suggest. Perhaps more mundane transaction costs may have got in the way. The landlord's interest can be seen as a bundle of (a) a rent charge, and (b) residual customary rights. Capital market imperfections could not have been a barrier to the tenant buying out the latter rights, because this purchase could be made through an increased initial rent (upgrading to a fixed rent tenancy at a higher rent level was not restricted) - "buy now, pay later". As will be mentioned in the last section of this chapter, poor growth continued after *zamindari* abolition. If landlords really were a drag on agriculture we would expect rapid growth once they were taken out of the picture. Some authors have claimed that a substantively inferior version of the traditional *raiyyati* tenancy, provided by statutory land reform, promoted both economic growth and equality in the 1990s, yet the much larger redistribution of income in the 19th century did not seem to have done much.³²

³⁰"Rich ryots have been in the habit of paying a fixed sum down to the landlord in consideration of which they will continue to hold at the same rate or at the then village rate for ever", (Sachse, 1920, Page 43). In the 1920s, rents were, on average, 3.5 per cent of gross output, which at 20 years purchase would be worth 70 per cent of one year's crop. Assuming that economic rents made up 40 per cent of gross output, the *raiyyat* got 36.5 per cent of the product as land rents, and so it would have only taken two years of this surplus to buy out the landlord. All *raiyyats* had a simple outlet for their savings.

³¹(Ogilvie, 2007, Page 666), (Acemoglu, 2003).

³²(Banerjee *et al.*, 2002).

Tirthankar Roy and Anand Swamy argue that a landlord could reap returns from any investment before tenancy legislation but not after and therefore look down upon it.³³ This, however, side-steps the nature of the rental agreements made: after 1885 anyone buying *zamindari* rights knew that they were really only getting the right to some rental income stream plus a few customary rights (which would lapse or be bought out in the course of time) – most of the rights in land had been sold to the *raiyats* at the creation of their tenures. To make an English parallel, it was really as if you had bought the rights to a rent charge on the land rather than the freehold. Before 1885 the vast majority of *zamindars* (and the common law rulings for cases involving tenants with rights) acted as if this was the case - which is ultimately why the statute law became what it was - and therefore presumably any prudent purchaser of such rights was aware of what he was getting into. If you wanted to buy land for agricultural investment purposes you should have bought the *raiyati* rights, or cultivated the land as a *zamindar* through short term tenancies.³⁴ More specifically, the 1885 act did not prevent the reclamation of wasteland and provided exceptions for this case, both through leases and by hired labour, as well as safeguards where landlords invested in irrigation.³⁵

What are we to make of all this? Tenancy legislation in Bengal, unlike modern urban rent control or post war land reform worldwide, was about the formalisation of privately created customary rights in land rather than the creation of new ones. Knowing this is crucial for understanding what exactly was going on, and it is an easily missed point. Colonialism did not really create property rights in India *de novo*, nor did it try to deny them. What it did was try to more clearly define them and bring them closer into the formal legal system. This shift from informal to formal institutions was termed the "transition from custom to contract" by one colonial official, and it about sums it up - whence the title of this chapter.³⁶ This was a gradual, evolutionary process that started from precolonial rights, or those created by the people themselves, rather than any sort of radical reform. The Permanent Settlement was merely one step in this direction

³³(Roy & Swamy, 2016, Chapters 2-3).

³⁴One unusually enterprising *zamindar*, for example, built up his home farm from 8 to 32 acres by purchase and had it cultivated by a mix of labourers and share tenants between 1895 and 1931 (Ali & Bose, 1934, Page 383).

³⁵(Finucane & Fulton, 1889, Pages 90, 250-51). The Midnapore Zamindari Company brought "40,000 to 50,000 acres under cultivation and gave the land rent free ... for three years" between 1906 and 1939 in Nadia district (FC, 1940, Vol IV, Page 250).

³⁶(Jameson, 1918, Page 55). This, of course, was a reference to Sir Henry Maine's "from status to contract". Maine had a large influence on the colonial bureaucracy (Dewey, 1991).

rather than an overnight revolution. The novel colonial institutions were procedural, such as the development of the courts, or fiscal (marginal tax rate of zero). By providing fair rents and fixity of tenure the Bengal Tenancy act may seem to have been radical land reform well before the middle of the 20th century, but it was in fact fairly conservative because it merely put customary rights more firmly on a statutory basis; nothing really changed immediately after it passed.³⁷ It is not as if the British took active measures to enforce legislation. The success of their efforts was rather because these were organic, i.e. in line with the existing "spontaneous order" (to get Hayekian about it), and did not immediately disrupt the status quo: the *zamindars* were like the proverbial frogs in the pot. The political economists should look elsewhere for sources of exogenous institutional variation, for the story about "colonial institutions" here is actually very different from the popular one: the Colonial State constrained the local elite. A much better accusation against the British than setting up extractive institutions, is that they did not disrupt custom enough. Perhaps they could have had a scheme for the compulsory purchase of the superior landlords' interest (either by the tenant, as in Ireland, or by the state, as in the 1950s), although given that few tenants bothered to entirely buy out their landlords by private agreement, the market signal is that there was little to gain from doing so.

3.4 Rentals

So much for legal theory. If the state was willing, but, for some reason, unable to uphold tenant right, then the usual story about *zamindars* may have been true. We can test this by looking at the time series of rents as persistently low rents imply security of tenure. To see why, consider a variant of the "market for lemons" situation with an addition of a rental market.³⁸ The market for tenant right is potentially a market for "lemons". A tenant contemplating the expansion of his landholding could either purchase some sort of right in a plot of land, or take a temporary tenancy.³⁹ Assume that he would prefer a permanent tenure, perhaps because it provides better

³⁷Clive Dewey calls the Bengal Tenancy Act the "most radical ... agrarian reform between the mutiny and independence" (Dewey, 1991, Page 372), but I'm with W. H. Nelson: "The custom governing *raiya*'s rights was embodied in Statute in 1859 and 1885. The Tenancy Law of Bengal is to be looked on as part of the Permanent Settlement" (FC, 1940, Vol V, Page 2).

³⁸(Akerlof, 1970).

³⁹In addition, he could have bought the land outright, but I ignore this option because the people of Bengal usually did too.

incentives and therefore the net produce is higher. He would like to agree upon a rent and then pay a premium (known as a *salami*) on admission, following which the land would be his. If his tenure was likely to be insecure and landlords unable to commit to not expropriate these rights once conveyed, he would rationally refuse to pay a premium *ex ante*. The only option left would be to take a temporary tenancy at competitive rates of rent. Even if there were landlords who could commit as well as those who could not commit, asymmetric information may result in all tenancies being temporary rack-rented ones - the market for "lemons" collapses - unless the former had some sort of credible signal of his type. So the persistence of less than economic rents indicates security of tenant right. Since there is a widespread impression that enhancements were general and severe, this section is an essay in persuasion and therefore presents a wide range of statistical evidence in favour of the view that tenant right was secure.

3.4.1 Maximum Increase in Gross Raiyati Rentals over Time

I have estimated figures for gross rentals for each district in Bengal for five baseline years (Table 3.4). The baseline 1793 figure is a multiple of the permanently settled land revenue, and is approximately 30.5 million rupees in total. I take this to be an absolute minimum of the rental in that year in order to estimate an upper bound on the increase in the rentals. Indeed, it is less than a figure that I will estimate separately below of 45 million. The other figures come from the road cess statistics (the cess was levied on existing rents), except the 1939 (b) figure, which comes from the Floud Commission.⁴⁰ The details are presented in Appendix 3.D. This is supposed to be the "*raiyyati* rental" or the rents paid by the *raiyyats* to their superiors in the tenure tree. It is most fundamentally not a measurement of the actual economic (Ricardian) rent. These indices are for gross rentals, which are by definition:⁴¹

$$\text{Nominal Gross Rental}_t = \text{Average Rent per Acre}_t * \text{Acreage}_t$$

⁴⁰Landlords could not claim rents in court higher than what they reported in the cess returns, so they had the incentive to report truthfully.

⁴¹We only observe the Nominal Gross Rental and Paddy Prices.

$$Real\ Gross\ Rental_t = \frac{Average\ Rent\ per\ Acre_t * Acreage_t}{Paddy\ Price_t}$$

Clearly, this is an overestimate of the rent paid for tenancies held continually since the Permanent Settlement as it includes increases due to the expansion of cultivation. Figure 3.4 presents indices by district of the nominal aggregate rental. The road cess figures contain a number of elements which should not be included, for example, temporarily settled areas and imputed rentals from rent free tenancies. Thus they bias the series towards an increase over time. My suspicion is that the FC figures also include much of these, as its revenue figure, for example, includes revenue and taxes from government owned and temporarily settled estates, in addition to the *zamindaris* proper which were permanently settled. Another factor for inaccuracies, but in the opposite direction, are *abwabs* or customary cesses. These were not enforceable by law, but continued to be paid by the tenants for a long time after. These were common in the 18th century, and could be fairly substantial relative to the rent, at that time, but by the interwar period the tenants were actively refusing to sustain the custom. F. Ascoli, settlement officer for Dacca, categorized these as routine and ceremonial (which were only paid on special occasions such as festivals or the marriage of a *zamindar*).⁴² Rates of *abwab* were set by custom as so many annas in the rupee (an anna was one-sixteenth of a rupee) on the rent, and were not usually arbitrary, and only where custom was most unfavourable to the rent payer could they reach four annas in the rupee.⁴³ As they took the form of a percentage on the rent, and the number of them was declining over time, inferences from these indices should be largely unchanged. Not included either are the customary transfer fines, which affected the subset of tenancies which were "non-transferable".⁴⁴ On the other hand, remissions of rent and other customary deductions in favour of tenants are also not included.

The nominal rental indices show considerable district wise variation. The increase tends to be highest in the districts which were less densely populated in the 18th century, such as Bakarganj,

⁴²(Ascoli, 1917, Pages 42-3).

⁴³The Settlement Reports contain sections on the types and incidence of *abwabs*.

⁴⁴The maximum legal fine of 20 per cent (although actual rates were often lower, and many tenancies freely transferable) was approximately the same as maximum (which was close to the average) land transfer taxes, not counting capital gains taxes, in West Bengal (until 1994) and Bangladesh, see (Alm *et al.*, 2004) and (Schroeder, 1989, Chapter 4). Bangladesh has recently set a minimum price by which to base the transfer fee, so the actual rates have increased (Miah & Suzuki, 2018, Pages 151-153). It is as if all land rights became "non-transferable"!

Khulna, or Mymensingh, reflecting the expansion of cultivation. As much of this was financed by landlords, these rents should largely be seen as a return on a capital investment (and not a very high one *ex post*) rather than a pure unearned increment. By contrast, Burdwan and Murshidabad have much lower nominal rental increases as they had little land uncultivated at the time of the Permanent Settlement. Burdwan was the home of the infamous *patni* tenure, which usually gets blamed for rapaciously enhancing rents.⁴⁵ These figures provide no support to this claim: Burdwan had some of the lowest increases of all districts. Some of these nominal increases appear entirely fictional to me. Dacca and Faridpur districts see substantial increases in road cess figures between 1913 and 1918, but given that rents up to that point had hardly been enhanced, it is very unlikely that this represented actual enhancements.⁴⁶ For some districts there is a large difference between the 1939 (a) and 1939 (b) indices. These unsurprisingly tend to be those with large temporarily settled areas. Jalpaiguri, for example, saw the expansion of the tea industry and this accounts for the major difference. In sum, the gross rental increased, at the very most, by a factor of four between 1793 and 1939.

Real rents are another story. We can deflate the nominal rental series by changes in the price of paddy to get a metric of the change in real rentals. Figure 3.2 presents the path of the price of paddy over the period, and details of how it was constructed can be found in Appendix 3.E. Paddy prices don't move that much before 1872, except for a jump round 1850, after which they start to rise faster than before. This was the period when many countries shifted away from a silver standard to a gold one following the Franco-Prussian war.⁴⁷ The demand for silver fell, so too did the real price of silver relative to goods and services, and since the rupee was based upon silver, rupee prices rose: A petty European dispute bailed out the Bengali *raiyat*. India then just so happened to switch from silver to gold as the latter was experiencing inflation. Inflation continued at a slow but steady pace until WW1, when the price level jumps up. High nominal prices continued over the 1920s before plummeting to pre-war levels during the Great Depression. Indices of the aggregate gross rental in terms of paddy are presented in Table 3.5.

⁴⁵E.g. (Harington, 1827, Page 23).

⁴⁶The Dacca settlement report outlines the following reasons for the increase in the road cess valuation: the assessment of rent free lands hitherto exempt, including some subletting *raiyats* as tenure holders, the discovery of many tenures which had escaped earlier valuations, some degree of expansion of cultivation, and the inclusion of produce rents (Ascoli, 1917, Page 135).

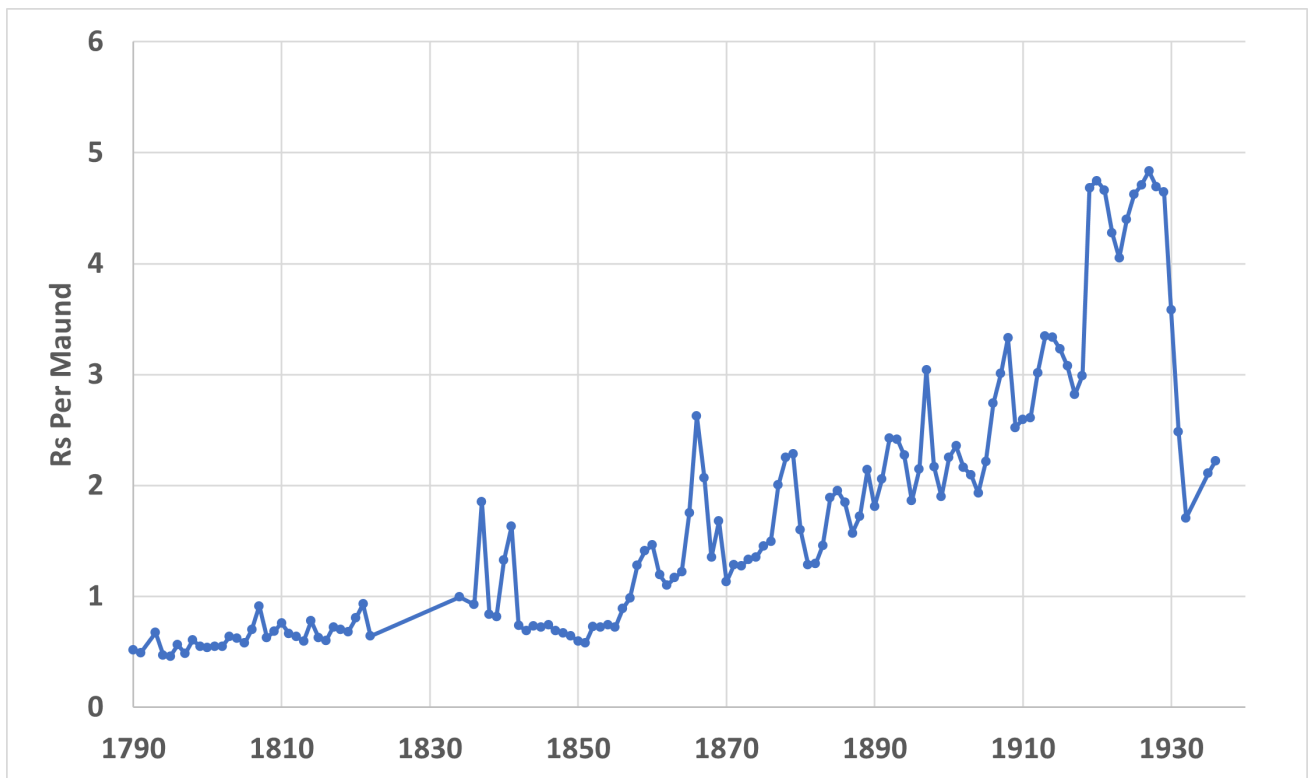
⁴⁷(Flandreau, 1996).

Table 3.3: Legal Milestones Regarding Tenant Right

| Year | Event | Description | Legal Maximum on Rents for Tenants with Rights |
|------|----------------------|--|---|
| 1793 | Permanent Settlement | Marginal rate of land tax set to zero forever. Superior property rights recognised by statute. Subordinate ones by the Common Law. | Agreement and/or Customary rates. |
| 1812 | Regulation V of 1812 | <i>Patni</i> tenure given statutory recognition. | Agreement and/or Customary rates |
| 1859 | Act X | Statutory recognition of occupancy rights. | "Fair and Equitable" |
| 1865 | Great Rent Case | What did "Fair and Equitable" actually mean? | Adjusted to price of food-grains. |
| 1885 | Bengal Tenancy Act | Broader statutory coverage of types of tenures. Codification of existing law. Stricter on <i>zamindars</i> . | No Enhancement beyond 12.5 per cent every 15 years. |

Source: See Appendix 3.C. **Note:** The maximum for tenants without rights (mainly share tenants) was whatever they could be got to pay.

Figure 3.2: Paddy Prices in Bengal



Source: See Appendix 3.E. **Notes:** Figures averaged for years where there were multiple prices given. A Maund is 37 kg.

Table 3.4: Nominal Gross Rental Indices 1793 = 100

| District | 1793 | 1871 | 1913 | 1918 | 1929 | 1939 (a) | 1939 (b) |
|------------------------------------|------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Burdwan | 100 | 148.28 | 130.07 | 157.83 | 173.92 | 167.91 | 118.74 |
| Birbhum | 100 | 120.27 | 227.5 | 234.29 | 229.04 | 288.33 | 274.42 |
| Bankura | 100 | 107.45 | 286.99 | 286.63 | 627.74 | 626.12 | 532.33 |
| Midnapore | 100 | 218.2 | 283.55 | 284.03 | 455.16 | 456.56 | 410.52 |
| Hooghly and Howrah | 100 | 171.31 | 251.22 | 250.81 | 331.52 | 330.86 | 392 |
| 24 Parganas* | 100 | 260.05 | 447.47 | 499.43 | 567.48 | 580.72 | 627.72 |
| Nadia | 100 | 256.75 | 313.6 | 329.93 | 483.4 | 483.85 | 401.78 |
| Murshidabad | 100 | 242.82 | 265.86 | 256.99 | 256.9 | 346.5 | 298.8 |
| Jessore | 100 | 331.68 | 322.97 | 366.14 | 688.18 | 688.83 | 372.39 |
| Khulna* | 100 | NA | 576 | 622.84 | 712.02 | 1464.21 | 752.18 |
| Dacca | 100 | 353.58 | 679.51 | 822.8 | 828.16 | 851.07 | 828.16 |
| Mymensingh | 100 | 445.06 | 736 | 736.06 | 1005.38 | 1021.66 | 878.19 |
| Faridpur | 100 | 291.39 | 386.3 | 721.84 | 742.89 | 832.94 | 795.19 |
| Bakarganj* | 100 | 444.8 | 523.86 | 570.76 | 602.34 | 652.24 | 573.67 |
| Chittagong* | 100 | 379.41 | 571.59 | 576.22 | 583.87 | 1221.94 | 438.8 |
| Tippera | 100 | 525.34 | 681.73 | 787.42 | 868.4 | 866.42 | 735.55 |
| Noakhali* | 100 | 206.99 | 325.6 | 339.2 | 325.61 | 356.26 | 294.52 |
| Rajshahi | 100 | 222.16 | 255.01 | 279.97 | 328.96 | 329.48 | 359.9 |
| Dinajpur | 100 | 144.88 | 182.88 | 202.63 | 250.97 | 339 | 247.95 |
| Jalpaiguri* | 100 | 622.12 | 1184.83 | 2093.69 | 2334.78 | 2929.1 | 746.88 |
| Rangpur | 100 | 305.83 | 415.56 | 438.38 | 589.44 | 589.86 | 412.73 |
| Bogra | 100 | 202.95 | 375.26 | 374.87 | 375.87 | 860.17 | 435.75 |
| Pabna | 100 | 283.42 | 516.56 | 524.08 | 521.85 | 857.55 | 636.18 |
| Malda | 100 | 157.64 | 324.44 | 346.11 | 488.4 | 506.27 | 396.1 |
| Total (30 Million Baseline) | 100 | 240.23 | 344.99 | 380.81 | 464.35 | 538.17 | 417.85 |
| Total (45 Million Baseline) | 100 | 160.15 | 229.99 | 253.87 | 309.57 | 358.78 | 278.57 |

Source: See Appendix 3.D. Note: * Indicates substantial temporarily settled areas.

Table 3.5: Real (Paddy) Gross Rental Indices 1793 = 100

| District | 1793 | 1871 | 1913 | 1918 | 1929 | 1939 (a) | 1939 (b) |
|------------------------------------|------|--------|-------|-------|-------|----------|----------|
| Total (30 Million Baseline) | 100 | 179.76 | 90.01 | 46.95 | 53.45 | 135.8 | 105.44 |
| Total (45 Million Baseline) | 100 | 119.84 | 60 | 31.3 | 35.64 | 90.54 | 70.29 |

Sources: See Appendix 3.D and Figure 3.2. Note: * Indicates substantial temporarily settled areas.

In total, the upper bound on the gross real rental burden seems to have increased by, at most, 35 per cent over the period. Using the 45 million benchmark for 1793, would result in an unambiguous real decline. The burden of rents does not seem to have increased in real terms by much, if at all. My calculations substantially confirm a guess of W. H. Nelson's - always on the ball - in his response to the Floud Commission.⁴⁸

3.4.2 The Burden of Rents in 1939

The Floud Commission figures allow us to calculate the average rental share of the gross produce for 1939, which was a period of low prices (and therefore higher real rents) relative to the 1910s and 1920s. These are presented in Table 3.6. Rents as a share of the gross produce are low - on average not even a tithe.⁴⁹ Midnapore has the fourth highest rent share, and yet Chitta Panda found the *zamindars* in poor shape there.⁵⁰ These figures suggest that his story applies elsewhere as well.

3.4.3 An Attempt to Estimate the Path of Rents per Acre

The evidence presented above suggests that rental enhancements were not very severe. Rental enhancements were spoken of as so many annas in the rupee, i.e. in percentage terms. To think about the path of rents per acre over time, then, let us suppose that:

$$Rent_{it} = \alpha_j e^{\delta t} \tag{3.1}$$

Where subscript j indexes districts, and subscript t denotes time, measured in years. $Rent_{it}$ is an observation (i) of rent per acre in year t . α_j therefore represents a district fixed effect, and δ the annual rate of increase of rents. Let us linearize this equation by taking natural logarithms and add an error term:

⁴⁸(Colebrooke, 1884, Note by the Editor, Page XVI), (FC, 1940, Vol V, Page 3).

⁴⁹The calculation of the average value of the gross produce per acre is included in F. A. Sasche's contribution to the FC appendices, (FC, 1940, Vol II Page 74-87). He slightly adjusted yield figures from the published agricultural statistics, usually upwards, which were notoriously unreliable (see (Dewey, 1978)) but took conservative prices - the actual prices of paddy and jute (the two main crops) were at least 10 per cent higher than those he used. Any overestimation in yields should be matched by underestimation in prices.

⁵⁰(Panda, 1997).

Table 3.6: Bengal Average Rents Per Acre 1939

| District | Raiyati | | |
|----------------|--------------|---------------|--------------|
| | Rs. | Produce (Rs.) | Rent % |
| Bakarganj | 4.5 | 53 | 8.491 |
| Bankura | 2.063 | 36 | 5.731 |
| Birbhum | 3.875 | 40 | 9.688 |
| Bogra | 2.875 | 48 | 5.99 |
| Burdwan | 3.938 | 41 | 9.605 |
| Chittagong | 4.688 | 55 | 8.524 |
| Dacca | 2.813 | 59 | 4.768 |
| Dinajpur | 2.438 | 47 | 5.187 |
| Faridpur | 2.563 | 56 | 4.577 |
| Hoogly | 7.438 | 52 | 14.304 |
| Howrah | 8.188 | 50 | 16.376 |
| Jalpaiguri | 2.313 | 45 | 5.14 |
| Jessore | 2.5 | 44 | 5.682 |
| Khulna | 3.375 | 42 | 8.036 |
| Malda | 2.25 | 45 | 5 |
| Midnapore | 3.938 | 39 | 10.097 |
| Murshidabad | 3.438 | 42 | 8.186 |
| Mymensingh | 2.875 | 61 | 4.713 |
| Nadia | 2.438 | 43 | 5.67 |
| Noakhali | 4.25 | 57 | 7.456 |
| Pabna | 3.063 | 53 | 5.779 |
| Rajshahi | 3.188 | 48 | 6.642 |
| Rangpur | 3 | 62 | 4.839 |
| Tipperra | 3.125 | 58 | 5.388 |
| 24 Parganas | 5.813 | 46 | 12.637 |
| Darjeeling | 2.313 | 29 | 7.976 |
| Average | 3.313 | 49.469 | 6.697 |

Sources: (FC, 1940, Vol II, Tables No. VI (a) and VIII (a)).

$$\ln(Rent_{it}) = \delta t + \tilde{\alpha}_j(District_j) + u_{it} \quad (3.2)$$

Where $District_j$ is an indicator variable, for each district, and $\tilde{\alpha}_j$ is the log of α_j . I estimate this equation with OLS using a data set of 2,644 rent observations over the period 1790-1940. This assumes that the district fixed effect was constant over time.⁵¹ Running the regression allows me to deduct the district fixed effect from the log rental observations, linearise the resulting number, and then plot these against time.

Alternatively, I also run the following hedonic regression to estimate the path of rents (using the estimated decade coefficients):

$$Rent_{it} = \sum_k \beta_k Decade_k + \sum_j \gamma_j District_j + \epsilon_{it} \quad (3.3)$$

The data are described in Appendix 3.F. Figure 3.3 plots the rent observations for all districts over time. It is clear that high rates of rent (above 4 Rs an acre) were not uncommon at the time of the Permanent Settlement and the early 19th century. Many of these observations, however, are from the West Bengal districts that also had high rates in the 1930s. We can standardise the rents by estimating the first specification above, and then deducting the estimated district fixed effect. The baseline district in the regressions was the 24 Parganas. I further standardise the adjusted nominal rents by the ratio between the 24 Pargana's rate of rent and the Bengal-wide average in 1939 according to the FC (approximately 0.622). Figure 3.4 plots these standardised rents per acre over time, and includes the predicted time trend line, as well as that from the hedonic regression. Tables 3.18 and 3.19 in Appendix 3.F report the regression results for the two specifications. The estimated coefficient on the time trend in the above equation was 0.0022823.⁵² This would give us a ratio of the average rent between 1939 and 1793 as $e^{0.0022823 \times (1939 - 1793)} = 1.395$. The average rate of rent appears to have increased by around 40 per cent in nominal terms between the Permanent Settlement and the Floud Commission - an interval of 146 years. If we take the hedonic regression results, the enhancement would be

⁵¹A reasonable assumption, since the actual degree of enhancement was so low across the board.

⁵²The heteroskedasticity robust standard error was 0.000299, and the coefficient is significant at the 0.001 level.

close to zero. This stands in contrast with the maximum enhancement legally permitted: had the enhancement rule set down by the 1885 Bengal tenancy act been followed between 1885 and 1939, nominal rents would have increased by 57 per cent - a greater enhancement than there actually was in a period approximately three times as long. The rent laws did not bind on average.⁵³

The implied average rate of rent per acre in 1793 from the first specification is 2.37 Rupees, and that from the second is around 3. Let us be conservative and take the lower figure. The permanently settled land revenue was approximately 20 million Rupees, and so it could be covered by the rent of around 8.43 million acres. The FC gives the net cultivated area at 28.94 million acres in 1939.⁵⁴ If the Permanent Settlement truly took all of the assets of the *zamindars*, we would have the cultivated area expanding by a factor of 3.42.⁵⁵ This is far too high a figure, as it would imply an increase in cultivated land per capita. The rule of thumb (based on a remark by Lord Cornwallis) is that the cultivated area expanded by 50 per cent, and so 19.2 million acres were under the plough in 1793.⁵⁶ This would give a gross rental of 45.5 million Rupees (60 million from the alternative specification).⁵⁷ It appears that the *zamindars* paid less than half of their income as taxes.

Why then is there a widespread impression that the Permanent Settlement taxed them highly? The main evidence for the high tax theory is the low price of estates from the auction sales for arrears of revenue.⁵⁸ But only the estates that were highly assessed would be sold for arrears - sampling bias. It was in the interest of the others to pay promptly because they earned handsome rents net of tax. This assumes that auction prices signal the actual value of the estates, but the

⁵³1939 to 1885 is a gap of 54 years. The rent law allowed an enhancement of 12.5 per cent every 15 years. $54/15 = 3.6$ and $e^{3.6*0.125} = 1.568$.

⁵⁴(FC, 1940, Vol II, Page 112).

⁵⁵This calculation ignores revenue free estates.

⁵⁶To get to my lower bound assumed figure from the gross rentals section, where the gross rental was approximately 30 million rupees in 1793, there would have to be 12.67 million acres cultivated at that time - which would imply that half of the cultivable part of Bengal was waste then, if the 1939 level was the upper limit.

⁵⁷This figure ignores the tenure holders, but their rents were not far from the *raiyati* ones at this period, and the number of tenures expanded considerably after the 1793. The average rent per acre in 1939 was 3.313 Rupees, and on a cultivated area of 28.94 million acres, we would have just under 96 million Rupees. The FC's gross *raiyati* assets were 128 million Rupees, and the difference is accounted for by (a) tenure holders' own cultivation, and (b) produce rent *raiyati* tenancies, which formed a tiny proportion of the total, but paid far higher rents than the cash rent ones.

⁵⁸E.g. virtually all of the evidence in B. B. Chaudhuri's article (Chaudhuri, 1975). Even in the 1920s, land sold for non-payment of revenue went for a large discount relative to private sales (GoB, 1930, Vol II).

auction process was itself frequently manipulated by the employees of *zamindars*, whether acting for their master or in their own interest. The Maharaja of Burdwan, for example, purchased much of his own estate in *benami* (ostensibly in the name of a third party), and somehow had the money spare to buy up most of the *zamindari* owned by his family's traditional rivals. The Natore Raj was purchased by its own employees, whose withholding of rents caused it to be put up for sale in the first place. Rakhalanta Ray provides numerous examples, including the two above, across Bengal of auction mischief in the wake of the Permanent Settlement.⁵⁹

Figure 3.5 plots the average standardised rent per acre in maunds of paddy. There is a clear long term trend downwards, interrupted only by a brief increase in the 1840s and later the Great Depression. This decline is consistent with contemporary estimates about the rental burden. Both Buchanan and Colebrooke in the early 19th century mention cash rents paid to *zamindars* being equivalent to a quarter of gross output.⁶⁰ The later settlement reports report much lower figures. In Faridpur district in East Bengal, Major J. C. Jack estimated that "As far as can be calculated the average rent represents 15 per cent of the value of the gross produce of an acre in 1860, 12 in 1880, 9 in 1900 and 6 in 1914" - very much in line with my figures here - and that nominal rents had hardly moved in over 50 years.⁶¹ His estimate for Bakarganj around 1900-1908 was less than ten percent.⁶² For Mymensingh, F. A. Sachse copied Jack and his figures show that including *abwabs* (illegal cesses), taxes, and legal cesses that the rent burden was just under 5 per cent of gross produce around 1915.⁶³ What about West Bengal? Rents in Murshidabad, densely populated during the 18th century, were only 4 per cent of the gross value of agricultural output in the 1920s.⁶⁴ This district suffered from the natural decline of the Bhagirathi river and the fertility of the soil was probably less in the interwar years than a hundred and fifty years before.

⁵⁹(Ray, 1979, Pages 99-103, 121-124, 180-189.)

⁶⁰(Colebrooke, 1884, Page 66) Colebrooke's cash rent figure comes to Rs 4.125 an acre, but he assumes a rather high yield.

⁶¹(Jack, 1916, Page 31).

⁶²Jack vehemently protests against *abwabs*, however (Jack, 1915, Page 72).

⁶³(Sachse, 1920, Page 23).

⁶⁴(Mukharji, 1938, Page 132).

3.4.4 The Selling Price of Tenant Right

No one would be willing to pay for rights which are only good on paper. Figure 3.6 plots the cumulative distribution of the selling value of *raiyati* rights in the 1920s according to evidence presented to the Bengal Provincial Banking Enquiry. The mean average per acre was Rs 513, and excluding the top 5 per cent reduces this to Rs 424. The mode and median value is Rs 300. The average produce per acre was Rs 50 in 1939 (see above), and prices were around half of what they were in the 1920s then, so the produce per acre around the same time was approximately 100 Rupees. Assume lower and upper bounds on the economic rent share of output of $1/3$ to $2/5$, and deducting the *raiyati* rent (Rs 3.3), the owner of such a right would get 30-36.7 Rupees annually.⁶⁵ This would imply a crude rate of return (economic rent minus *raiyati* rent divided by price, i.e. ignoring capital gains) to purchasing *raiyati* rights of 5.9-7 per cent. Are these crude estimates over or under the mark? This was shortly before the deflation of the Great Depression - land values should have been expected to decrease. Land being a status good is unlikely to have lowered the return here, since these were for the rights at the bottom of the status chain - social prestige went to *zamindars*. Some of these rights were subject to transfer fines, which would also tend to depress their value. If *abwabs* were large, or the value of output per acre is overstated, then these would be overestimates of the return.⁶⁶ Uniquely among the settlement reports, that of Midnapore reports the selling price of *raiyati* and *zamindari* rights in the years before 1911-15. The average value of the former was Rs 125, and the latter Rs 60.⁶⁷ The settlement officer estimated the average value of the produce per acre to be Rs 38.25, and the average rent to be around Rs 3.74.⁶⁸ Calculating the rent going to the *raiyati* interest (output times $1/3$ or $2/5$ minus *raiyati* rent) as above gives us Rs 9.01-11.56, and a crude rate of return of 7.2-9.2 per cent. Part of Midnapore was a dry, frontier, jungly tract so this is an overestimate for Bengal as a whole. The crude return on *zamindari* estates is $3.74/60 = 6.2$ per cent. W. H. Nelson suggests Rs 250 as the average sale price of *raiyati* rights in 1939,

⁶⁵For the lower bound see (Pal & Quizon, 1983, Tables 1 and 4). This is probably closer to the average, but I use it as a lower bound to overestimate the average return on holding *raiyati* rights, to be conservative by biasing my results against my argument.

⁶⁶There is a very small positive correlation between the share of each district in the total observations here with the rent to produce ratio in 1939 - composition effects are not biasing the figures downwards either.

⁶⁷(Jameson, 1918, Pages XLVI, XLV).

⁶⁸(Jameson, 1918, Pages 110 and XLIV).

which would imply a crude return of 5.3 to 6.68 per cent.⁶⁹ By the 20th century, the return to owning *raiyati* rights was 5-7 per cent on average. While much higher than the return to investing in land in England (3 per cent, probably the global minimum), and perhaps slightly higher than the usual expected return on investing in *zamindari* estates (5 to 6 per cent), these are for subordinate rights in tiny fragmented holdings.⁷⁰ The market for *raiyati* rights was therefore reasonably well integrated with other rural asset markets. Since *zamindars* could buy out their tenants, it had to be. Mortgage interest rates were higher, indicating the difficulty of foreclosure, and those on small unsecured loans were more like 18-37 per cent. Indeed, the ratio between the return to land investment in Bengal and the UK, was far less than the ratio of wages - capital markets were more integrated than labour ones apparently (unless we assume differences in labour quality).⁷¹ With a going rate of return, we can estimate the maximum pure productivity gain from enfranchising such a tenancy. Let the value of the tenancy be V_0 , and let the maximum value of the same holding but on adjusted tenurial terms be V_1 . Let the cost of bargaining be C . Then enfranchisement will occur when:

$$V_1 - V_0 \geq C \quad (3.4)$$

For the marginal tenancy, this will hold as an equality:

$$V_1 - V_0 = C \quad (3.5)$$

How large was C likely to have been? As an upper bound, assume that it was 15 rupees (per acre) in the 1930s, equivalent to 6 per cent of the value of the unenfranchised *raiyati* rights and over 20 per cent of a man's annual wages. Consider the marginal peasant; he could invest his money in enfranchising his tenancy, or purchase further *raiyati* rights, which bore a return of 6 per cent per year. Being the marginal peasant, he is indifferent between the two:

⁶⁹(FC, 1940, Vol V, Page 15).

⁷⁰(Clark, 1998, Table 3), (FC, 1940, Vol I, Page 308, Vol IV, Page 248).

⁷¹The maximum return difference here is 2.33 (7/3). Hourly Wages in Dundee were six times what they were in Bengal for the same work in Jute factories (Clark, 1989, Page 708).

$$V_1 - V_0 = C = P = \frac{x}{r} \quad (3.6)$$

Where P is the price of the additional raiyati land, x is the annual (certainty equivalent) net rent from that land, and r is the return to owning such rights. As above, $r = 0.06$ and $C = 15$, implying that:

$$x = Cr = 0.06 * 15 = 0.9 \quad (3.7)$$

I.e. enfranchisement at most results in a gain of 0.9 rupees per acre. This is equivalent to $0.9/50 = 1.8$ per cent of output. It is an upper bound for the gain, since if it were to get any larger, the tenancy would be enfranchised. Assume that the average gain was half of the marginal gain (c.f. Harberger Triangles); the efficiency gain from total enfranchisement would be 0.9 per cent. Since few tenants bothered to fully buy out their landlords, the marginal tenant was far from the average one, and since 15 Rs an acre is a gross upper bound on the cost of bargaining (implying that it would cost a year's worth of labour to enfranchise a mere four or five acres!), this 0.9 per cent figure is an upper bound itself. This was not a situation where tenant poverty or political concerns (e.g. serfdom) caused inefficient persistence - the *raiyyats* were individually free and their rights were worth far more than their landlords'.⁷² Nor was it a situation like enclosure, where the requirement of unanimity among large groups of people made transaction costs enormous. There was little to be gained from enfranchisement. That is why the system persisted.

3.4.5 How Many Landlords were there in the 1930s?

So rents were low by 1900, but landlords may have been wealthy if there were very few of them. Finding out the number of "landlords" is difficult, as so much depends on what we mean by that term.⁷³ If we mean anyone who had a share in the economic rent, then the majority of the

⁷²E.g. On tenant poverty, see (Mookherjee, 1995), on political concerns see (Acemoglu, 2003).

⁷³This difficulty has a long history, for the practice "from time immemorial, and [it] still prevails [in 1801], of conducting all the affairs of an estate from generation to generation in the name of the original proprietor of such estate or some fictitious name formed by him, under which cloak the actual proprietors for the time being are kept concealed" was common in East Bengal. From a letter from 1801, in (Beveridge, 1876, Page 421).

population would be landlords. If we mean anyone who leases out land, then many *raiyats* would still be counted. I instead take it to mean, as is traditional, *zamindars* and tenure holders. Shares in revenue paying *zamindari* estates had to be registered with the government after 1876. This gives me a metric on the number of proprietors. The Land Revenue Administration reports stop reporting the district wise figures after 1931-2, and so I use figures from that year.⁷⁴ Comparing the total with the number of revenue paying estates from the Floud Commission gives just under 8 shareholders per estate, or 936,000 interests, although around half of these were from Chittagong district.⁷⁵ The large number of *zamindars* in Chittagong was a legacy of its frontier history: soldiers were granted land to secure Mughal control (this and southwards expansion by the people of Chittagong during the colonial era is the origin of the modern *rohingya* conflict). Removing Chittagong, and using figures from the FC, we would get approximately 54.4 acres per proprietary interest.⁷⁶ Next, tenure holders. The land revenue administration reports stopped reporting the registered number of shareholders of tenures at some point, but do report the "number of tenures assessed to cesses".⁷⁷ The FC also reports the number of tenures.⁷⁸ The average ratio between these two figures was 2.69 - the former seems to count shareholders. One district, Rajshahi, has a very high ratio (17.1), and I am not sure why. I therefore use the land revenue administration report figure for the number of sharers in tenures. This would give a total of 5,701,425 sharers in tenures. Excluding Rajshahi, which appears to be an outlier, would result in 4,982,110 sharers.

To be on the safe side, let us deduct the Chittagong *Zamindars* and the apparent Rajshahi tenure holders, then multiply each number by two-thirds to account for multiple tenures or interests being held by the same person (and, when we are looking at rents per landlord, any understatement of rental earnings).⁷⁹ This would give us a lower bound on the number of

⁷⁴(GoI, 1931 - 1932, Appendix XI).

⁷⁵In neighbouring Orissa, the number of shareholders per estate ranged from 6 to 8 across the districts. (Maddox, 1900, Page 181).

⁷⁶(FC, 1940, Vol II, Page 112) gives the net cultivated area at 28.94 million acres, or 28.308 deducting Chittagong. There were 936,034 proprietary interests, and 520,417 of those were in Chittagong (GoI, 1931 - 1932, Appendix XI).

⁷⁷(GoI, 1931 - 1932, Appendix XXV).

⁷⁸(FC, 1940, Vol II, Page 107).

⁷⁹A *zamindar* may have been a tenure holder, even in his own land; the two interests were not merged when held by the same person: "Thus a zamindar will be found crediting himself with rent payable to him as zamindar by himself as howaladar [a permanent tenure, often a cultivating one], and again debiting himself as howaladar with the rent due to himself as zamindar" (Beveridge, 1876, Page 197). Similarly, someone who earned most of his income through cultivating his own *raiyati* land may have had a share in a tenure.

landlords, and the resulting figure is 3,668,351 - consisting of 346,945 *zamindars* and 3,321,406 tenure holders. The rural population of Bengal in 1931 was 48.7 million, and so this class included 7.5 per cent of the total, which is rather close to the share of gross arable produce they took as rent from Table 3.6 in 1939.⁸⁰ At 28.94 million acres, we have just eight acres per landlord. The gross rental, according to the FC in 1939, was 128.2 million Rupees, resulting in just under 35 Rupees per landlord per year.⁸¹ The average value of the gross produce per acre in Bengal was 50 Rupees per acre according to Table 3.6. I assume that the economic rent was 40 per cent of this gross produce, i.e. 20 Rupees per acre.⁸² Deducting the average *raiyati* rent of 3.3 Rupees per acre (again see Table 3.6), leaves the *raiyati* interest with 16.7 Rupees per acre per year. $35/16.7 = 2.1$, and so in terms of annual rents, the average landlord earned the same amount of rents as someone with *raiyati* rights in 2 acres did.

To put these numbers into perspective, we can compare them with agricultural wages. The 1916 and 1925 agricultural wage censuses in Bengal gave daily earnings for agricultural labourers at 7 and 11 annas per day respectively, on average throughout the year.⁸³ 35 Rupees in 1916 therefore represented 80 days worth of basic agricultural labour. Prices and wages in 1939 were much the same. In 1925, the average (mean) rent per landlord would be worth only 50 days of agricultural labour. The average landlord in Bengal was not making very much money from land rents and would have been unable to live an idle life without an auxiliary source of income. Many did have other sources, as middle class professionals were usually from the landed gentry. Their average income was therefore considerably higher than an agricultural labourer, but their land rents formed a small share of it. What about in comparison to other landowners in India? Table 3.7 presents my estimates of the number of, and post tax incomes of, certain landed classes in 1930s India. Notably, the Bengal *zamindars* are earning less rents from their own lands than their own tenants. The top landlords in (ryotwar) Madras, the Punjab, and UP do much better than the Bengali *zamindars*. Best of all are the largest Sind (a *ryotwari*/field survey province⁸⁴)

⁸⁰(FC, 1940, Vol II, Page 106).

⁸¹(FC, 1940, Vol II, Page 111). The land tax (approximately 20 million rupees, 30 if we include temporarily settled areas) has not been deducted from this figure, and it also includes imputed rents from tenure holders own cultivation/their lands cultivated by share tenants.

⁸²This is probably an upper bound, and a figure of one third may be more accurate, see (Pal & Quizon, 1983, Tables 1 and 4), but this makes no difference to the calculations of total income and only a small change to the distribution of the economic rent.

⁸³(GoI, 1926).

⁸⁴See Appendix 3.H for the meaning of these terms.

zamindars, who earned three quarters of what the Bengali *zamindars* did despite being a much, much smaller group in terms of numbers. Inequality within the landlord class meant that the median landlord was even worse off. Suppose that half of the gross rental went to tenure holders, and that half of it went to proprietors, who also have to pay the land tax.⁸⁵ This would give us 19.3 Rupees per tenure holder and 127 Rupees per *zamindar*. While there were a few very rich *zamindars*, this is consistent with low rental incomes for the average landlord.

3.4.6 Rental Summary

By the 20th century, rents in Bengal were low by international standards. Barbara Solow's estimates of the rent share in universally tenanted Victorian Ireland are in the range of 25-30 per cent, despite the existence of fairly strong tenant right.⁸⁶ In interwar Japan, where just under half of the land was under tenancy, and tenancies were often perpetual (by custom if not according to the civil code), rents were around half the crop.⁸⁷ Tenants with tenant right in the Yangtze Delta paid forty per cent of the main crop as rent.⁸⁸ Some rents arise naturally from rights in land, but others arise from barriers to entry. Anne Krueger's estimate of the ratio between the rents associated with post-war economic licensing (primarily import licenses) and Indian GDP in 1964 was 7.3 per cent - more than what the *zamindars* got!⁸⁹

This should be enough to disprove the rack renting allegations. Illegal enhancements of rent must have been the exception rather than the rule. Tenant right, therefore, seems to have been generally secure both by law and also in practice. Indeed, whether custom was universally failing is doubtful. As F. A. Sasche, author of the Mymensingh Settlement Report, remarked:

⁸⁵Figure 3.1 had the rents payable to the *zamindar* by the highest tenure holder at round half of what he received from an occupancy *raiyat*. Some land, however, was held by a *raiyat* directly under a *zamindar*, but on the other hand, tenure holders were more likely to have share tenants (who paid far higher rents) under them - I assume that these two forces balanced each other out.

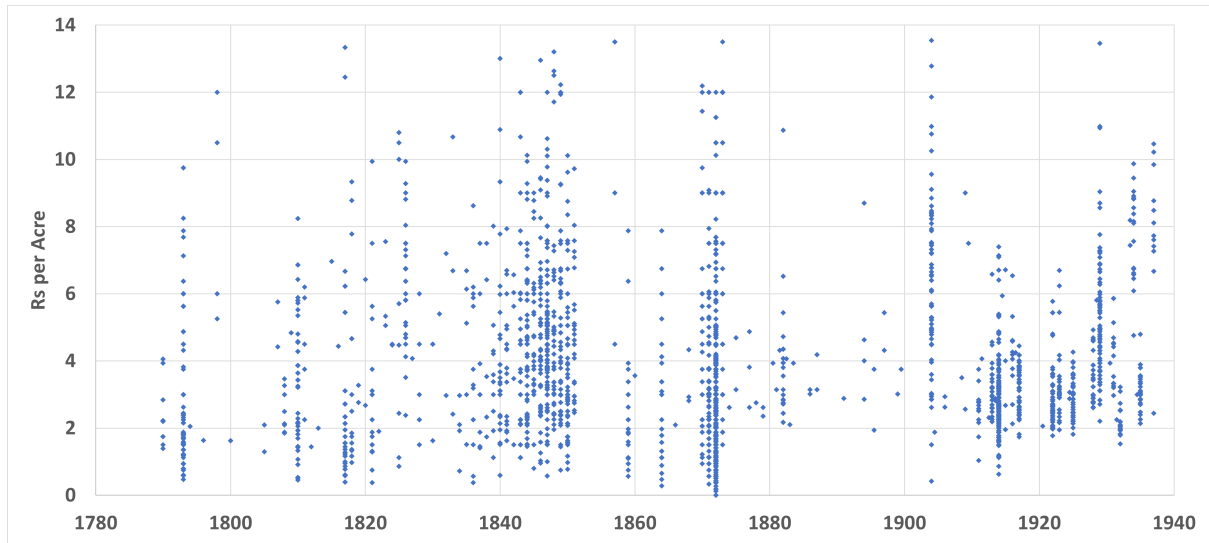
⁸⁶(Solow, 1973, Page 179).

⁸⁷For rent levels, see (Arimoto *et al.*, 2010, Figure 1). Penelope Francks notes that, in Saga prefecture, "the tenant had very little formal security of tenure ... In practice, tenancies were perpetual" (Francks, 1984 - 1983, Page 120). When push came to shove in the interwar years, the Japanese courts and the state tended to side with the tenants: Landlords won only 2.2-3.7 per cent of tenancy disputes outright between 1920 and 1941 (most were settled by compromise, which was a tenant victory relative to the usual meaning of landlord property rights - there is no point in fighting with your landlord if he can just evict you at will). Indeed, of the eviction cases that went to court, landlords won (without having to pay compensation to the tenant or give them other land) in only 5.3 per cent (Smethurst, 1986, Tables 5-12 and 5-13)! Japan's agricultural superiority over India was not because landlords could easily evict tenants. My view is that climate was more important, but this footnote is already long enough.

⁸⁸(Brenner & Isett, 2002).

⁸⁹(Krueger, 1974).

Figure 3.3: Rent Observations Over Time



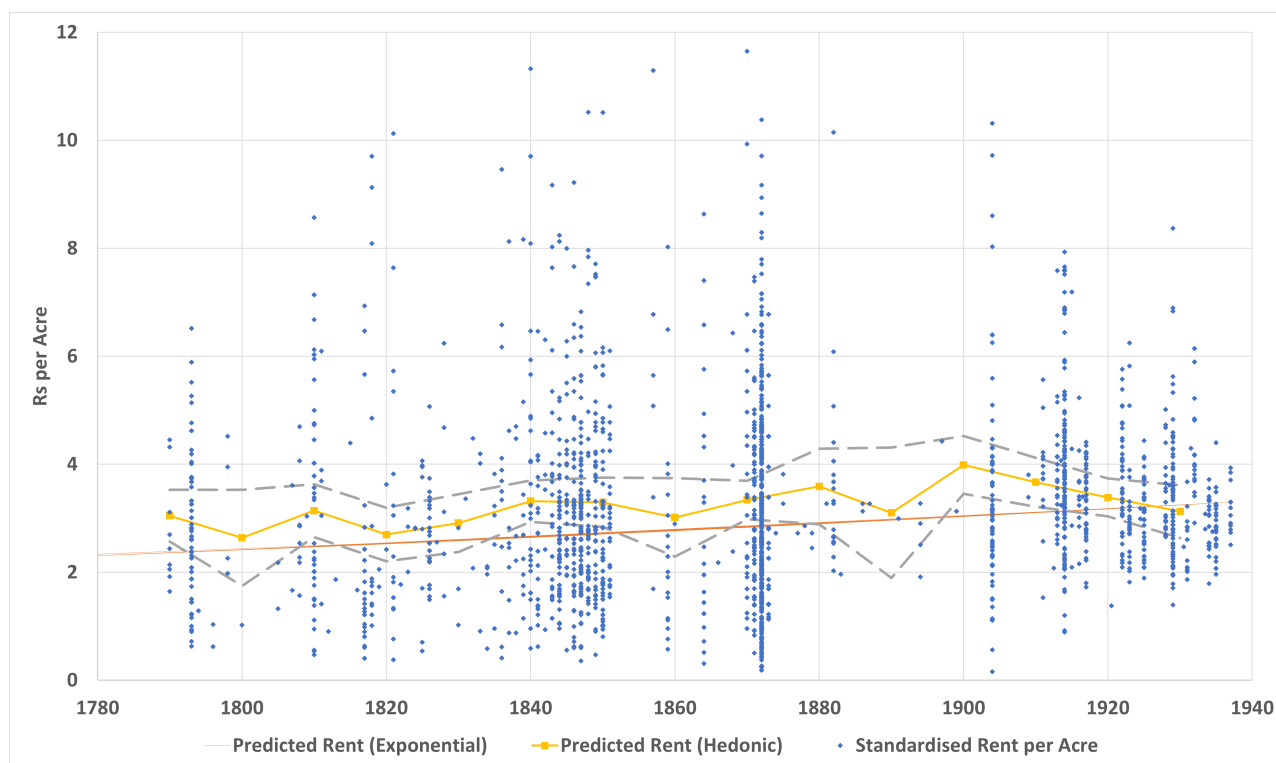
Sources: See Text and Appendix 3.F

Table 3.7: Post Tax Agricultural Rental Income of Selected Landed Classes in 1930s India

| Location | Year | Who? | Estimated Number | Estimated Rental Income (Millions of Rupees) | Source |
|----------|--------------------------------|--|------------------|--|--------------|
| Bengal | 1939 | Zamindars | 346,945* | 44.1 | See text |
| Bengal | 1939 | Tenure Holders | 3,321,406* | 64.1 | See text |
| Bengal | 1939 | Top 4 per cent of Raiyats ("Jotedars") owning 20 per cent of the cultivated area | 597,800 | 96.67 | Appendix 3.B |
| Madras | 1929 (Number) 1939 (Income) | Top 3.5 per cent of landowners (Field Survey Areas) | 366,000 | 41.6 (Lower Bound) | Appendix 3.H |
| Sind | 1936 | Top Landlords owing 50 per cent of the land | 18,251 | 35 | Appendix 3.H |
| Punjab | 1936 | Top 6.3 per cent of Landowners | 218,047 | 81.18 | Appendix 3.H |
| UP | 1939 | Landowners paying more than 25 Rupees Tax | 306,253 | 91.87 | Appendix 3.H |

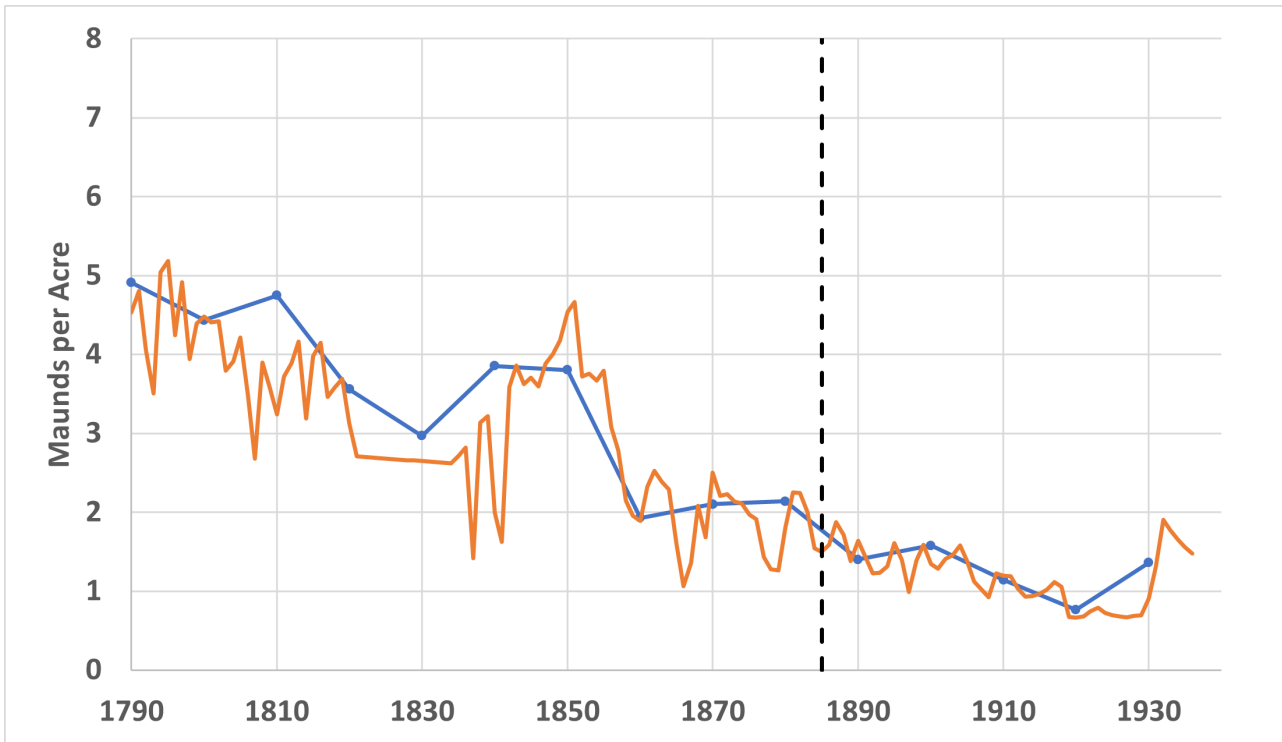
Notes: These income figures refer to agricultural land only. Individuals may have also earned incomes from other assets. The tax referred to is the land tax, local cesses for district boards are not deducted. * Chittagong *Zamindars* and Rajshahi tenure holders excluded from numbers but not incomes.

Figure 3.4: Standardised Rent Observations Over Time



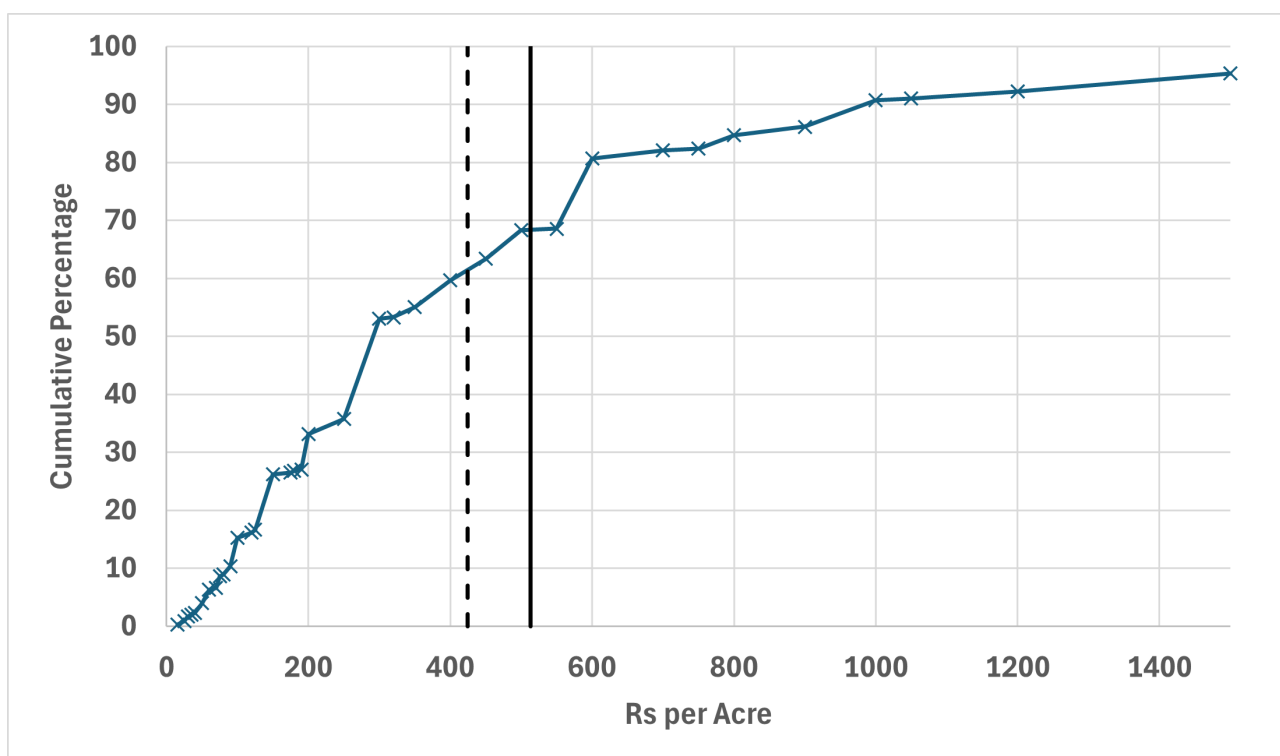
Sources: See Text and Appendix 3.F. **Notes:** Rents per acre have been standardised by subtracting the estimated district fixed effects in the log specification, then converting back to rents per acre, and adjusting by the ratio between the baseline district's (the 24 Parganas) average rate of rent per acre in 1939 and the all-Bengal average. The orange line represents the predicted value based on the time trend. It is exponential but looks linear due to the very low growth rate. The yellow line presents the trend from the hedonic regression, and the dashed grey lines are 95 per cent confidence intervals.

Figure 3.5: Standardised Average Rent per Acre in Paddy



Sources: See text and Figure 3.4. **Notes:** The orange line with no markers is the exponential trend in rents per acre valued in terms of paddy. The blue line is the result of dividing my rent path from the hedonic regression by the predicted decadal price from a regression of paddy prices on decadal dummies. The dashed line is 1885, the year restrictions on enhancement came in. A Maund is 37 kg.

Figure 3.6: Distribution of Raiyati Land Values, 1920s



Source: Calculated from witness evidence in (GoB, 1930, Vol II). **Notes:** Observations above 1,500 Rupees are not shown. The solid line is the overall average of land values (Rs 513), the dashed line is the average of those beneath Rs 1,500 (Rs 424).

*"The [Bengal Tenancy Act] act might have been passed in Fiji islands for all the immediate difference it made to the natural dealings of landlord and tenant. So long as they paid the rent fixed from time to time, and there is abundant evidence to show that arbitrary or abrupt enhancements were never demanded, the jotedars were never dispossessed and all tenancies passed from father to son. Transfers by gift or sale were almost equally matters of course."*⁹⁰

Tenancy legislation in Bengal was not introduced because landlords, by and large, were at the time exploiting their tenantry, but lest they do so in the indefinite future. That future, as it turns out, was off the equilibrium path. Restrictions on enhancements were not really due to legislation. Legislation was rather due to the lack of enhancements.

3.5 What was Going on Here?

Victorian officials argued that the Permanent Settlement had created a landlord class from mere tax collectors, destroying the rights of the peasantry, and that it resulted in major enhancements of rents. The popular and main academic view of Bengal has bought into this colonial mythology. The British were incorrect on all of these points. The *zamindars* were around long before 1793. The Permanent Settlement enhanced the security of any rights of the tenants by securing the rights of their superiors and through introducing a formal legal system (imperfect though it was). Rents were already rather high in the 18th century, and so there was very little room for enhancement: in reality the rent burden started to fall, and tenants only started to acquire valuable rights, during the 1800s.

What actually happened instead? Development economists have raised the question as to why tenants do not buy out landlords, and usually point to credit market imperfections.⁹¹ The people of Bengal, however, had come up with a partial solution to this issue; Subinfeudation was a "buy now, pay later" scheme. You essentially bought the land subject to a perpetual rent charge that was set in nominal terms but could from time to time, in theory, be reasonably adjusted (unless it had been permanently fixed). What is interesting is that such tenancies involved a long term commitment, while an outright sale (ostensively), by contrast, was a one time thing. This intertemporal aspect means commitment problems mattered. For such tenancies to be secure,

⁹⁰(Sachse, 1920, Page 73).

⁹¹E.g. (Mookherjee, 1995).

they would have to be incentive compatible: The landlord would have to not decide to evict the tenant and renege on the initial contract. Since tenant right was secure - to the extent that rents could go as low as 3 per cent of the gross produce by the 20th century - Bengali landlords were able to commit and were therefore constrained, on the whole, and are unlikely to have been a major problem. To reiterate, if the tenants were unsatisfied with their existing rights, all but the poorest of them could very easily have afforded to buy out their superior by 1900 - but would anyone today want to pay off their mortgage early if it had equivalently favourable terms?⁹²

We can interpret the legal and rental history by looking at the landlord's incentive compatibility constraint. A simple representation of one is outlined below:

$$Informal\ Costs_t + Formal\ Costs_t \geq \sum_{s=0}^{\infty} \beta^s (R_{1t+s} - R_{2t+s})$$

This states that for tenant right to be secure the cost to the landlord of renegeing on his agreement must exceed his benefit from doing so. Informal costs can be thought of as local custom. Formal costs can be thought of as the state-imposed costs. The right hand side (RHS) of the inequality represents the benefit to the landlord of renegeing on the contract. It is the discounted (at rate β) value of the sequence of the difference between the nominal value of the economic rent, R_{1t} , and the nominal value of the *raiyyati* (customary/contractual) rent, R_{2t} . In practice, as demonstrated above, tenant right was secure but this does not mean that both sides of the inequality were constant from 1793 to 1947.

Before the Permanent Settlement there was not really any formal legal system. In the Mughal-Early EIC period might made right. Formal costs of opportunism were essentially zero. Informal costs permitted some degree of tenant right, but as the *zamindars* were otherwise effectively unconstrained, tenant right could only be so valuable. The *zamindars* themselves had to deal with

⁹²Consider the situation in the 1920s. The average rent per acre was Rs 3.3. At 20 years' purchase, this is Rs 66. The average rental income per acre earned by a raiyat was $100 * 0.4 - 3.3 = 36.7$ (100 is twice the nominal value of output in the 1930s, representing the high price level of the 1920s). By sacrificing, then, two years' worth of his surplus from the soil, he could permanently free himself from the supposedly hated obligation to pay rent. Alternatively, by selling his rights in one acre, worth around Rs 513 on average (see Figure 3.6), he would be able to pay off the landlord for $513/66 = 7.77$ acres. This, and I stress it again, was really a case of "wouldn't pay" rather than "couldn't pay". As land values should have been expected to decline as the world rejoined the gold standard, and 40 per cent is a high pure rental share, $36.7/513 = 0.071$ is a generous upper bound on the return to owning *raiyyati* rights, and it is not one which indicates insecurity.

the threat of revenue enhancements from the Nawabs and the Company. Rents were therefore high and not that far from the immediate economic rent. With the *zamindars* socially and physically dominant, any regime had to deal with them; they had property rights de facto and de jure. The result of the EIC's recognition of this fact was the Permanent Settlement, which, it was hoped, would provide political and economic advantages by promising not to tax any future increases in their incomes, simultaneously providing them with a stake in the existing regime and an incentive to be productive (not that this expectation was fulfilled). The formal costs of opportunism actually rose after 1793 (as any permanent tenants had common law protection), but the RHS of the equation had not really changed, and therefore informal institutions were basically sufficient to secure tenant right since rents were not far from being economic rents - raiyati rights were not worth fighting over at this stage, unlike *zamindari* rights. By 1859, despite expectations and assertions to the contrary, tenant right had intensified rather than withering away. It was clear that virtually every landlord in Bengal had chosen to lease his lands out on perpetual tenures. Act X of 1859 shifted the legal presumption in favour of the tenant, and the formal costs of opportunism therefore rose, but still the RHS had not yet changed by that much. Between the 1850s and 1885 the RHS began to shift dramatically: Inflation and globalisation tended to increase the gap between the value of the economic rent and the *raiyyati* rent. The landlord's incentive compatibility constraint was therefore at risk of being violated. Custom, or, in other words, informal institutions, was no longer supposedly sufficient to protect the pre-existing rights of the tenantry. As a result the government stepped in and passed the Bengal Tenancy Act which further increased the formal costs of opportunism. As the value of the tenant's interest vis-a-vis the landlord's increased, it made sense to shift the legal presumption further in his favour. The point was to bring the relationship between landlord and tenant out of relying entirely on informal institutions and into the formal legal system more closely. In other words, "the transition from custom to contract". Landlords were not permitted to renege on tenancy agreements once unanticipated shocks turned out to be in favour of the tenants. Mass dispossession to the profit of the *zamindars* was not in the political interest of the colonial state. The story may have been very different if the landlords were mainly Europeans, as was the case in many other colonies.

3.6 Why Did Bengal Perform Poorly Later?

Bengal's poverty has persisted. While it appears unlikely that the *zamindars* are to blame for poor performance well after they were taken out of the picture, it is true that Eastern India and Bangladesh have under-performed agriculturally.⁹³ *Zamindari* abolition does not seem to have done anything for yields.⁹⁴ Since, as outlined above, the *zamindars* had next to no influence on agriculture by the 20th century, and war time inflation reduced the rent burden even further, this is understandable. One popular explanation for poor growth thereafter has been the survival of the *raiyati* landlords (see Appendix 3.B). However, substantial reform in other regions was lacking, so it cannot explain inter-regional performance differences. Land reform arguments appeared persuasive to many from the perspective of the 1980s when James Boyce was writing of an "agrarian impasse" in Bengal.⁹⁵ But, as Koichi Fujita has pointed out, Boyce was a little like Malthus in that he was writing at the end of the era he was describing.⁹⁶ Agricultural growth soon picked up, in both West Bengal and Bangladesh. What else could have been the culprit? Fujita thinks it was climate, as did Deepak Lal.⁹⁷ I will explore this climatic argument. I am going to focus on paddy, which was the main crop, and I am going to focus on Bangladesh because it formed the majority of pre-partition Bengal.

Before the Green Revolution yield differences between provinces were not that large. In Madras (now the Indian states of Tamil Nadu and Andhra Pradesh) they were perhaps higher than in Bengal.⁹⁸ In any comparison with Madras, Bengal was at an inherent disadvantage since in the former province rice was primarily cultivated in favourably located irrigated areas that benefitted from controlled water supplies (in contrast to the more common dry fields), while in the latter almost every acre was sown with rice. Would irrigation, the main form of investment in this period, have paid in Bengal? A straightforward answer can be found in the report of the Indian Irrigation Commission:

"Where rice is grown throughout India it is usually benefited by regulated irrigation; but it may

⁹³(Boyce, 1987), (Fujita, 2013), (Banerjee & Iyer, 2005).

⁹⁴(Islam, 1978, Chapter 7, Page 198, footnote 5.), see also Table 3.8 below.

⁹⁵(Boyce, 1987).

⁹⁶(Fujita, 2010).

⁹⁷(Lal, 2004), see also (Stepanek, 1979, Chapter 4, Appendix A). In fairness, Boyce also stressed water control, but blamed inequality for its absence.

⁹⁸See Figure 3.8 below.

be said generally for Bengal, that east of the longitude of Calcutta there is no need whatever for artificial irrigation."⁹⁹

Does the evidence bear this out? I have collected district wise data on average annual rainfall, gross cropped area and the irrigated area for Bengal and other major regions of India, forming a majority of the subcontinent's population, from the Appendix to the report of the Irrigation Commission.¹⁰⁰ A scatter plot of average annual rainfall against the irrigated share is presented in Figure 3.7. The Bengal districts are about where you would expect given their high rainfall, which tended to be less variable than in the other provinces.¹⁰¹

In British India, irrigation works were built by the state where the people were willing to pay for them, a crude cost benefit analysis. Were they in Bengal? Over the 19th century, the government built irrigation networks in the deltas along much of the East coast of India, moving Northwards but stopped at Orissa, between Madras and Bengal. The reason was that the Orissa canals were found to not pay their maintenance and interest costs. Why? Rainfall was higher and more reliable than in Madras, so there was less demand for irrigation. Around 1903, cultivators in Madras were willing to pay rates of Rs. 4 an acre for water, while those in Orissa barely bothered to accept offers of Rs 1.31 an acre.¹⁰² Even in the drier parts of Bengal, the demand for irrigation was limited. When the Bengal Provincial Government constructed the Damodar Canal system in West Bengal during the 1930s, the peasants kicked up a fuss and refused to pay for the privilege of having secure water supplies. The provincial ministry then implemented a betterment levy in order to get the people benefited by the works to pay for them. The farmers, however, ran to the Maharaja of Burdwan, the largest *zamindar* in all of Bengal, to protect them from the irrigation department!¹⁰³ The tenantry (i.e. landowners, under the peculiar Bengali conditions) were asked to put their money where their mouths were, and therefore there was limited irrigation because there was limited demand for irrigation.¹⁰⁴

For the main crop in Bengal, *aman* paddy, the issue was, as a rule, not irrigation but rather

⁹⁹(GoI, 1903, Vol II, Page 150)

¹⁰⁰(GoI, 1903, Vol IV, Pages 378-80).

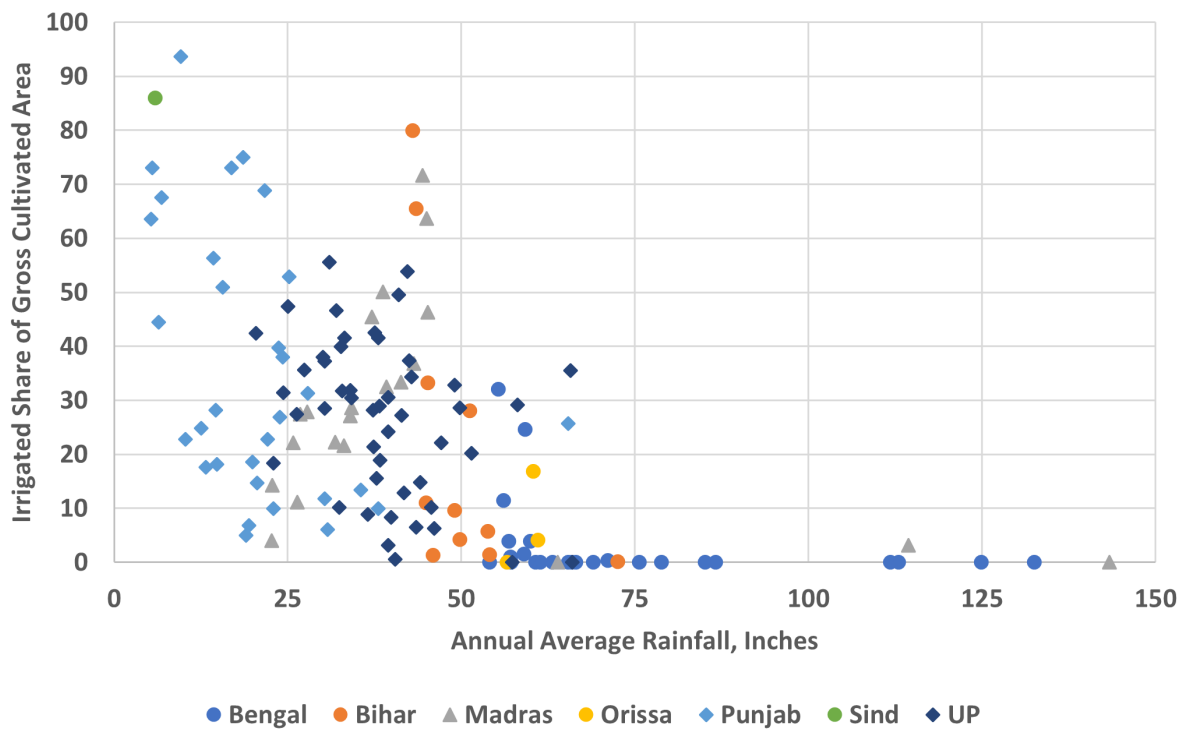
¹⁰¹Irrigation statistics were understated for the Bengal districts.

¹⁰²(GoI, 1903, Vol II, Pages 150-152) This was completely affordable to them, especially if irrigation had large yield benefits; the value of the unirrigated gross produce per acre could not have been less than 20 Rs an acre.

¹⁰³(Bhattacharyya, 1979).

¹⁰⁴The exception that proves this rule was South Bihar, as shown on Figure 3.7. The *zamindars* there invested in irrigation and as a result gave their land out on short term share tenancies.

Figure 3.7: Average Annual Rainfall and Irrigated Share of Cropped Area: British India circa 1900



Source: Calculated from (GoI, 1903, Vol IV, Pages 370-80).

drainage.¹⁰⁵ Surplus water came either from river and tidal floods, or rainwater. When the risk of inundation came from flooding rivers, embankments could potentially have helped. The problem in Bengal, however, was that most inundation came from the heavens, and no one had control over the weather.¹⁰⁶ This worked both ways, as drought in the early or later stages of the crop thanks to variable rainfall could pose as much a threat as too much water, even if this did not occur often enough to make irrigation investment worthwhile. When flood embankments were constructed along rivers, they were highly controversial as they were accused of denying land the benefit of silt, causing problems with malaria, and worsening rainwater drainage.¹⁰⁷ Similarly, tidal embankments in the Sundarbans (mangroves) were accused of being premature and worsening drainage elsewhere.¹⁰⁸ Damned if you do, damned if you don't.

Abundant rainfall allowed for high population densities under traditional techniques and fertility regimes, but limited the degree of water control: Nature provided irrigation for you, on her own terms. This tended to reduce the benefits of investing in water control, as yields were usually already good by local standards. It also tended to raise the cost of achieving complete water control as both irrigation and drainage investments would be needed. Natural fertility did not result in higher living standards for standard Malthusian reasons. The simple answer to this, after 1870, would have been to replace land with physical capital and export manufactured goods to import agricultural ones, but comparatively few people in Bengal chose to do so. After the 1960s the opportunity for sustained yield growth finally appeared with the Green Revolution. This required the application of large amounts of inorganic fertilizer to certain new fertilizer-responsive High Yielding Varieties (HYVs) of crops.¹⁰⁹ HYVs and fertilizer use were complimentary to controlled irrigation and drainage for a number of reasons. First, HYVs were bred for yields under ideal conditions and were very sensitive to drought or floods, and being dwarf varieties they were particularly susceptible to the latter.¹¹⁰ Second, flooding tended to wash away any

¹⁰⁵There were four paddy crops in Bengal: *aman*, *aus*, *boro* and "floating" rice (usually broadcasted *aman*). *Aman* has historically been the most important, but *boro* cultivation has spread dramatically since the 1970s. I ignore *aus* and broadcast *aman* here because these were comparatively minor crops and have performed worse than both *aman* and *boro*.

¹⁰⁶(Brammer, 1997, Page 8).

¹⁰⁷(Brammer, 1997, Pages 90-93). The silt argument could only apply to a tiny fraction of cultivated land, as most flooding was from rainwater. While embankments prevented inundation from river water, they could trap rainwater behind them - the cure could be worse than the disease.

¹⁰⁸(Addams-Williams, 1913).

¹⁰⁹For a comparison between traditional and HYVs, see (IRRI, 2000, Pages 142-145).

¹¹⁰"Modern cultivars with high yield potential are usually short stemmed (85-110 cm) as they were specifically

fertilizers, and, in addition, water can become the limiting factor for yields when fertilizers ease nutritional constraints. When water control-complimentary HYVs came onto the scene, nature's blessing became a curse as the timing of the high levels of rainfall were not under the cultivators' control. The drier regions of India were far better posed to take advantage of the Green Revolution technologies. Agricultural growth was therefore much better in those regions, without the need to appeal to the dead hand of landlords.

Strong evidence for this argument comes from the differing fortunes of the different paddy crops within Bengal. The dry season paddy crop, known as *boro*, where water control was good, saw the fastest adoption of HYVs, just as the drier states did. For Bangladesh, this is shown in Table 3.8. Observed yields are the weighted average of local and HYVs. Until the 21st century virtually all growth in yields can be accounted for by the adoption of HYVs - those of traditional varieties are stagnant. I calculated a counterfactual average yield for the *aman* crop assuming the same HYV adoption rate as with the *boro* crop. Since *aman* was the paddy crop with the largest area, had HYV adoption rates been higher agrarian growth would have been faster, even if HYV *aman* yields were lower than those of HYV *boro*. The gap in observed yields between *aman* and *boro* has two causes: *boro* HYVs have greater yields, and HYV adoption rates were far higher for this crop. Why?

HYVs were dwarf varieties that could not withstand flooding over 30 cm well and not at all beyond 50 cm. The water level they were best adapted to was only 10-15 cm.¹¹¹ According to figures provided by Hugh Brammer, in the floodplain areas of Bangladesh, which formed the majority of cultivated area, only 18 per cent was free from flooding ("highland"), while 36 per cent was inundated by more than 90 cm ("lowland"). The remaining 47 percent was flooded between 0 to 90 cm ("medium highland").¹¹² When HYVs became available, this category was split into MH-1, up to 30 cm (where HYVs could survive), and MH-2, 30 to 90 cm (where HYVs could not survive), but unfortunately I cannot find the statistics for these areas separately.¹¹³

bred for controlled shallow-water conditions. At water depths greater than 10-15 cm basal tillering is reduced drastically reduced (developing tillers [shoots] put out by the plant are lost) and their short leaves are submerged by rising water. Water levels above 30 cm increasingly interfere with growth and reduce productivity of rices with mature plant height below 110-120 cm and they will not normally survive depths greater than 50 cm under field conditions" (Catling, 1992, Page 117).

¹¹¹(Catling, 1992, Page 117).

¹¹²(Brammer, 2014, Table 1.4 Page 12). Calculated by excluding the areas covered by settlements.

¹¹³(Brammer, 1997, Page 9). In an old report, Brammer provides various estimates for the area suitable for

Table 3.8: Yields in Bangladesh, *Aman* and *Boro* Crops

| Year | Observed Yield Mds. per Acre | | | Local Varieties Mds. per Acre | | HYV Mds. per acre | | Share Planted With HYVs | | Aman Counter- factual (Boro HYV Share) | |
|------|---------------------------------|-------|--------|----------------------------------|-------|----------------------|-------|----------------------------|------|--|----------|
| | Aman | Boro | AB Gap | Aman | Boro | Aman | Boro | Aman | Boro | Aman | Increase |
| 1939 | 13.36 | 14.02 | 0.66 | 13.36 | 14.02 | 13.36 | 14.02 | 0 | 0 | 13.36 | 0 |
| 1970 | 11.85 | 24.22 | 12.37 | 11.5 | 17.17 | 28.44 | 37.12 | 0.02 | 0.35 | 17.43 | 5.58 |
| 1972 | 11.41 | 22.79 | 11.38 | 10.11 | 14.54 | 19.05 | 32.99 | 0.15 | 0.45 | 14.13 | 2.72 |
| 1975 | 14.49 | 21.57 | 7.08 | 13 | 13.97 | 23.54 | 27.56 | 0.14 | 0.56 | 18.9 | 4.41 |
| 1980 | 15.2 | 24.19 | 8.99 | 13.35 | 16.52 | 21.95 | 28.43 | 0.22 | 0.64 | 18.85 | 3.65 |
| 1985 | 16.21 | 25.95 | 9.74 | 14.54 | 15.31 | 23.67 | 28.76 | 0.18 | 0.79 | 21.75 | 5.54 |
| 1990 | 19.12 | 27.05 | 7.93 | 14.81 | 15.63 | 25.43 | 28.47 | 0.41 | 0.89 | 24.26 | 5.14 |
| 1995 | 17.58 | 28.21 | 10.63 | 12.88 | 14.9 | 23.72 | 29.64 | 0.43 | 0.9 | 22.64 | 5.06 |
| 2000 | 22.58 | 34.36 | 11.78 | 16.93 | 19.74 | 26.9 | 35.19 | 0.57 | 0.95 | 26.4 | 3.82 |
| 2005 | 22.5 | 37.27 | 14.77 | 17.01 | 21.61 | 25.48 | 37.97 | 0.65 | 0.96 | 25.14 | 2.64 |
| 2010 | 25.51 | 42.19 | 16.68 | 17.64 | 22.21 | 28.17 | 42.65 | 0.75 | 0.98 | 27.96 | 2.45 |

Sources: 1939 Figures from (FC, 1940, Vol II, Pages 89-91), Paddy converted to rice by given ratios (around 1.5). Unweighted Average of future Bangladesh districts only. 1970-2010 Figures from (BBS, 2018). **Notes:** 1 Maund (Mds) = 37.3242 Kg. *Aman* (Counterfactual) is the average yield of *aman* assuming the HYV adoption rate of the *boro* crop. HYV includes Pajam variety and Hybrids.

Assume that a half of the Medium Highland area was MH-1. In that case only 42 per cent of the area was suitable for HYVs in the rainy season. A later estimate has 46.9 per cent of the rainy season area either irrigated or flooded less than 30 cm.¹¹⁴ In either case, the upper bound for this category, which much of the land was likely to only be slightly below, is around double the optimum water level for HYVs. Even when flooding was not the major issue, rainfall variability meant that drought in the early stages of the crop could pose a threat.¹¹⁵

These problems were not new. The early 20th century Agricultural Department could not recommend many fertilisers as nature interfered by “removing the sphere of operations of any applied soluble manure from the desired plot to some other” when the land almost completely got inundated by the rains.¹¹⁶ Forty years later, the East Pakistan agricultural department published their updated recommendations about the use of ammonium sulphate, a common artificial fertiliser. For the *Aus* and broadcast *aman* crops they could not recommend it “without proper water control”, and mentioned that “the use of any fertiliser in a sea of water is a mere waste”.¹¹⁷ For the *boro* crop, despite adequate water control, they found the response to fertiliser to be low - HYVs had not been developed yet. They recommended that such fertiliser be used on “transplanted aman paddy in medium lands where water is controlled [by plot embankments]”.¹¹⁸

Even when large sums of money were thrown at the problem, sorting out the rainy season was not easy. A large irrigation scheme, based around pumping water from the Ganges (Padma) into a canal network was an expensive failure.¹¹⁹ As water control became more important, the East Pakistan/Bangladesh government embarked on an expensive and extensive polder scheme for the tidal areas in order to keep out sea water. This has had only a mixed success at best as such embankments sometimes made the drainage of rainwater even worse.¹²⁰ Even when expensive pumping equipment was installed in favourable areas, one third of the land could still be too deeply flooded for any HYVs in the rainy season.¹²¹ Draining the intensely flooded areas where

rained HYVs. He thought (in 1974) that the higher estimates were more appropriate, but the actual adoption rates suggest otherwise until plant breeding progressed. (Brammer, 1997, Chapter 10).

¹¹⁴(Huke & Huke, 1997, Page 11). Calculated by excluding dry season and upland crops.

¹¹⁵(Brammer, 1997, Chapter 3). Traditional varieties had adapted to these conditions, unlike HYVs.

¹¹⁶(Meggitt, 1912).

¹¹⁷(Department of Agriculture, 1955, Page 3).

¹¹⁸(Department of Agriculture, 1955, Page 4).

¹¹⁹(Stepanek, 1979, Pages 119-126).

¹²⁰(Catling, 1992, Pages 195-6).

¹²¹(Brammer, 1997, Page 91).

floating rice (over 100 cm flood depth) was cultivated is simply out of the question. It has only been relatively recently that HYVs have been successful bred to withstand Bangladeshi monsoon conditions.¹²² This accounts for the pick up in *aman* HYV adoption around 1990.

As you may expect, the Green Revolution resulted in a major shift in the relative importance of the various paddy crops in Bangladesh in favour of *boro* where water control was simple so long as you had some supply of water. Where conditions were good, *boro* was cultivated as a second crop after *aman*. Where conditions were not good, farmers left paddy fields that were severely flooded in the rainy season fallow and switched to *boro* cultivation in the dry season. Before HYVs became available *boro* was cultivated in a very limited area where good water supplies were found in the dry season. Irrigation investment was a possibility, but it was not profitable with traditional paddy varieties and old fashioned wells.¹²³ HYVs and the development of tube well technology finally made investment in irrigation for the dry season profitable. This shift in the relative area planted is demonstrated in Table 3.9 (the extension of *boro* between 1939 and 1970 is overstated, because Sylhet with a very large *boro* area was added to Bengal during partition).

To see whether water control mattered for the regional divergence in paddy yields, we can compare Bangladesh to another region with more favourable conditions. I have averaged yields around the same set of years across three deltaic Madras districts, which are now part of the Indian state of Andhra Pradesh (AP): East Godavari, West Godavari, and Krishna. Irrigation networks were constructed in these districts by the state in the middle of the 19th century. By WW2 most of the paddy area was said to be under improved varieties produced by the Agricultural Department, although this apparently did not do much for yields.¹²⁴ As expected, the HYVs of the Green Revolution spread rapidly when they were released, and this time yields did rise. I have averaged these yields by season. *Kharif* was the main monsoon, and was akin to *aman*, while *Rabi* the second crop with parallels to *boro*. Time series for yields of rice (husked

¹²²E.g. (Mackill *et al.*, 1996, Preface). Paddy breeding in Bengal began early in the 20th century but did not have that much success (Alim, 1962). Returns to agricultural research in British India appear to have been far lower than during the GR period (Pray, 1984). Interestingly, Bengal was a candidate for the establishment of the International Rice Research Institute (that developed the original HYVs), but the Pakistan government turned down the offer (Catling, 1992, Page 393). How different things may have been!

¹²³(Catling, 1992, Pages 256-57).

¹²⁴(Ramiah, 1953, Page 97), (Ramiah, 1937, Page 167).

paddy) in Maunds per acre are presented in Figure 3.8. Yields in AP were higher than in Bangladesh in the interwar years but not by that much, especially when we consider that the former represented the most favourable conditions in the province and perhaps all of the Indian subcontinent, while in Bengal almost every plot of cultivable land was under rice. After 1969, there is a large divergence between the Bengali *aman* crop and the rest. By the 1980s *aman* yields in Bengal were marginally higher than in the interwar years, while the AP yields were almost double what they had been. But, importantly, *boro* yields in Bangladesh see the same high growth trend as the *Kharif* and *rabi* crops in the Godavari and Krishna deltas in Andhra Pradesh. Comparing yields under similar conditions does not paint Bangladeshi agriculture in that bad a light. It was just that conditions, in particular those relating to water control, were far from ideal for the major crop. Climate has been far stronger and more persistent than landlords.

Does this generalise? West Bengal has also seen a major expansion of the *boro* crop driven by groundwater following the Green Revolution while *Aman* lagged behind.¹²⁵ Within Bihar, it has been the southern districts served by the old Sone Canal network that have performed best; The indigenous irrigation network in the other parts of South Bihar declined without the *zamindars*, and as a result they have not experienced such high yields.¹²⁶ Most irrigation expansion in the Gangetic valley since the Green Revolution has come from the installation of private tube-wells and pumps.¹²⁷ There has been an institutional issue here. The average holding has been far too small to take advantage of the economies of scale these irrigation devices provide, but this problem is because estates are currently too small rather than because they were formerly too large. Fortunately, markets in groundwater, enabling farm size to be largely decoupled from irrigation investment, have emerged to overcome the problem.¹²⁸

¹²⁵(Rawal & Swaminathan, 1998), (Saha & Swaminathan, 1994).

¹²⁶(Fujita, 2013).

¹²⁷(Shah, 1993).

¹²⁸In Bangladesh, there are now around 1.6 million irrigation wells/pumps. A large (over 814,000) sample of rural households found that only 2.08 per cent of these owned a pump (Mottaleb *et al.*, 2016). Presumably, some rich households own multiple pumps and provide water to smaller farmers for a fee, and these are most likely to be the modern equivalent/descendants of the *jotedars* who really controlled land in the past.

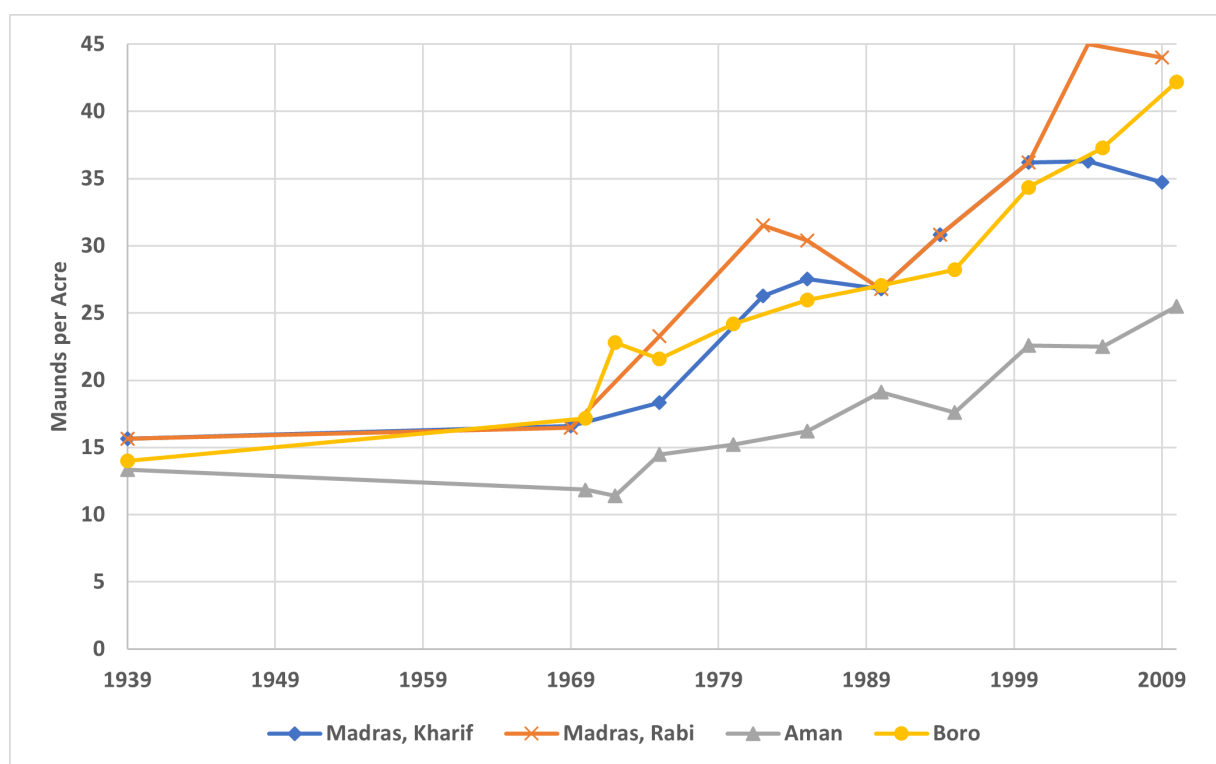
Table 3.9: Relative Area Cultivated in Bangladesh, *Aman* and *Boro* Crops

| Year | 1939 | 1970 | 1972 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 |
|------|-------|-------|------|-------|-------|-------|------|------|-------|-------|-------|
| Aman | 96.93 | 79.96 | 79.6 | 77.39 | 79.36 | 75.25 | 65.5 | 64 | 56.77 | 54.77 | 52.58 |
| Boro | 3.07 | 20.04 | 20.4 | 22.61 | 20.64 | 24.75 | 34.5 | 36 | 43.23 | 45.23 | 47.42 |

Sources: 1939 figures from (Ben, 1939, Pages 8-13). 1970-2010 Figures from (BBS, 2018).

Notes: These figures are percentages of the combined *aman* and *boro* area.

Figure 3.8: Rice Yields by Season, Deltaic Madras and Bangladesh



Source: See Appendix 3.G and Table 3.8. **Notes:** The 1970 *boro* yield is for local varieties, in order to show yields just before the Green Revolution. See Table 3.8 for the actual figure. The 1970 and 1971 *aman* yields were usually low relative to trend, probably due to a cyclone followed by the 1971 war.

3.7 Conclusion

The *zamindars* of Bengal were known for their contributions to literature, rather than to agricultural or any other sort of development. Rabindranath Tagore is the classic example. The proximate reason for this can be found in the nature of agrarian contracts and the path of rents. Subinfeudation was a form of alienation of land: the perpetual tenant had the right to any residual income and therefore the incentive to invest. The landlord, by contrast, received what amounted to little more than a rent charge and had no interest in spending money on improvements. The tenants had effectively bought out the landlords, and they had done so under a peculiar "buy now, pay later" scheme. Their future payments were effectively fixed in nominal terms, and when inflation eroded the real value of these rental income streams, the state stepped in to prevent the landlords from renegeing on their agreements with tenants through unreasonable rental enhancements and/or evictions. It was able to do so because landlord wealth was not associated with political power. The colonial government was the third party trying to uphold agreements between landlord and tenant. With the way things went, the tenants got the better end of the stick. None of this really mattered if you were landless, however - property rights mattered more to the colonial state than human rights.

Without political power and without control over land, the *Zamindars* had little to do but live on their landed pensions and write poetry. Consumption smoothing in the face of a declining income stream would suggest investment of the more valuable initial portions. The great question is therefore not why the landlords did not invest in agriculture, but why they did not invest more in industry. Selling your rights in land in order to finance a cotton or jute mill would have relieved you of the need for suing tenants for rental arrears. To a limited extent it is understandable that those whose landed incomes fell short of their desired consumption, therefore requiring them to try to make some money, invested in education and entered the professions, but while I will defend the Bengali landlords from the usual charges of rack-renting and so on, I think they could have done an awful lot more with the cards they were dealt in terms of investment outside of agriculture. If India was an unprofitable place to invest in, for whatever reason, they could have invested abroad. If the traditional land tenure system was a major impediment to agricultural investment, this should have shifted Bengal's comparative advantage towards industry.

On the flip side one can wonder why the tenants did not therefore invest, particularly the comparatively wealthy *Jotedars* who actually controlled much of the land. Was a lack of credit the problem? Simply striking a deal with your landlord, one party buying out the other, would have solved this if tenant right got in the way. Private investment in agriculture in India was not particularly high anywhere independent of the local tenurial set up. What investment that did occur, tended to be in comparatively drier regions where the return to irrigation was correspondingly high. The state also focused its efforts in these areas, such as the Indus river basin, the Ganges-Jumna Doab, and the Madras Deltas. Bengal, by contrast, usually had abundant rainfall that was adequate for the cultivation of good crops (by Indian standards) through small holders using traditional methods. Paddy cultivation in India has been found to have constant or decreasing returns to scale.¹²⁹ Interpreted in this light, subinfeudation allowed for the separation of ownership and control, as tenant right provided incentives and security of tenure to the smallholder while supporting landlord life in Calcutta, at least before rents were eroded by inflation. If conditions changed, requiring a new tenurial order, it is highly likely that contractual choice and the law would have too.

Gaining the greatest benefit from the HYVs of the Green Revolution, that appeared in the 1960s, required the use of dwarf HYVs as well as artificial fertilisers and therefore water control. Such conditions were simply not those of the major rainfed paddy crops in Bengal, grown around the period of the year when abundant rainfall inundated the land for long periods of time and washed away any fertilisers. Only the dry season *boro* paddy crop could really benefit to any great degree from the use of first generation HYVs, but this required groundwater pumps. These had significant economies of scale, and there was therefore finally a role for improving landlords in Bengal, almost 200 years after the Permanent Settlement. As I have shown, Bengali landlords, the *jotedars* excepted, had neither the wealth nor political power to survive until then.

One may ask why I do not re-run the regressions of the persistence literature with some change such as a Bengal dummy. The reason I have not done so is that I do not think that the "landlord" metric is a particularly useful one. There are three reasons for this. First, land revenue systems and land tenure systems were in theory entirely separable. For every distribution of rights in land

¹²⁹(Bardhan, 1973).

there was essentially an equivalent "zamindari" and "ryotwari" representation. Any link has to be empirical. Second, it ignores tenant right, which, as I have shown in the case of Bengal, simply cannot be. This throws the empirical relevance into doubt. Third, Banerjee and Iyer's attempt to control for endogeneity, the year of British conquest, is unpersuasive because its correlation with their landlord variable reflects the pre-existing state of things, which presumably is correlated with other fundamental, persistent factors not included in their data that may have affected outcomes in the late 20th century. If you believe that "history matters", as the institutionalists do, a simple confounding factor would be pre-colonial history, which was the prime determinant of the colonial land revenue classifications and perhaps affected later outcomes. These subjects are elaborated upon in Appendix 3.H, but more importantly, the colonial era saw the defeat of the landlords long before land reform. Furthermore, "owner-cultivation" in South India was often a bit of a farce, as many landholders had permanent servants, who could not be tenants for social (caste) reasons, to do the work for them.¹³⁰ Things were a little topsy-turvy: "landlord" regions with many peasant (partial) proprietors, and "owner-cultivating" regions often with little owner cultivation.

¹³⁰Details are also in Appendix 3.H.

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3.A Calculating the Distribution of Income in the Example Tenure Tree

Assume that:

- The value of the Gross output per acre was Rs. 50.
- The competitive (economic) fixed cash rent was Rs 20 an acre, i.e. 40 per cent of the crop.
- Share tenants paid 50 per cent of the crop, economic rents (40 per cent) plus a premium for risk sharing. This premium gets counted as rental income/outgoings.
- Raiyats paid 3.5 Rupees an acre to their superiors.
- Under-*raiyats* paid 7 Rupees an acre to their *raiyati* landlords.
- 2nd degree tenure holders paid Rs 2 an acre to the 1st degree tenure holders.
- 1st degree tenure holders paid Rs 1.5 an acre to the zamindar.

For cultivators (c):

$$GrossOutput = CultivatingIncome + RentalIncome$$

but their net income is:

$$Income_c = CultivatingIncome_c + RentalIncome_c - RentalOutgoings_c$$

i.e.

$$Income_c = GrossOutput_c - RentalOutgoings_c$$

So in general, for interest n :

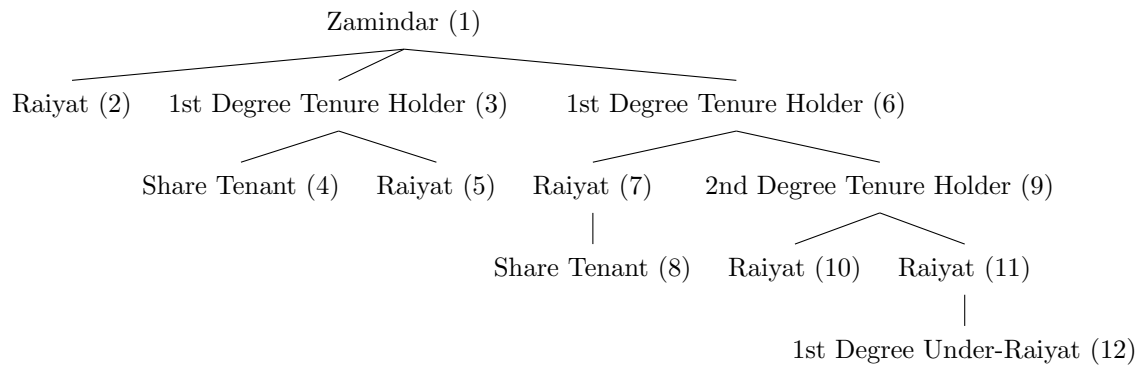
$$Income_n = CultivatingIncome_n + RentalIncome_n - RentalOutgoings_n$$

For purely rentier interests, $CultivatingIncome_n$ equals zero.

$RentalIncome$, therefore, includes the economic rent for cultivators before they pay their rental outgoings.

To calculate the income of each person, I have assigned them numbers 1 to 12. Start at the bottom of the Tenure tree.

Figure 3.9: Example Tenure Tree (Tenancy Act Classifications)



Note: () denotes the identifying number.

(12) 1st Degree Under Raiyat: Cultivating one acre, has interests in one acre. Value of output: Rs 50. Rental income: Rs 20 (from cultivation). Rental Outgoings: Rs 7 to *Raiyat*(11). Net rental Income: Rs 13. Total Income: Rs 43.

(11) Raiyat: Does no cultivation, but has interests in one acre. Value of output: Rs 0. Rental Income: Rs 7 from Under-raiyat (11). Rental Outgoings: Rs 3.5 to 2nd Degree Tenure Holder (9). Net Rental Income: Rs 3.5. Total Income: Rs 3.5.

(10) Raiyat: Cultivates one acre, has interests in one acre. Value of output: Rs 50. Rental Income: Rs 20 (from cultivation). Rental Outgoings: Rs 3.5 to 2nd degree tenure holder (9). Net Rental Income: 16.5. Total Income: Rs 46.5.

(9) 2nd Degree Tenure Holder. Does not cultivate, but has interests in two acres. Value of output: Rs 0. Rental Incomes: Rs 3.5 from raiyat (10) and Rs 3.5 from raiyat (11), total Rs 7. Rental Outgoings: Rs 4 to 1st degree tenure holder (6), i.e. Rs 2 per acre. Net Rental Income: Rs 3 Total Income: Rs 3.

(8) Share Tenant. Cultivates one acre, has interests in no acres. Value of output: Rs 50. Rental Income: Rs 25 (from cultivation). Rental Outgoings: Rs 25 to *Raiyat*(7) Net Rental Income: Rs 0. Total Income: Rs 25.

(7) Raiyat. Does not cultivate. Has interests in one acre. Value of output: Rs 0. Rental Income: Rs 25 from share tenant (8). Rental Outgoings: Rs 3.5 to 1st degree tenure holder (7). Net Rental Income: Rs 21.5. Total Income: Rs 21.5.

(6) 1st Degree Tenure Holder. Does no cultivation but has interests in three acres. Value of output: Rs 0. Rental Income: Rs 3.5 from raiyat (7), Rs 4 from 2nd degree tenure holder (9), total Rs 7.5. Rental Outgoings: Rs 4.5 to the zamindar (1), i.e. Rs 1.5 per acre for 3 acres. Net Rental Income: 3. Total Income: Rs 3.

(5) Raiyat. Cultivates one acre, has interests in one acre. Value of output: Rs 50. Rental Incomes: Rs 20 (from cultivation). Rental Outgoings: Rs 3.5 to 1st Degree Tenure Holder (3). Net Rental Income: Rs 16.5. Total income: Rs 46.5.

(4) Share Tenant. Cultivates one acre, has interests in zero acres. Value of output: Rs 50. Rental Income: Rs 25 (from cultivation). Rental Outgoings: Rs 25 to 1st degree tenure holder (3). Net rental income: Rs 0. Total Income: Rs 25.

(3) 1st Degree Tenure Holder. Cultivates zero acres, has interests in two acres. Value of output: Rs 0. Rental Income: Rs 25 from share tenant (4) and Rs 3.5 from *Raiyat*(5), total Rs 28.5. Rental Outgoings: Rs 3 to zamindar (1), i.e. 2 acres at Rs 1.5 per acre. Net rental income: Rs 25.5. Total Income: Rs 25.5.

(2) Raiyat. Cultivates one acre, has interests in one acre. Value of output: Rs 50. Rental Income: Rs 20 (from cultivation). Rental Outgoings: Rs 3.5 to zamindar (1). Net Rental Income: Rs 16.5. Total Income: Rs 46.5.

(1) Zamindar. Cultivates zero acres, has interests in six acres. Value of output: Rs 0. Rental Incomes: Rs 3.5 from *Raiyat*(2), Rs 3 from 1st degree tenure holder (3), Rs 4.5 from 1st degree tenure holder (6). Rental Outgoings: None (Zamindars paid taxes, but these are ignored here). Net Rental Income: Rs 11. Total Income: Rs 11.

Table 3.10: Net Rental and Total Income According to Position in the Example Tenure Tree

| Position | Net Rental Income | Total Income | Class |
|-----------|----------------------|--------------|--------------------------|
| 1 | 11 | 11 | Zamindar |
| 2 | 16.5 | 46.5 | Raiyat |
| 3 | 25.5 | 25.5 | 1st Degree Tenure Holder |
| 4 | 0 | 25 | Share Tenant |
| 5 | 16.5 | 46.5 | Raiyat |
| 6 | 3 | 3 | 1st Degree Tenure Holder |
| 7 | 21.5 | 21.5 | Raiyat |
| 8 | 0 | 25 | Share Tenant |
| 9 | 3 | 3 | 2nd Degree Tenure Holder |
| 10 | 16.5 | 46.5 | Raiyat |
| 11 | 3.5 | 3.5 | Raiyat |
| 12 | 13 | 43 | 1st Degree Under Raiyat |
| Aggregate | 130 | 300 | |

3.B A Note on Intra-Raiyati Inequality

Since the majority of the surplus product of the soil was in the hands of the *raiya*s, inequality within this class is an important subject. The greater intra-*raiya*ti inequality was, the less the *zamindars* and the tenure holders contributed to aggregate inequality. This is a very difficult subject owing to a scarcity of data. There are, however, good reasons to suppose a fair degree of inequality in *raiya*ti rights, and that this was rather persistent. Dinajpur is an extreme but useful example. When Buchanan-Hamilton visited it around 1810, rack rented share tenants cultivating under large *raiya*ts were extremely common.¹³¹ The exact same situation was found by government officers undertaking survey and settlement operations in the district in the late 1930s.¹³² The *raiya*ti rents had barely changed in nominal terms between the two periods, but the in-kind rents paid by share subtenants were inflation proof, and so a very large amount of income had been transferred from one kind of big landlords (*zamindars*) to smaller ones (*raiya*ts/jotedars). In Chittagong, the FC found two *raiya*ts poles apart: one was a co-sharer, with 30 other people, in 6.75 acres (cultivated by an under-*raiya*ti), while they also bumped into the grandson of a "paddy king", owning (as a *raiya*ti) 2,560 acres and cultivating them through a mix of hired labourers, short term cash rents, and bargadars.¹³³ Despite his wealth and managerial talents, he apparently hadn't introduced any "improved, scientific methods". Share subtenants could be found elsewhere too. In the drier portions of West Bengal, such as Bankura and Birbhum, it seems that there were also large numbers of these and agricultural labourers, perhaps because the risk of cultivation was higher.¹³⁴ But general impressions are unsatisfactory. Can we find any reliable data?

Here I am going to present some evidence, but it is admittedly not perfect. The Floud Commission enquired into the distribution of *raiya*ti rights, as well as the manner in which land is cultivated. Figure 3.10 plots the cumulative share of families with a holding less than a certain number of acres, based on data collected for the commission from 19,599 families. Just under 50 per cent of all families have less than 2 acres, while the mean average number of acres per family was 4.36 - there certainly was inequality. Only 3.3 per cent of the families apparently owned no

¹³¹(Buchanan-Hamilton, 1833, Pages 234-239).

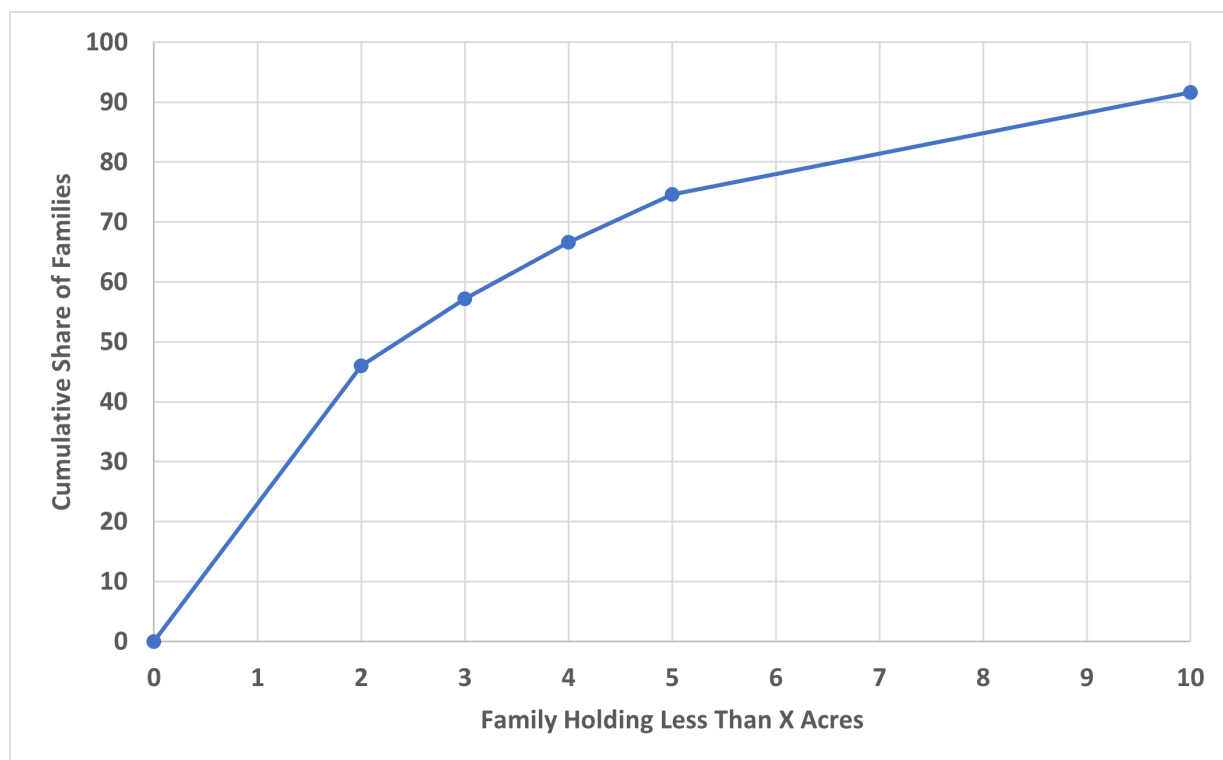
¹³²(Bell, 1942).

¹³³(FC, 1940, Vol V, Pages 547 and 556).

¹³⁴(Robertson, 1926, Page 70).

rights in land (excluded from the figure).¹³⁵ On the other hand, smaller holdings may have been more labour intensive/productive, and so area is not completely informative as to value.

Figure 3.10: The Distribution of Raiyati Rights



Source: Calculated from (FC, 1940, Vol II, Page 117, Table VIII(b)). **Notes:** Holdings here also includes permanent under-*raiyyati* rights. Only 3.3 per cent of the families examined owned no rights in land, but these are not included.

If the holding of a family outstripped its labour endowment, then they would have had to give the land out to a tenant or cultivate through labourers (or sell the land). Table 3.11 contains data presented to the Floud Commission regarding who actually cultivated based on enquiries into 63,665.75 acres of land. A *Bargadar* was a share tenant who effectively paid economic rents. Approximately two thirds of the land was cultivated by family members, which suggests some but not a huge amount of inequality. Perhaps "family" here includes distant but poorer relatives of the landowning branches of the family. Can we trust these figures? The area inquired into on a per district basis was small, and I personally doubt the Dinajpur figure: I suspect that

¹³⁵This is inconsistent with some of the Lorenz curves below.

none of the huge *raiyats* mentioned above were selected, but even then this was an exceptional district. The FC also collected data on the shares of families (seemingly the same 19,599 above) "living mainly or entirely" from *barga* cultivation and the wages of agricultural labour. The percentages were 12.2 and 22.5 respectively - a curious inversion of the figures in the table.¹³⁶ These figures suggest that, while there was substantial inequality within the *raiyati* class, the majority of land was cultivated by the permanent tenant and their family. It also seems that rental markets pricing land use with competitive rents at the margin (as well as labour markets) were alive and well in Bengal despite the presence of tenant right.

Some of the Settlement Reports provide some data on the distribution of holdings by area. My *Zillah* court data (see below) often reported the size of a tenancy. The cumulative share of tenancies versus the cumulative share of area from these sources is plotted in Figure 3.11. What is remarkable is that the distribution of holdings by area appears to be little different in the inter war years than it was in the early 19th century, although it is true that the areas examined are not the same. Again, one family may have multiple holdings - only 37.1 per cent of families from the FC sample held one tenancy - so this is not a perfect measure of inequality.¹³⁷

Figures from the Dinajpur settlement report did look at total areas held per family and per family member. F. A. Sasche estimated the distribution of *raiyati* land in Mymensingh in his settlement report for that district. The resulting distributions are presented in Figure 3.12. These districts appear to be less unequal than those near Calcutta and the holdings from the *Zillah* court records. Notably, the massive Dinajpur jotedars are included in these figures. To summarize these lorenz curves, estimated Gini coefficients for inequality within the *raiyat* class are presented in Table 3.12. As a rough summary, a Gini index of 0.55 seems reasonable: intra-*raiyati* inequality was not inconsiderable.¹³⁸

How much net rental income did these big peasants earn? Let us suppose that the top 4 per cent of *Raiyati* families owned 20 per cent of the land, or $28.94 * 0.2 = 5.788$ million acres. Assuming the economic rent to be 20 rupees an acre, and the average *raiyati* rent to be 3.3 rupees, they

¹³⁶(FC, 1940, Vol II, Table VIII (d), Page 117).

¹³⁷(FC, 1940, Vol II, Table VIII (c), Page 116).

¹³⁸Note that this is an estimate of inequality in the distribution of a certain type of wealth, *raiyati* rights in land, and is likely to be higher than income inequality.

Table 3.11: How the Land was Cultivated, 1939

| District | By Family | By Bargadars | By Labourers | Bargadar and Labourers Combined |
|--------------|-------------|--------------|--------------|---------------------------------|
| Bakarganj | 55.3 | 44.7 | 0 | 44.7 |
| Bankura | 50.8 | 29.2 | 20 | 49.2 |
| Birbhum | 32.7 | 24.8 | 42.5 | 67.3 |
| Bogra | 80.8 | 16 | 3.2 | 19.2 |
| Burdwan | 53 | 25.2 | 21.8 | 47 |
| Chittagong | 78.1 | 11.9 | 10 | 21.9 |
| Dacca | 60.9 | 22.9 | 16.2 | 39.1 |
| Dinajpur | 72 | 14.5 | 13.6 | 28.1 |
| Faridpur | 80.5 | 11.4 | 8.1 | 19.5 |
| Hooghly | 64.8 | 30.5 | 4.8 | 35.3 |
| Howrah | 67.3 | 23.4 | 9.2 | 32.6 |
| Jalpaiguri | 70.4 | 25.9 | 3.7 | 29.6 |
| Jessore | 71.3 | 22.1 | 6.6 | 28.7 |
| Khulna | 47.7 | 50.2 | 2.1 | 52.3 |
| Malda | 89.3 | 9.6 | 1.2 | 10.8 |
| Midnapore | 53 | 17.1 | 29.9 | 47 |
| Murshidabd | 58.9 | 25.8 | 15.3 | 41.1 |
| Mymensingh | 78.2 | 10.3 | 11.5 | 21.8 |
| Nadia | 61.2 | 24.1 | 14.7 | 38.8 |
| Noakhali | 70.5 | 16.8 | 12.7 | 29.5 |
| Pabna | 77.6 | 19.4 | 3 | 22.4 |
| Rajshahi | 81 | 15 | 3.9 | 18.9 |
| Rangpur | 72.2 | 22.8 | 5.1 | 27.9 |
| Tippera | 70.6 | 12.4 | 17 | 29.4 |
| 24 Parganas | 51.1 | 22.3 | 26.6 | 48.9 |
| Total | 65.9 | 21.1 | 13.1 | 34.2 |

Source: (FC, 1940, Vol II, Page 118, Table VIII (e)).

Table 3.12: Estimated Gini Coefficients within the Raiyati Class

| Location | Gini Coefficient | Type |
|-------------------------|------------------|-----------------|
| Mymensingh | 0.284 | Holding Size |
| Dinajpur | 0.474 | Area per Person |
| Dinajpur | 0.6 | Area per Family |
| 24 Parganas | 0.6 | Holding Size |
| Hooghly | 0.491 | Holding Size |
| Howrah (Sadr) | 0.435 | Holding Size |
| Howrah (Uberia) | 0.503 | Holding Size |
| Zillah Court Figures | 0.655 | Holding Size |

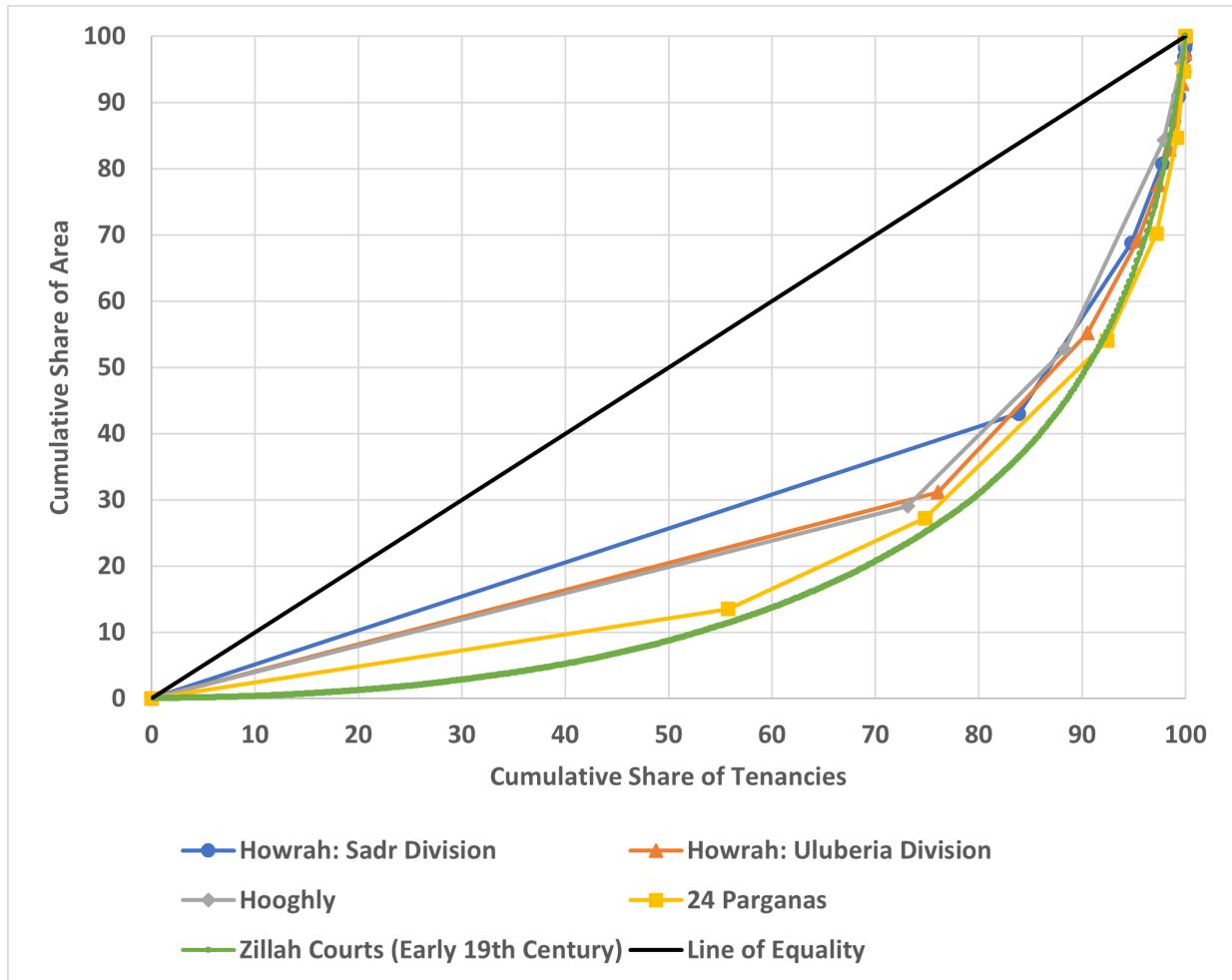
Source: Gini coefficients calculated from the same data as the Lorenz curves in this appendix.

would have $(20 - 3.3) * 5.788 = 96.6596$ million rupees per year as their share of the economic rent. This is just short of the after tax income of the *zamindars* and tenure holders. How many *raiyyati* families were there? The FC gives 5,978,000 agricultural families (excluding superior landlords, but including labourers), so 4 per cent would be 239,120.¹³⁹ At 2.5 shareholders per family, we would have 597,800 shareholders - around a sixth of our estimate of the number of superior landlords.¹⁴⁰ The conclusion is that intra-*raiyyati* inequality was much more important for aggregate inequality in interwar Bengal than that between the superior landlords and the *raiyyats* - Ray's Jotedar thesis is supported by the available evidence. The payment of rent to the superior landlords was largely one elite being paid by another.

¹³⁹(FC, 1940, Vol II, Page 113, Table VII (a)).

¹⁴⁰The Dinajpur figures for the families with the largest holdings (excluding the huge jotedars) had 9.33 people per family, so this is not an overstatement.

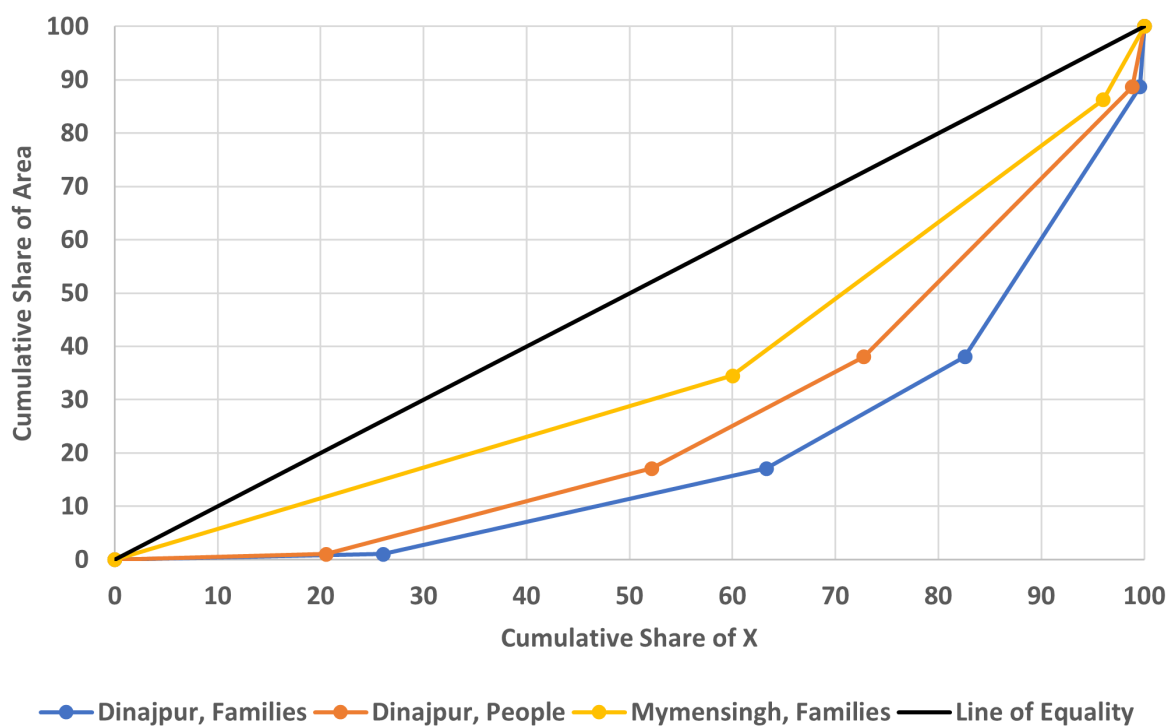
Figure 3.11: Shares of Raiyati Holdings and Areas: Near Calcutta



Source: (Lahiri, 1936, Page 81), (Ray, 1942, Page 20), (Sen & Chatterji, 1940, Page 37).

Notes: All of these three were from the interwar period. The *Zillah* court data source is discussed below. I have excluded holdings larger than 104 acres from the *Zillah* court data, because these would have been classified as tenures rather than *raiyyati* tenancies according to the 1885 act.

Figure 3.12: Shares of Raiyati Holdings and Areas: North Bengal



Source: (Sachse, 1920, Page 25) and (Bell, 1942, Page 18). **Notes:** Both were from the interwar years. The Dinajpur figures separately noted the huge *raiyyati* tenancies.

3.C Legal Details

And now for the fleshed out version of the legal argument.¹⁴¹ Whatever the origin of landlords elsewhere in India, hereditary *zamindars* with landed estates were found in Bengal well before the 18th century and the British.¹⁴² A number of them fought the Mughals in Akbar's time before agreeing to be subject to and pay revenue to Delhi - the revenue responsibility of landlords was a long standing tradition; they were, after all, already collecting rents from their tenants.¹⁴³ The most famous of these were the *Bara Bhuyias* ("the 12 landed magnates"), the descendants of which were often still found in possession of estates in the 1870s, albeit impoverished by historical events alongside the laws of inheritance and inflation.¹⁴⁴ Bengal had never been surveyed by the Mughals, and so long as the *zamindars* paid their taxes, the state tended to leave them alone, which left the tenants in their grasp.¹⁴⁵ Of course, given the political insecurity of pre-colonial India, powerful *zamindars*, sometimes with the support of the Nawab, usurped the rights of their neighbours and built up large private estates.¹⁴⁶ This was the origin of many of the huge *zamindaris*, particularly those that got broken up after the Permanent Settlement for their refusal to pay their taxes.¹⁴⁷ If the rights of the landlords were insecure before the Permanent Settlement, any of the tenants could not have been very valuable. Even then, Francis Buchanan found *zamindars* who had held their lands for many generations during his travels in the 1810s.¹⁴⁸ Mughal political theory was opposed to recognising private property rights in land, whence the view of the *zamindar* as a mere official, but there was a large gap between theory and practice; *Zamindars* rented out land at rates agreed by them (or their staff) and the tenant, their rights were heritable, and they granted lands rent free in perpetuity - things which mere tax collectors have no right to do. That they were wealthy suggests that they earned more than

¹⁴¹For alternative accounts, see (Roy & Swamy, 2016, Chapter 2) and (Robb, 1997).

¹⁴²Regarding elsewhere in India, they were found across the Mughal Empire (Nurul Hasan, 1964), (Habib, 1958), (Alam, 2013 - 1986).

¹⁴³John Shore, a senior civil servant at the time of the Permant settlement wrote that the *zamindars* were "numerous, rich and powerful" in the time of the Mughal Emperor Akbar (GoI, 1884, Page 21). See also (Ray, 1979, Pages 14-18), (Harington, 1805, Vol III, Fourth Part, Section I), and (Datta, 2000, Chapter 3).

¹⁴⁴(Wise, 1874, Volume 43, No III). They were still around in the early 20th century, as the author Nirad Chaudhuri wrote in his account of his childhood that the local respected descendant of the most famous of the *bara bhuyias* was a weakly old man known for his poetry - what a contrast to his empire defying ancestor (Chaudhuri, 1951, Page 38)!

¹⁴⁵(Ray, 1979, Page 18).

¹⁴⁶(Ray, 1979, Pages 26-28).

¹⁴⁷(Momen, 1925, Pages 92-4).

¹⁴⁸(Buchanan-Hamilton, 1833, On Estates).

what they paid as tax revenue, an indication of a valuable interest in land.

On all new lands settled since the Permanent Settlement, the *zamindar* was undoubtedly the proprietor. But, since *zamindars* had been around since at least the Mughal Emperor Akbar's time, this was also the case for land settled since the late 1500s, which would include the majority of Bengal.¹⁴⁹ This waste was often settled through the creation of new tenures, before and after the Permanent Settlement and so subinfeudation was not the creation of colonialism either.¹⁵⁰ In fact, for a few years after the Permanent Settlement, the British government banned the creation of any further perpetual leases, but was forced to retrospectively legalise them in the face of their widespread prevalence - the state gave way to custom.¹⁵¹ A law was passed enabling landlords to sell a certain type of perpetual tenure, the *patni*, for arrears along the same lines the government did when *zamindars* refused to pay their taxes. This type of tenure, then, had a "tenancy act" (statutory protection) from a very early date, but that did not mean whatsoever that other tenures had no legal rights. On lands without tenant right, or where it was in practice insecure, the *zamindar* was the proprietor in reality. Where tenant right existed in fact as well as in theory, the rents paid to the *zamindars* were, at this early period close to the economic rent (see the rentals section), and so, evaluated at market prices, the *zamindar* was the main owner of the land (although he had to pay taxes). *Zamindars* and rest of the Bengali land tenure system were not colonial inventions.

That there were some tenants with rights was acknowledged by Lord Cornwallis' regulations (statutes) but these were not defined or identified beyond a few general categories.¹⁵² The government did, however, reserve the right to legislate on the subject of tenancy at a later date. The determination of rights was instead left to the courts. When a tenant held on a lease, the conditions, including short term leases, were to be upheld. When a tenant held on a perpetual fixed rent, this could either be proved by a contract or prescription through long standing possession and payment of that rent. The real difficulty was the case of perpetual

¹⁴⁹(Eaton, 1993).

¹⁵⁰E.g. (Beveridge, 1876, Page 416) describing multiple degrees of tenures in East Bengal in 1790. See also (Datta, 2000, Chapter 3).

¹⁵¹(Phillips, 1876, Page 394).

¹⁵²Harington asked the fundamental question at an early date: "what shall be deemed the standard of their [rai-yats'] rights? Written institutions, or general usage? and if the latter, whether ancient, or modern." (Harington, 1805, Vol 3, Page 458).

leases with enhanceable rents. When the two parties would not agree to an equitable rent, the landlord could sue for an enhancement. This was not necessary for short term tenancies, as you could simply evict them at the end of the contract if they refused any new terms. When enhancement cases regarding permanent tenancies came up, the courts relied upon the *pergannah* (local customary) rates as a guide. Where these were not forthcoming, rents paid by similar classes of tenants in the locality were used.¹⁵³

Tenant right was therefore protected in theory by law well before tenancy legislation, and there are examples of this being the case in practice. Francis Buchanan-Hamilton found tenant right protected by the courts during his travels in Bengal and Bihar, and even went so far as to call tenants with rights in Rangpur district "peasant proprietors".¹⁵⁴ In Dinajpur, the majority of leases were in perpetuity, but much land was cultivated by sharecropper subtenants with no rights whatsoever - exactly the same situation found by government officers in 1940.¹⁵⁵ In Purnea, part of which was in Bengal, he was told that "in some cases the Judge had found sufficient evidence of such a rate [of rent] being fixed, at least by custom, and in consequence had determined that both parties [landlord and tenant] should adhere to it as a rule".¹⁵⁶ Not all tenants holding directly under *zamindars*, however, had rights in the land by custom, and so the rulings of the judges reflected this. Buchanan gives an example from South Bihar, where sharecropping (and therefore a lack of tenant right) was predominant owing to the local system of irrigation.¹⁵⁷

The *Zillah* (appeal) court records around 1850 - before any tenancy legislation - are full of cases of permanent tenures. In Rangpur, the court sends a dispute about whether or not a tenancy was *mokurruree* (permanently) fixed rent to be re-tried, although here it appears that the tenant was himself collecting higher rents from his own subtenants.¹⁵⁸ Another case saw a landlord fail to provide any evidence that his tenant's rent was enhanceable, while the tenant provided receipts

¹⁵³Grounds for enhancement are discussed in (Bakur, 1833, Pages 113-124) and (GoI, 1884, Part II).

¹⁵⁴(Buchanan-Hamilton, n.d., Book IV, Page 100).

¹⁵⁵(Buchanan-Hamilton, 1833, Pages 234-239), (Bell, 1942). Except Buchanan's perpetual tenants often absconded: "But this perpetual possession ... is almost nominal, not one tenant in four resides seven years on the same spot".

¹⁵⁶(Buchanan-Hamilton & Jackson, 1928, On Tenures, Page 442) Once again, the tenures in the district were "extremely various", ranging from permanent fixed rent tenancies to rack-rented short term leases.

¹⁵⁷(Buchanan-Hamilton, 1936, Vol II, Page 580). See also Page 555, where a Judge did rule in favour of tenant right, almost certainly because the facts of the case were different, in another case, and Page 575 where an estate is leased out on a variety of tenures, some perpetual, others not.

¹⁵⁸*Bahadee Nushoo v Musst. Karheshuree*, 23rd July 1849 (GoI, 1846-1851, 1849, Vol III, Page 15 (175)).

showing an unchanged rent from the inception of the tenancy in 1767 - before the Permanent Settlement. The landlord lost the case, and the tenant faced no enhancement.¹⁵⁹ In Birbhum, the courts ruled in favour of a tenant (who, once again, had subtenants) as the landlord failed to mention "the right under which any enhancement could be demanded".¹⁶⁰ In Burdwan, a tenant of long standing, who had already had their rent enhanced up to the pergannah rates once, could "scarcely be subject to a further increase under the regulations".¹⁶¹ Although these pergannah rates were not always in operation, where they were, they persisted until the 1885 act. Around 1880, a civil servant deputed by the Rent Law Commission found the courts still enforcing the pergannah rates for permanent tenants, as well as upholding permanent subtenancy contracts (for which there were no pergannah rates).¹⁶² Even the Maharaja of Burdwan, whose ancestors had built up one of the largest *zamindaris* in the whole of Bengal (it made up a significant portion of what is now West Bengal) by warfare in the 17th and 18th centuries, lost a court case against a family who held a mere 16 bighas (5.33 acres) - a demonstration of just how different things were to the 18th century, legally speaking.¹⁶³

As W. H. Nelson put it: "The rights of *raiyats* were not secured by statute but by custom."¹⁶⁴ That is, judge made law (the common law) respecting local customs and agreements upheld them rather than any special act of the legislature.¹⁶⁵ Act X of 1859 finally put tenant right on a statutory footing, so there is no question that tenant right had legal protection in theory after that point. The role of the common law can be further illustrated by looking at under-*raiyats* (subtenants of some degree). Tenancy legislation before 1928 did not provide statutory protection or rights to this class, but it did to their immediate landlords. However, many of them did have valuable permanent rights, which were protected by the common law and when encountered during survey and settlement operations these were entered in the record-of-rights,

¹⁵⁹Ruttunnesser Surma v Buddun Chunder Doss, 2th November 1846 (GoI, 1846-1851, 1846, Vol I, Page 23 (745)).

¹⁶⁰Tikaet Greedharee Singh v Hoolas Bhogta and Bechoo Bhogta, 24th June 1846, (GoI, 1846-1851, 1846, Vol I, Page 30 (133)).

¹⁶¹Becharam Ghose v Pearee Munne, 17th July 1849, (GoI, 1846-1851, 1849, Vol II, Page 107 (683)).

¹⁶²(Momen, 1925, Pages clxxxi to cxcv).

¹⁶³The Maharajah of Burdwan v Muddoosoodun and others, 7th September 1849, (GoI, 1846-1851, 1849, vol II, Page 94 (195)).

¹⁶⁴(FC, 1940, Vol V, Page 2).

¹⁶⁵J. H. Harington wrote up a draft act that would put tenant right on a statutory basis in the 1820s. The government refused to pass the act but printed copies to be sent to the judges for reference in cases regarding tenant right (Harington, 1827, Pages 9-10).

the result of a cadastral survey after 1885, as occupancy rights by custom.¹⁶⁶

While the 1859 act created a presumption of occupancy rights after 12 years' continuous cultivation, it allowed this to be barred by contract, and therefore did not restrict contractual choice.¹⁶⁷ This act stated that the rents of tenants with occupancy rights but not permanently fixed rents, where there was no clear customary or contractual guide, were to be "fair and equitable". What this actually meant came up in a landmark high court case in 1865, that came to be known as the "Great Rent Case".¹⁶⁸ The immediate context was a court ruling that potentially threatened occupancy rights, and the High Court Judges had to restate the intention of the 1859 act:

*It is, then, absolutely certain that (whether or not they were strictly and exactly right in the definition adopted) it was the intention of the Legislature to declare and define existing rights, - not to create a new class of rights; and in that Sense the plain words of the Legislature must be taken. The 12-year rule, thus declared and established, covered the great mass of resident [Occupancy] ryots who had held so long or much longer, and relieved from the burden of proof ancient ryots whose proofs could not be carried back beyond a limited period. It amounted, in fact, to this. All holders of ryotee lands who can prove a 12-year holding shall be presumed to be ryots of the occupancy class, unless the contrary is proved by express written contract ..., If, in Bengal, some comparatively few pykasht [Cash rent short term leaseholders, tenants-at-will] ryots were wrongly included in the definition that is an accident, and not the rule. This creature of Act X., whom it is sought to make the normal occupancy-ryot, seems to be in practice a rare creature. He is more common in theory than in actual cases. Probably most of those to whom the Old custom did not give such rights do not now assert them.*¹⁶⁹

Tenant right was not a creation of statute - just as the rights of the *zamindar* were not either. The puzzle was that of permanent rights but enhanceable rents.¹⁷⁰ After an extremely lengthy discussion, the final result of the Great Rent Case was to fix the rate of rent payable by occupancy tenants according to the common law in real terms, as enhancements could only follow changes in the price of staple foodstuffs, in the absence of a contractual or customary guide (such as the

¹⁶⁶E.g. compare the discussion in Jessore SR (Momen, 1925) - where there were more under-*raiyati* tenancies than *raiyati* ones, almost all of which had permanent rights - before 1928 with that in Pabna and Bogra SR (MacPherson, 1930), where settlement operations took place after 1928.

¹⁶⁷"[E]very written contract inconsistent with the right of occupancy overrides all claim to such right, it being reasonably assumed that, in the absence of express written contract, the ordinary custom prevailed and the ordinary prescription ran", Justice Campbell in the Great Rent Case Judgements (GoI, 1884, Page 120). The state of the law following 1859 but before the later tenancy act was described in the 1874 Tagore Law Lectures (Phillips, 1876).

¹⁶⁸Thakurani Dasi v. Busheshur Mukerji and others, High Court, Calcutta, dated 19th June, 1865. See "The Judgements in the Great Rent Case" in (GoI, 1884).

¹⁶⁹(GoI, 1884, Justice Campbell, Page 120).

¹⁷⁰One of the High Court judges considered that "the Courts of this country are placed in this matter in a position which, it is not too much to say, resembles that of no other Courts in the world" (GoI, 1884, Justice Seton-Karr, Page 133).

pergannah rates). This case could rightly be called a "critical juncture". Had the high court ruled in favour of economic rents, then tenant right would have been unprotected at law, and the *zamindars* free to ignore the rights of their tenants. In such a world, the popular story about landlord and colonial oppression may have actually been true.

After a government commission ("The Rent Law Commission") wrote up a digest of the existing statute and case law on the subject as well as a report on suggested improvements, in 1885 the law was updated with the passing of the Bengal Tenancy Act.¹⁷¹ If tenant right already had common and statute law protection, what was the need for further legislation? Contemporary land agitation in Britain, and especially Ireland, played an ideological role as did the movement for legal codification in British India.¹⁷² Bengal had a very long way to go to get to the sort of political discord that was going on in Ireland, but a few agrarian disputes spooked the Government, notably the Pabna riots of 1874. The ultimate reason for further legislation (and the riots), however, as demonstrated above, was inflation and a jute boom in East Bengal leading to increased nominal values of competitive rents, and decreasing real values of the actual customary rents. Largely by accident, the subordinate right in land had become of superior value. The incentives for enhancement, whether equitable or not, had therefore risen, and therefore, as tenant right became more valuable, it made sense to provide it with greater protection through the statute law.

However, this act was not so generous to the *zamindars* as the High Court judges had been; rents could not be increased beyond 12.5 per cent every 15 years.¹⁷³ Provisions were made for unrestricted rental increases due to improvements made at the landlord's expense but this rarely occurred. There was one major restriction on contract choice: *raiyats* could not contract themselves out of the accrual of occupancy rights, the *zamindar* would have to buy them out from his tenant and give the land to him as a share tenant if he wanted a short term lease.¹⁷⁴ However,

¹⁷¹For the Rent Law Commission, see (GoI, 1881). For a historian's perspective on the Tenancy act see (Robb, 1997).

¹⁷²(Cook, 1993). On Codification, see the 1912 Tagore Law Lectures (Acharyya, 1914), and also (Rankin, 1946).

¹⁷³The land law after the Tenancy Act was the subject of the 1895 Tagore Law Lecture (Mitra, 1898). This cap on rents for tenants with rights was not, on average, a binding one (see the rentals section). For the act itself see (Finucane & Fulton, 1889).

¹⁷⁴Clive Dewey, for example, writes that "the Bengal Tenancy Act (1885) deprived millions of tenants of freedom of contract by fixing their rents", but in the majority of cases their rents were already fixed (and enhancements limited) in the first place by custom (Dewey, 1991, Page 368). If you wanted to be rack rented you could take a non-occupancy under-*raiyati* tenancy.

the agricultural ladder was not shut out to newcomers for taking an insecure competitive rent tenancy under a *raiyat* was much more common in the first place, as practically all land, including in newly colonised areas, had been let out on perpetual tenancies who could legally sublet. Land markets were therefore considerably less restricted than they were after independence. Had tenant right withered away, as many people expected around 1800, there would have been no need for legislation.¹⁷⁵ Since, instead, it thrived, let alone merely survived, it made sense, politically (and morally), to support it. The act allowed for survey and settlement operations - a cadastral survey accompanied by the creation of a record of rights (detailing every right in every plot of land) - which began in Bihar shortly after, and were completed in Bengal in 1940, shortly before it was all to be swept away after independence.

¹⁷⁵E.g. (Colebrooke, 1884, Page 45).

3.D Gross Rental Time series for Bengal Districts: Sources

- 1793: This is the government revenue demand on permanently settled estates as of 1913 multiplied by a factor.¹⁷⁶ For Burdwan, Birbhum, Bankura, Midnapore, Hooghly and Howrah, 24 Parganas, Nadia, Murshidabad, Jessore, and Khulna districts the factor is 4/3, otherwise it is 3/2. This reflects that West Bengal was higher assessed than East Bengal. The revenue itself is a lower bound estimate on the rental in 1793 (for the incidence of land taxation falls upon land rents). These assumptions give us a gross nominal rental of approximately 30.5 million Rupees. The nominal gross rental from the Floud Commission figures in 1939 was 128 million Rupees. My estimated rental in 1793 was around 45 million Rupees. Tirthankar Roy has estimated the gross nominal rental for Bengal and Bihar in 1763 as 126 million. Taking 2/3rds of this to apply to Bengal we get 84 million Rupees.¹⁷⁷ So my assumptions result in a rather moderate 18th century rental, and therefore tend to overstate its rise.

The Paddy price for 1793 is taken from the Floud Commission as an average of the observations for 1791, 1793 and 1795.

- 1871: Road cess valuation of rental in 1871 as provided in the 1912-13 Bengal land revenue administration report.¹⁷⁸ This is an overstatement as it included some rents paid by tenure holders, imputed rentals from tenure holders own cultivation, and mine royalties. On the other hand it may be an understatement if there was underreporting. 1871 paddy price taken from the Floud Commission figures for 1874 – the 1871 price was unusually low (and was excluded from the yearly averages in Figure 3.2). The 1874 figure does not seem to be a famine price as it was far lower than that of 1885 and inflation had not been that rapid over the decade.

Note that an observation for Khulna district is missing for 1871. This is because the district was only created (from Jessore and 24 Parganas districts) after that date.

- 1913: Figures are the road cess valuation from the 1912-1913 Bengal land revenue admin-

¹⁷⁶(GoI, 1913).

¹⁷⁷(Roy, 2010, Table 1)

¹⁷⁸(GoI, 1913).

istration report.¹⁷⁹ This is an overstatement of the *raiyati* rental as it included rents paid to tenure holders, imputed rentals from tenure holders own cultivation, and mine royalties – the latter took off in this period. The forces tending towards understatement in 1871 were probably much weaker at this point in time as the returns became prepared better. Paddy price is the 1909 figure from the Floud Commission.

- 1929: Road Cess valuation.¹⁸⁰ Burdwan figure adjusted for mines.
- 1939 (a) Road Cess valuation.¹⁸¹ Burdwan figure adjusted for mines. The 1936 price has been used for 1939, which should bias things upwards.
- 1939 (b): Rental figures are taken from the Floud Commission.¹⁸² These are the sum of the *Raiyati* assets (rental proper) and the Khas assets (*zamindar* and tenure holder own cultivation imputed rent). These figures exclude mineral royalties.

¹⁷⁹(GoI, 1913).

¹⁸⁰(GoI, 1929).

¹⁸¹(GoI, 1939).

¹⁸²(FC, 1940, Vol II, Page 111, Table No. VII).

Table 3.13: Summary of Paddy Price Sources

| Source | Years | Number | Notes | Citation |
|------------------|----------------------------------|------------|-------------------------|--------------------------------|
| Floud Commission | Various | 26 | | (FC, 1940, Vol II, Table III) |
| Index Numbers | 1861-1931 | 71 | Rice Adjusted | (GoI, 1933, Page 3, Table III) |
| Jessore SR | 1790, 1791 | 2 | Rice Adjusted | (Momen, 1925, Page clxxxvi) |
| Labour Enquiry | 1863 to 1892/3 Quinquennially | 7 | Rice Adjusted | (GoI, 1896, Appendix A) |
| Maddox | 1836-1898 | 63 | Rice Adjusted | (Maddox, 1900, Page 119) |
| Phipps | 1815-1822 | 8 | 1st Class Rice Adjusted | (Phipps, 1823, Page 261) |
| Sykes | 1845-6 | 2 | Rice Adjusted | (Sykes, 1847) |
| Toynbee, Orissa | 1811-1817 | 7 | Rice Adjusted | (Toynbee, 1873, Page 100) |
| Toynbee, Hooghly | 1793-1813 | 21 | Rice Adjusted | (Toynbee, 1888, Appendix E) |
| Total | | 207 | | |

3.E Paddy Price Series: Sources

The Floud Commission appendix contained a number of observations.¹⁸³ I have supplemented it with figures from a number of sources. The first is a government index of average rice prices at Calcutta from 1861-1930.¹⁸⁴ The second was the Report of the Labour enquiry (1896) the appendix of which provided quinquennial common rice prices for 1860 to 1896 for a few districts in West Bengal.¹⁸⁵ The third is prices of 3rd grade rice in 1845 and 1846 from a paper presented by W. H. Sykes to the statistical society of London.¹⁸⁶ To convert these to paddy prices I multiplied them by 0.65, which was the average ratio in the early 20th century.¹⁸⁷ This leaves gaps in the early 19th century. Toynbee reports the price of coarse rice at Hooghly between 1793 and 1813. I adjust these by 0.75 to account for higher prices at Calcutta than near the farms. I then convert this price to that of paddy by 0.65.¹⁸⁸ Phipps reports prices of 1st class rice at Calcutta from 1815-1822. I adjust these by 0.7 (Calcutta and 1st class premium) and then convert it to paddy by 0.65.¹⁸⁹ The appendix to the Jessore settlement report gives prices of 2nd class rice for 1790 and 1792, these I adjust to paddy by the standard ratio.¹⁹⁰ I also use prices from neighbouring Orissa, provided by an early history of the province (also by Toynbee)

¹⁸³(FC, 1940, Vol II. Table No. III).

¹⁸⁴(GoI, 1933, Page 3 Table III).

¹⁸⁵(GoI, 1896, Appendix A).

¹⁸⁶(Sykes, 1847).

¹⁸⁷(GoI, 1942, Appendix XLVI).

¹⁸⁸(Toynbee, 1888, Appendix E).

¹⁸⁹(Phipps, 1823, Page 261).

¹⁹⁰(Momen, 1925, Page clxxxvi). I exclude 1792 which was a year of unusually high prices there due to a poor crop.

and one of the late 19th century settlement reports by Maddox.¹⁹¹ Maddox reported rice prices, and noted that while the common adjustment ratio from rice to paddy is approximately 0.65, 0.5 came up in his Orissa sources. Toynbee reports both paddy and rice prices, and 0.5 appears to match the ratio better than 0.65 for this period. I have therefore adjusted Maddox's rice prices by 0.5, which also fits the figures provided by the other sources better. This difference may have something to do with the introduction of machine milling. Robert Allen and Roman Studer have compiled a price database for India. My data is generally consistent with theirs, and the only major difference is that my price of rice (assumed to be that of paddy divided by 0.65) usually lies below their Calcutta figures for the period 1790 - 1820. My prices, however, are consistent with their prices in the Bengal countryside, which are more relevant to determining the burden of farm rents.¹⁹²

¹⁹¹(Maddox, 1900, Page 119), (Toynbee, 1873, Page 100).

¹⁹²(Allen & Studer, 2009).

3.F Rent per Acre: Sources

The rent data came from a number of sources, as outlined in Table 3.14. There are three main sources: the settlement reports, W. W. Hunter's Statistical Account of Bengal, and the *Zillah* court (appellate) records. There are also a number of miscellaneous sources with far fewer data points. The settlement reports primarily relate to the 20th century, but often contained a discussion of the path of rents over time. Since they give the average rental per acre for the standard class of occupancy *raiyats* by district subdivision, I use these. Hunter's account gives rents in each district around 1872, and commonly also gave rents for earlier years. These observations are usually for different classes of land in different district subdivisions. They usually provide a range with a lower and higher figure. The pages and volumes mainly associated with each district are presented in Table 3.15. The *Zillah* Court records are from 1849-1852, but frequently refer to rents that were set in earlier years. Where no year was specified when rents were set, I recorded it as the year of the court case. These observations relate to rents on specific holdings, and either the per acre (or local land measure) figure was mentioned or the size of holding enabled me to calculate it. The Settlement Reports and Hunter cover all districts. The *Zillah* court records, on the other hand, were primarily from West Bengal.

Table 3.14: Distribution of Rental Observations by Source

| Source | Count |
|----------------------|--------------|
| Statistical Account | 1,193 |
| Settlement Reports | 848 |
| Zillah Court Records | 522 |
| Misc. | 81 |

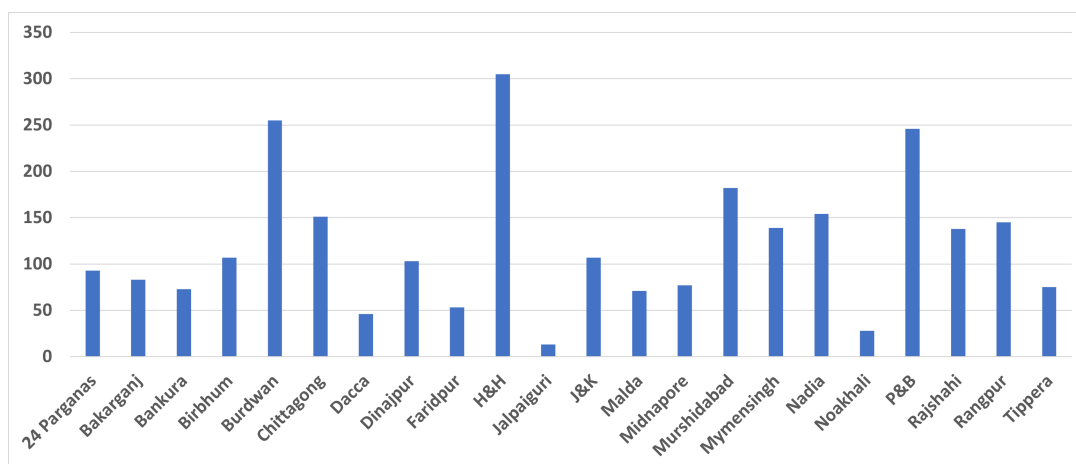
I decided to exclude rental figures for homestead land (usually including a garden) and that suited to special crops such as sugar cane and betel nut. Such tenancies paid far higher rates of rent than the average one did, but formed a small share of the total area. Importantly, the settlement report figures do include these in their averages (appropriately weighted). I exclude them from the earlier figures, and so, if anything, this would tend to bias the results towards enhancement over time.

For a few districts Hunter and his co-authors purport to give very low rents existing at the

time of the Permanent Settlement, but these were below the average rate of land revenue per cultivated acre in 1939, which had basically been unchanged since 1793. Since the land revenue is a lower bound on the rate of rent, these figures are implausible. One district was Hooghly, where the existence of a substantial revenue free area made this even more unlikely. The other was Rajshahi. Hunter gives the figure of 2.5 annas a bigha (7.5/16 Rupees an acre), but the average rate of revenue per cultivated acre in 1939 was around 1.2 Rupees. Since cultivation expanded somewhat, the 1793 figure was likely to have been higher; this figure is too low.

Often rents were given per local unit of land, and these I converted into acres. Figure 3.13 outlines the number of observations per district. Some districts were combined because they were only separated fairly late into the 19th century: H&H stands for "Hooghly and Howrah", J&K stands for "Jessore and Khulna", and P&B stands for "Pabna and Bogra". Figure 3.14 presents the distribution of observations by decade.

Figure 3.13: Distribution of Rent Observations by District



Source: See Text.

Table 3.15: Rent Sources from Hunter's Statistical Account of Bengal

| District | Volume | Approximate Pages |
|--------------------|--------|---------------------|
| 24 Parganas | I | 155-57, 336 |
| Bakarganj | V | 210 |
| Bankura | IV | 265-8 |
| Birbhum | IV | 370 |
| Burdwan | IV | 87-90 |
| Chittagong | VI | 180 |
| Dacca | V | 101 |
| Dinajpur | VII | 406 |
| Faridpur | V | 326 |
| H&H | III | 354-6 |
| Jalpaiguri | X | 291 |
| J&K | II | 266-273 |
| Malda | VII | 88 |
| Midnapore | III | 102-8 |
| Murshidabad | IX | 123-7 |
| Mymensingh | V | 454 |
| Nadia | II | 74-81 |
| Noakhali | VI | 314 |
| P&B | VII/IX | (VII) 244, (XI) 317 |
| Rajshahi | VIII | 74 |
| Rangpur | VII | 284 |
| Tippera | VI | 413 |

Source: (Hunter, 1875 - 1877). **Notes:** H&H - Hooghly and Howrah. J&K - Jessore and Khulna. P&B - Pabna and Bogra.

Table 3.16: Rent Sources from the Zillah Court Records

| Year | Volume | Pages |
|------|--------|---|
| 1846 | 1 | 38, 60, 71, 73-4, 4, 5, 6, 7, 10, 12, 30, 35, 54, 62, 74, 79, 83, 86, 88, 110, 126, 141, 143, 69, 7, 13, 37, 38, 47, 53, 60, 73, 78, 79, 80, 87, 98, 39, 30 |
| 1846 | 2 | 22, 63, 28, 79, 105-6, 139-40, 147 |
| 1847 | 1 | 5, 14, 39, 59, 63, 103-4, 151, 152, 154, 155, 176, 178, 12, 18, 20, 27, 33, 35, 43, 48, 59, 67, 90, 93, 98, 101, 117, 120, 125, 142, 144, 150, 158, 161, 163, 164, 167, 169, 170, 174, 175, 180, 210, 162, 174, 188, 199, 200, 201, 202, 206, 207, 213, 219 |
| 1847 | 2 | 19, 27, 41, 70, 99-100, 111, 10, 23 |
| 1847 | 3 | 9, 8, 3, 60, 63, 25, 42, 61, 62, 69, 70, 83, 86, 88, 98, 100, 118, 130, 139, 140, 147, 18, 21, 23, 24, 43, 46, 47, 2, 15, 37 |
| 1848 | 1 | 43, 58, 60, 64, 75, 81, 87, 88, 133, 144, 156, 160, 181, 182, 275, 176, 193, 206, 207, 37, 43, 59, 77, 79, 82, 134, 138, 167, 24, 29, 37, 39, 54 |
| 1848 | 2 | 27, 39, 41, 50, 65, 66, 75, 75, 101, 103, 107, 119, 123, 135, 171, 68, 69, 70, 88, 118, 128, 140, 151, 151-156, 157, 159, 160, 162, 169 |
| 1848 | 3 | 26, 33, 112, 164, 167 |
| 1849 | 1 | 10, 31, 34, 41, 46, 67, 76, 81, 83, 88, 105 |
| 1849 | 2 | 18, 31, 32, 83, 2, 9, 12, 50, 51, 55-6, 65, 67, 73, 97, 100, 111, 124, 128, 153, 155, 1, 5, 6, 11, 33, 42, 55, 97, 99, 107, 108, 121, 122, 124, 134, 148, 167, 168, 171, 173, 178, 185, 190, 195, 163, 187, 192, 207, 227, 223 |
| 1849 | 3 | 49, 63, 69, 76, 88 |
| 1849 | 4 | 14, 37, 40, 54, 56, 62, 120, 141, 167, 192, 213, 233, 250, 253, 139, 140, 154, 33, 37, 55, 24, 25, 55, 56 |
| 1850 | 1 | 126, 127, 128, 129, 136, 147, 163, 215, 253, 267, 297, 309, 313, 318, 320, 321, 355, 356, 407, 412, 415, 42, 70, 136, 138 |
| 1850 | 2 | 76, 93, 116, 120, 136, 138, 140, 91, 120, 121, 126, 157, 176 |
| 1851 | 1 | 2, 5, 11, 14, 17, 20, 21, 9, 15, 25, 32, 35, 36, 37, 45, 47, 52, 31, 17, 65, 73, 76, 81, 82, 84 |
| 1851 | 2 | 96, 67, 82, 60, 83, 169, 170, 183, 190 |
| 1851 | 3 | 250, 495, 461, 205, 213, 229, 239, 11, 14, 24, 294 |
| 1851 | 4 | 100, 105, 109, 114, 116, 362 |
| 1851 | 5 | 50 |

Source: (GoI, 1846-1851). **Notes:** Each volume reset the page numbers when it moved onto a new district, and included some Bihari districts. I only look at those in Bengal.

Table 3.17: Miscellaneous Rent Sources

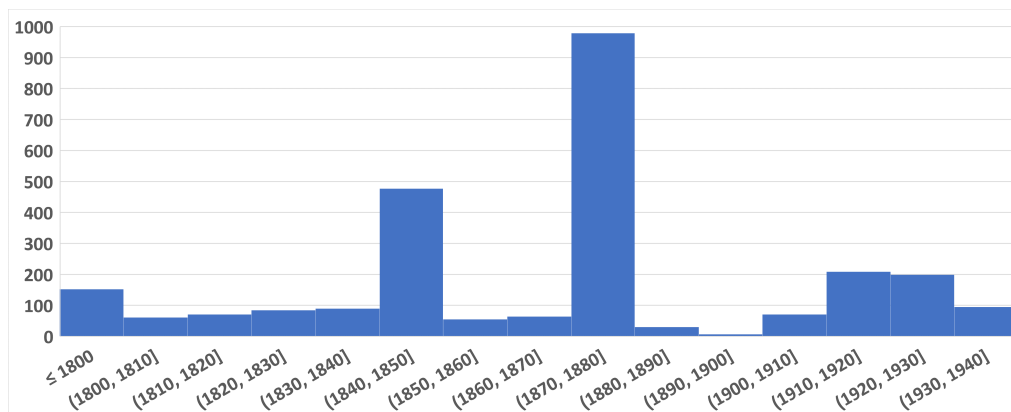
| Source | Author | District | Number of Observations | Page |
|---|------------------|---------------------------------|------------------------|--------------------|
| A Sketch of the Administration of the Hooghly District | G. Toynbee | H&H | 71 | 173 (Appendix O) |
| Asiatic Researches, 1811 | W. Carey | Dinajpur | 2 | 3 |
| Geographical, Statistical, and Historical Description of Dinajpur | Francis Buchanan | Dinajpur | 4 | 237, 242, 244, 246 |
| Principal Heads of the History and Statistics of the Dacca Division | Government | Mymensingh, Faridpur, Bakarganj | 3 | 158-160, 202, 236 |
| FC, Vol V | W. H. Nelson | H&H | 1 | 8 |

Table 3.18: Rent Regression Results

| Variable | Coefficient | Std. Error | Significance |
|--------------------|-------------|------------|--------------|
| Intercept | -2.75322 | 0.573608 | *** |
| Year | 0.002282 | 0.000299 | *** |
| Bakarganj | -0.26808 | 0.070538 | *** |
| Bankura | -0.07176 | 0.101156 | |
| Birbhum | -0.11426 | 0.069093 | |
| Burdwan | -0.00754 | 0.059776 | |
| Chittagong | -0.01321 | 0.062369 | |
| Dacca | -0.61661 | 0.098559 | *** |
| Dinajpur | -0.7775 | 0.07832 | *** |
| Faridpur | -0.86915 | 0.085613 | *** |
| Hooghly and Howrah | 0.502843 | 0.056197 | *** |
| Jessore and Khulna | -0.40523 | 0.055571 | *** |
| Jalpaiguri | -0.3666 | 0.243537 | |
| Malda | -1.12085 | 0.090061 | *** |
| Midnapore | -0.54378 | 0.085609 | *** |
| Murshidabad | -0.49281 | 0.069381 | *** |
| Mymensingh | -0.82136 | 0.067316 | *** |
| Nadia | -0.90625 | 0.066047 | *** |
| Noakhali | -0.25042 | 0.09043 | ** |
| Pabna and Bogra | -0.51332 | 0.064481 | *** |
| Rajshahi | -0.4658 | 0.063094 | *** |
| Rangpur | -0.3882 | 0.056268 | *** |
| Tippera | -0.56661 | 0.09256 | *** |

Notes: The baseline district was the 24 Parganas, and the District Variables therefore reflect the level of rents relative to the 24 Parganas controlling for time. *** indicates significance at 0.001, ** significance at 0.01, * at 0.05. Adjusted R-squared: 0.3698.

Figure 3.14: Distribution of Rent Observations by Decade



Source: See Text.

Table 3.19: Rent Regression (Hedonic Specification) Estimates and 95 per cent Confidence Interval Limits

| Decade | Lower | Estimate | Upper | Obs |
|--------|-------|----------|-------|------|
| 1790 | 2.569 | 3.048 | 3.526 | 147 |
| 1800 | 1.746 | 2.637 | 3.528 | 14 |
| 1810 | 2.654 | 3.141 | 3.628 | 117 |
| 1820 | 2.203 | 2.698 | 3.192 | 83 |
| 1830 | 2.378 | 2.913 | 3.447 | 54 |
| 1840 | 2.933 | 3.316 | 3.698 | 453 |
| 1850 | 2.841 | 3.296 | 3.751 | 117 |
| 1860 | 2.289 | 3.016 | 3.742 | 34 |
| 1870 | 2.983 | 3.338 | 3.693 | 1010 |
| 1880 | 2.889 | 3.589 | 4.29 | 30 |
| 1890 | 1.895 | 3.102 | 4.31 | 7 |
| 1900 | 3.455 | 3.988 | 4.522 | 71 |
| 1910 | 3.214 | 3.667 | 4.121 | 209 |
| 1920 | 3.034 | 3.384 | 3.735 | 199 |
| 1930 | 2.637 | 3.125 | 3.613 | 95 |

Notes: Rents are in Rupees per Acre. The baseline district was the 24 Parganas (and I do not report the coefficients on the district dummies), but I have adjusted the decadal estimates by the ratio between that district's average rent and the All Bengal average in the 1930s (0.622).

3.G Andhra Pradesh Yields: Sources

- Interwar years: 1929 estimates from the Madras Provincial Banking Enquiry, Vol I, Page 8.¹⁹³ East and West Godavari had not been separated by this stage, so I assign them both their average at this time. Likewise with *Kharif* and *Rabi* Yields.
- 1968 yields from Season and Crop Report Page 164.¹⁹⁴
- 1975-6 yields from Season and Crop Report, Page 182.¹⁹⁵
- 1982 yields from Season and Crop Report Page 174.¹⁹⁶
- 1985 yields from Season and Crop Report Page 198.¹⁹⁷
- 1990 yields assumed to be yields from 1987-88, Statistical Abstract Page 119.¹⁹⁸
- 1994-5 assumed to be the yields from 1992-3, Statistical Abstract 1993 Page 88.¹⁹⁹
- 2000 yields from Statistical Abstract 2001 Page 104.²⁰⁰
- 2005 yields from Season and Crop Report Page 298.²⁰¹
- 2009-10 yields from Andhra Pradesh Agricultural Statistics at a Glance: Pages 91-2.²⁰²

¹⁹³(GoI, 1930a, Vol I, Page 8).

¹⁹⁴(Government of Andhra Pradesh, 1969).

¹⁹⁵(Government of Andhra Pradesh, 1976).

¹⁹⁶(Government of Andhra Pradesh, 1983)

¹⁹⁷(Government of Andhra Pradesh, 1986)

¹⁹⁸(Government of Andhra Pradesh, 1988)

¹⁹⁹(Government of Andhra Pradesh, 1993)

²⁰⁰(Government of Andhra Pradesh, 2001)

²⁰¹(Government of Andhra Pradesh, 2005)

²⁰²(Government of Andhra Pradesh, 2010).

3.H Land Revenue and Land Tenure Systems: An Explanation

3.H.1 Introduction

Much of the literature on Indian agrarian institutions has been confused thanks to a failure to carefully distinguish between land revenue systems and land tenure systems. This appears to have been started by some of the British and the confusion has been passed down the generations.²⁰³ The fundamental cause of confusion has been the term "rent", which has a variety of different senses:

1. The "contractual" rent: Whatever is paid by a tenant to a landlord in return for the right to use a piece of land for some period of time.
2. The "economic" rent: The residual value of the gross produce after deducting the cost of cultivation. Also known as the Ricardian rent or the net produce.²⁰⁴
3. The land tax: The incidence of a land tax falls upon land rents, and so, in a sense, the land revenue is the payment of rent to the government (as colonial officials liked to claim). It was, in fact, a tax, the incidence of which fell on land rents.

Thus a tenant may pay an agreed rent to a landlord (sense 1), which may or may not represent the economic rent (sense 2), and the landlord may have to pay tax to the government (sense 3), the incidence of which falls upon his rental income. The landlord is often called an "intermediary" between the cultivator and the state. This is not a useful way to think about things, because the cultivator gets his share of the produce as wages/payments to capital. The residual produce is the economic rent (sense 2), the distribution of which, ignoring taxation, depends on the nature of property rights in land. The land tax does not affect the cultivator *qua* cultivator whatsoever; it has nothing to do with him. It can only affect those with permanent rights to the economic rent, or, in other words, someone with a property right in land.

Suppose that the cultivator is a tenant at will. He may, however, as part of his agreement with his

²⁰³(GoI, 1881, Pages 18-24).

²⁰⁴This differs from the "surplus over next best alternative" textbook definition of economic rent, unless that alternative is leaving the land uncultivated.

landlord, pay the land tax. In this case, it does make sense to call the cultivator an intermediary between the land owner and the state.²⁰⁵ For every rupee such a tenant paid in tax, his rental payments to the landlord will be correspondingly diminished. The fundamental reason is that land is inelastically supplied and legal incidence does not mean economic incidence.

In India things were complicated by the fact that there were many permanent tenants, who did have a right to some portion of the economic rent. But this does not change the fundamentals: the permanent tenant pays a rent to his landlord (sense 1), which is less than the economic rent (sense 2). The landlord, in turn, pays the land tax (sense 3). The landlord is not an intermediary between the state and the cultivator, for the same reason as given above. In addition, the tenant was not the state's tenant, he was the landlord's tenant. If the tax was abolished, the tenant, whether permanent or not, would still have the obligation to pay rent to his landlord, by virtue of the latter's proprietary rights. This would not be the case for a true intermediary, such as a tax farmer, who would then need to find a new source of income.

The British liked to state that, by the custom of the country, the state was entitled to a share of the gross produce of the soil. However, they did not levy their taxes upon this principle: they took a lump sum cash tax, fixed for a term of years, intended to represent a share of the economic rent, or permanently fixed the tax. The difference between the land tax and the net produce was therefore left in the hands of private individuals. But, since the land tax, however set, cannot exceed the economic rent, as if it does the land will not be cultivated, there was always some share of the economic rent that accrued to private individuals; private property in land always existed in India. The owner of this residual may decide to rent out his land, and therefore tenancy always existed in India - which multiple decades of land reform legislation have failed to destroy. The landowner may alternatively choose to cultivate the land himself, but in either case it is the economic rent, and not the cost of cultivation, from which the land tax ultimately gets paid. The land tax, if taken as a fixed cash sum, can therefore never have actually been very oppressive, because if it was, it would not have been paid. Anytime you read anyone complaining about the land tax, they are complaining about relatively wealthy land

²⁰⁵This was the case in Malabar, now part of Kerala, which was a *ryotwari* district, where the tenants paid the land tax to the state as well as rent to their landlords up to the end of the 19th century, until a court ruled that the landowner had to pay the land tax (GoI, 1905, Pages 2-3).

owners having to pay tax. What's more, for every rupee paid in land taxes, that is one less rupee in more distortionary taxes that would fall on capital or labour. This was the real problem with the Permanent Settlement, although until the 1920s Bengal was able to siphon off some of the tax revenue from other provinces. Therefore we need to carefully distinguish between land revenue systems and land tenure systems, for the two had no inherent connection except for the fact that the incidence of land tax fell land rents (sense 2).

3.H.2 Land Revenue Systems

The details of land revenue systems in British India varied regionally.²⁰⁶ The fundamental fact that the incidence of the land tax fell on land rents did not. There were two key distinctions between land revenue systems: (a) the duration of assessment, and (b) the unit of assessment. A summary is presented in Table 3.20. (a) is straightforward: Land revenue assessments were either permanent or temporary. Where the land tax was permanently settled, it was fixed in nominal terms in perpetuity. Temporary settlements had the advantage of being able to adjust for inflation (with tax exemptions for improvements, not that landowners bothered to make many) - marginal tax rates in either case were zero.

The other fundamental difference in the revenue systems was the basis of assessment, (b). This was either done at the level of a survey field or at the level of an estate (called a *mahal*).²⁰⁷ Field systems are often called the *ryotwari* system, while the estate based system was often called the *mahalwari* or *zamindari* system. Explaining taxation at the level of the survey field is much more straightforward, because it does not require an understanding of local customs, and so I start with it.

Field System, or *Ryotwari*

A field system levied the land tax upon an individual field. The cultivated area was split up into fields during a cadastral survey, and upon each field a land tax was fixed. The "survey field" was

²⁰⁶The most comprehensive book on the revenue tenures of British India is "The Land-systems Of British India", by B. H. Baden Powell, but this is not free from the confusion described above (Baden-Powell, 1892).

²⁰⁷Field systems are covered by Baden-Powell Book 3, *Mahal* systems in books 1 and 2. The classic text on the *mahalwar* set up in UP is by James Thomason, one time governor of UP, "Directions for Revenue Officers, North Western Provinces of Hindostan" (Thomason, 1858). See also W. H. Moreland's book (Moreland, 1911). The Punjab equivalent was written by Robert Crust (Cust, 1866). For the Punjab, see also (Gol, 1938b).

Table 3.20: Provincial Land Revenue System Classifications

| | | Duration of Assessment | |
|--------------------|-----------------------------|---|---------------------------------|
| | | Temporary | Permanent |
| Unit of Assessment | Field Based | Madras*, Bombay Sind, Berar, Assam Burma | |
| | <i>Mahal</i> (Estate) Based | Punjab United Provinces** Central Provinces | Bengal Bihar Benares (UP) |

* Also had substantial permanently settled estate areas.

** Benares was part of UP.

by no means an actual field insofar as cultivation was concerned, as it may have formed part of one farmer's field or may have been split between many different owners.²⁰⁸ If you owned the land within the survey field, then you had responsibility for paying the land tax (at the end of the day). Since a "survey field" may have covered the land of multiple owners, revenue responsibility may therefore have been joint between those owning land within a survey field.²⁰⁹

The *ryotwari* system, as the field system is known, is often mistakenly stated to have resulted in settlement with the cultivator, and to therefore have been one of owner-cultivating peasant proprietors. This is Banerjee and Iyer's contention. The landowner, otherwise known as a "registered occupant" or *pattadar*, of a survey field, who paid taxes (at the end of the day) did not have to be the actual cultivator. The revenue system had nothing to do with the land tenure system, since the *pattadar* could, and often did, give his land out to tenants. Further, in South India, the heartland of the field system, there were many permanent agricultural servants, which was really a disguised form of tenancy linked to the caste system:²¹⁰

"We find it difficult, however, to draw a clear line between cultivation by farm-servants and subletting. Subletting is rarely on a money rental. It is commonly on a sharing system, the landlord getting 40 to 60 or even 80 per cent of the yield and the tenant the rest. The tenant commonly goes on from year to year eking out a precarious living on such terms, borrowing from the landlord being supplied by him with seed, cattle and implements. The farm-servant, on the other hand, uses the landlords seed, cattle and implements, gets advances in cash from time to time for petty requirements and is paid from the harvest either a lump sum of grain or proportion of the yield. The farm-servant may in some cases be paid a little cash as well as a fixed amount

²⁰⁸(FC, 1940, Vol II, Appendix VI, Pages 26-28).

²⁰⁹Half of the revenue in Madras was paid by joint pattas (tax holdings) (FC, 1940, Vol II, Appendix VI, Page 29).

²¹⁰For an economic analysis of permanent servants, see (Hayami & Otsuka, 1993, Chapter 4).

Table 3.21: The Distribution of land in Sind, 1936-7

| Size of Holding (Acres) | Total Owners | Total Area | Share of Owners | Share of Area |
|-------------------------|----------------|------------------|-----------------|---------------|
| <5 | 74,511 | 258,508 | 29.93 | 2.69 |
| 5 to 15 | 74,880 | 735,980 | 30.08 | 7.65 |
| 15 to 25 | 35,953 | 723,608 | 14.44 | 7.52 |
| 25 to 100 | 45,328 | 2,126,730 | 18.21 | 22.1 |
| 100 to 500 | 11,377 | 2,285,519 | 4.57 | 23.75 |
| 500 < | 6,874 | 3,494,919 | 2.76 | 36.31 |
| Total | 248,923 | 9,625,264 | 100 | 100 |

Source: Calculated from (GoI, 1938a, Pages 46-7).

of grain. The tenant may cultivate with his own stock and implements but there is in practice no very clear line between the two, and when the landlord is an absentee it is not always obvious whether the actual cultivator is a farm-labourer or a sub-tenant.²¹¹

By "subletting" here, the authors of the report really mean letting. Since the permanent servants were not, strictly speaking, tenants their master was technically an owner cultivator, even if he did next to nothing in the way of cultivation. Bengali *raiya*s were in a much more favourable position than tenants and quasi-tenants in Madras who had to fork over around half the produce. Tenant right existed in field systems too, but it was not as frequent.²¹² That a *ryotwari* system could co-exist with large scale land inequality and widespread insecure tenancy was not merely a theoretical possibility. The most fertile *ryotwari* regions, particularly those with irrigation facilities or high rainfall, i.e. those most comparable to Bengal, were dominated by a small number of landlords. This is clearest in Sind (now in Pakistan), and the distribution of land there in 1936-7 is summarized in Table 3.21. This extreme inequality was after the government dealt "directly with the occupants of land", who, as if to confuse virtually everyone, happened to be known as "*zamindars*".²¹³

The top 7 per cent of the landowners, 20,000 people, owned half of all the land. The majority of this was irrigated, but half the land was fallow each year. My rough calculations suggest that a landlord earned approximately 12.2 Rupees per cultivated acre.²¹⁴ This would give the

²¹¹(GoI, 1930a, Vol I, Pages 14-15).

²¹²These are covered in (GoI, 1894).

²¹³(Hughes, 1876, Page 82).

²¹⁴The 1935-6 agricultural statistics give the harvest price of wheat as Rs 2.5 per maund (of 82.28 lb), I assume

Table 3.22: Distribution of Land, Bombay 1929

| Size of Holding | Holders | Area | Percentage of Holders | Percentage of Area |
|-----------------|------------------|-------------------|-----------------------|--------------------|
| <5 | 1,013,465 | 2,362,484 | 46.3 | 8.84 |
| 5-15 | 624,270 | 5,595,138 | 28.52 | 20.94 |
| 15-25 | 248,790 | 4,847,182 | 11.37 | 18.14 |
| 25-100 | 280,568 | 9,540,119 | 12.82 | 35.71 |
| 100-500 | 20,876 | 3,427,980 | 0.95 | 12.83 |
| 500 < | 918 | 943,547 | 0.04 | 3.53 |
| Total | 2,188,887 | 26,716,450 | 100 | 100 |

Source: (GoI, 1930b, Pages 13-14). **Note:** This includes survey tenure land only.

20,000 landlords here approximately 35 million Rupees per year. It was not just Sind that had substantial *ryotwari* inequality. Malabar²¹⁵, Burma²¹⁶, and Tanjore²¹⁷ are cases in point. Elsewhere land was also not particularly evenly distributed in the *ryotwari* tracts: Table 3.22 outlines the distribution of field-survey land in Bombay Presidency (excluding Sind).

Madras Presidency had both field assessment areas and *zamindari* estates. Tenants of the estates apparently paid higher rents than those in Bengal, although they were otherwise given hereditary and transferable rights by statute in 1908, but there was substantial inequality within the field assessed regions. Table 3.23 outlines land inequality in the field assessment parts of Madras in 1929. A few things stand out. First, there was a very large number of land owners: approximately 10.4 million. Second, the majority of these pay little in the way of revenue and hold little in the way of land: the bottom 74 per cent of land owners pay only 23 percent of the land tax, and hold 35 per cent of the area. Third, larger landholders tend to pay higher rates of revenue per acre, i.e. they also controlled the more fertile land. The small holders did not have a sufficient holding to live on, and therefore would have taken on additional land as tenants or worked as a labourer. To qualify as a "peasant proprietor" in Madras merely required you to own a few fractions of an acre of dry land. The top 366,000 landholders (3.5 per cent of the total) held a quarter of yields around 900 lb per acre (slightly less than the irrigated figure), and the average rate of land tax per cultivated area was round Rs 3.5. Since landlords took half the crop (assumed to be worth 31.44/2 Rupees) as rent, they had a post tax income of around 12.2 Rupees). It is worth noting that the agricultural statistics weren't that accurate (GoI, 1936).

²¹⁵(Logan, 1882, Vol 1, Pages XXVI-XXXVIII).

²¹⁶58 per cent of the land was tenanted in lower Burma (with a climate like Bengal) (Government of Burma, 1939, Part I, Page 8).

²¹⁷Tanjore was the most fertile district in Madras. "Tanjore is eminently a district of large landholders" (Hemingway, 1906, Pages 110-11).

Table 3.23: Land Inequality in Ryotwari Madras, 1929

| Size of Holding (Acres) | Holders | Area | Revenue (Lakhs) | Acres per Holder | Revenue per Holder | Revenue per Acre | Share of Holders | Share of Area | Share of Revenue |
|-------------------------|-------------------|-------------------|-----------------|------------------|--------------------|------------------|------------------|---------------|------------------|
| <1 | 2,396,000 | 603,000 | 6.37 | 0.25 | 0.27 | 1.06 | 23.03 | 2.26 | 1.13 |
| 1-10 | 5,273,000 | 8,998,000 | 122.45 | 1.71 | 2.32 | 1.36 | 50.68 | 33.72 | 21.69 |
| 10-30 | 1,925,000 | 7,560,000 | 152.05 | 3.93 | 7.9 | 2.01 | 18.5 | 28.33 | 26.93 |
| 30-50 | 445,000 | 3,004,000 | 75.73 | 6.75 | 17.02 | 2.52 | 4.28 | 11.26 | 13.41 |
| 50-100 | 241,000 | 2,624,000 | 76.62 | 10.89 | 31.79 | 2.92 | 2.32 | 9.83 | 13.57 |
| 100-250 | 97,000 | 1,962,000 | 64.87 | 20.23 | 66.88 | 3.31 | 0.93 | 7.35 | 11.49 |
| 250-500 | 19,000 | 844,000 | 29.81 | 44.42 | 156.89 | 3.53 | 0.18 | 3.16 | 5.28 |
| 500-1000 | 6,000 | 526,000 | 18.69 | 87.67 | 311.5 | 3.55 | 0.06 | 1.97 | 3.31 |
| 1000< | 3,000 | 560,000 | 18.03 | 186.67 | 601 | 3.22 | 0.03 | 2.1 | 3.19 |
| Total | 10,405,000 | 26,681,000 | 564.62 | 2.56 | 5.43 | 2.12 | 100 | 100 | 100 |

Source: (GoI, 1930a, Page 16). **Notes:** I have combined single and joint pattas, fortunately the number of share holders was given for joint ones.

the area and paid 36 per cent of the revenue. Assume that the land revenue formed 2/7 of the economic rent.²¹⁸ In that case this number of landowners would earn 41.6 million Rupees as rent after tax. Inequality here was less than in Sind, but seemingly greater than in Bombay. It was also highly persistent: Dharma Kumar found basically unchanged gini coefficients for land inequality in Madras between 1853 and 1951.²¹⁹

Estate systems, or *Mahalwari*

What, then, about the *Mahalwari* and *Zamindari* systems? These two were actually one and the same, so far as the land revenue was concerned, as the unit of assessment in both cases was the *mahal*, or estate. An estate did not necessarily mean the temporal interest of a single individual in land (as it did in England), for an estate was owned by a proprietary body.²²⁰ The *mahal* was simply this: an area for which the owners of land had joint responsibility for the land tax assessment levied upon it. An estate may have been no larger than a survey field, but it could also cover multiple villages.²²¹ The members of the proprietary body, who could number anywhere from one to hundreds, had joint responsibility for the land revenue (which was often little more

²¹⁸This is an overstatement, answers given to members of the Floud Commission, who were visiting Madras, gave the average more like 1/7 (FC, 1940, Vol II, Page 29).

²¹⁹(Kumar, 1975).

²²⁰(Thomason, 1858, Page 8).

²²¹"The estates may be of any size ; they may even be no larger than what in the Madras or Bombay Presidency are called fields" (Thomason, 1858, Page 14).

than a legal fiction) while each had distinct property rights. The tax assessment on each estate was determined by survey operations (or fixed at the time of a Permanent Settlement), and its distribution among shareholders varied according to their rights in land and/or custom.

Management of an estate may have been in common, and this was termed "*zamindari*", obviously including the case of a single proprietor, but the members of the proprietary body could instead manage their shares separately, and this was termed "*pattidari*" or "*bhaiyachara*". *Pattidari* referred to land being held separately according to ancestral shares, while *bhaiyachara* meant holdings purely according to possession, with no link except theoretical joint tax responsibility.²²² *Pattidari* estates could be partitioned and this would create multiple *zamindari mahals* from one *pattidari mahal*, while one shareholder buying out his neighbours would convert a *pattidari mahal* into a *zamindari* one.²²³ This distinction was not made by the government between estates in the permanently settled regions, which were all recorded as "*zamindari*" but separate management of shares, and therefore *pattidari* and *bhaiyacharia* estates, was common - which would be recorded as "peasant proprietors" if we were to follow Banerjee and Iyer's schema - although the precise extent would be impossible to ascertain.²²⁴

Imagine a single patriarch owning land, which pays some tax to the government as a single *zamindari mahal*. He dies, and his children inherit the land. If they continue to manage the estate in common, paying out the profits in accordance with their ancestral shares, after defraying the land tax out of the aggregate, then the *mahal* was known as a joint *zamindari* estate. If, after a few generations, each branch of the family decides to manage their shares independently, but retaining their joint revenue responsibility, then the *mahal* becomes a *pattidari* estate. Now suppose that the branches want to get rid of joint responsibility: they partition the *pattidari mahal* into so many *zamindari* mahals. The nature of rights in land has not changed whatsoever, but the land revenue classification has.

The *mahalwar* system was an outgrowth of the laws of inheritance and North Indian customs, but shares in estates could be bought and sold, and so non-family members could acquire rights to

²²²(Thomason, 1858, Page 56-9).

²²³(Thomason, 1858, Page 55).

²²⁴Nirad Chaudhuri, the Bengali author, wrote, for example, that: "Although [the family branches] maintained the outward appearance of one joint family it really was not so, because after the death of ... the old generation all the more important properties ... had been divided among the heirs" (Chaudhuri, 1951, Page 49).

land, either continuing joint responsibility with the other shareholders, or asking for a partition. The *mahalwar* revenue system was compatible with any land tenure system. There were tenures upon which it was possible to hold land under the proprietary body, which, although not proprietary rights, were often valuable property rights - as Bengal testifies. The *mahalwari* system was fundamentally a flexible one, which could be adjusted to any distribution of land rights, but which developed out of the peculiarities of pre-colonial rights in land in North India.²²⁵ And so it simultaneously covered Bengal, with distinct landlord classes but strong tenant right, Oudh, with large estates and many tenants at will, and the Punjab, with proprietary bodies usually consisting of smallholder peasants but also many at will tenancies.

The distribution of land tax payments in the Punjab in the late 1930s is outlined in Table 3.24. As the land revenue bears some relation to rent, since (unlike Bengal) the majority of tenants in the Punjab were tenants-at-will, it is an indicator of land inequality. The top 6.3 per cent of tax payers paid 41 per cent of the total, while the bottom 50 per cent paid only 7.61 per cent of the total. The Punjab Land Revenue Commission report estimated the gross produce to have been worth around 720 million Rupees in the middle 1930s.²²⁶ Assume that economic rents were one-third of this (sharecroppers paid between this and half the crop), which would give us 240 million Rupees as rent. The government took approximately 42 million Rupees as tax. Landowners as a whole are left with 198 million Rupees. Assuming that revenue was directly proportional to rent, this would give the top 6.3 per cent of revenue payers, around 218,000 people, $198 * 0.41 = 81.18$ million Rupees.

For some *mahalwari* regions, tenant right throws a spanner into the works of most attempts to estimate inequality from land revenue figures. This is most obvious in Bengal, but it is also true for Bihar and most of the United Provinces, and it is what Iverson, Palmer-Jones, and Sen were talking about in the Central Provinces too.²²⁷ Bihar was much like Bengal, with two key differences: Subinfeudation was not very common, and South Bihar had a large proportion of share tenants at will due to its irrigation system.

²²⁵Or so claimed James Thomason: "The system can be introduced into any part of the country, and adapted to the existing state of property, whatever that may be. One of its chief features is, that it professes to alter nothing, but only to maintain and place on record what it finds to exist" (Thomason, 1858, Page 15).

²²⁶(GoI, 1938b, Page 11).

²²⁷(Iverson *et al.*, 2013).

Table 3.24: The Distribution of Land Tax Payments: The Punjab 1936

| Revenue per Payer | Number of Payers | Revenue | Share of Payers | Share of Revenue |
|-------------------|------------------|-------------------|-----------------|------------------|
| <5 | 1,759,260 | 3,226,440 | 50.7 | 7.61 |
| 5-10 | 659,739 | 4,635,329 | 19.01 | 10.93 |
| 10-20 | 491,004 | 6,828,331 | 14.15 | 16.11 |
| 20-50 | 342,198 | 10,418,610 | 9.86 | 24.58 |
| 50-100 | 168,025 | 6,474,132 | 4.84 | 15.27 |
| 100-250 | 41,118 | 5,591,775 | 1.18 | 13.19 |
| 250-500 | 6,277 | 2,213,270 | 0.18 | 5.22 |
| 500-1,000 | 1,825 | 1,253,547 | 0.05 | 2.96 |
| 1,000-5,000 | 775 | 1,368,562 | 0.02 | 3.23 |
| 5,000-10,000 | 23 | 151,406 | 0.01 | 0.36 |
| 10,000 < | 4 | 228,639 | 0.01 | 0.54 |
| Total | 3,470,248 | 42,308,738 | 100 | 100 |

Source: (GoI, 1938b, Appendix 1). Similar figures for 1925 can be found in (Calvert, 1925).

The United Provinces (of Agra and Oudh) were disunited so far as land tenure systems were concerned, even if all parts had similar land revenue systems. Table 3.25 presents the distribution of land tax payments in the United Provinces in 1947. It shows an extremely skewed distribution of land tax payments, and therefore presumably rental income. Even then, the top 306,253 revenue payers earned 91.8 million Rupees - a sum not far from that earned by the 3,300,000 tenure holders and 300,000 *zamindars* in Bengal combined. Indeed, it is surprisingly close to the figure I worked out above for the top 200,000 Punjabi landlords, although there was far more inequality within the landlord classes in UP. However, the gross rental for the province did not equal the whole economic rent because there were many customary tenants. The distribution of land between these different types of holdings is presented in Table 3.26. That landlords were willing to recognise tenant right on 30 to 40 per cent of the area of their estates does not suggest that they were particularly oppressive.

There were three main distinct areas, in UP, so far as land tenure was concerned.²²⁸ The first was in the East of the province around Benares, which was permanently settled like Bengal. Also like Bengal, much land was held by fixed rent tenants with heritable and transferable interests. In Agra division, the West and South of the province, your average *zamindar* was a petty landlord, who often cultivated himself. Tenancy, however, was still the rule rather than the exception.

²²⁸William Moreland's account is the classic, (Moreland, 1911, Chapters 10 (Agra) and 11 (Oudh)). Moreland was both a colonial official and a historian.

But a significant share of the tenants there had occupancy rights. These were less valuable than those in Bengal - being non-transferable, with restrictions on subletting, and higher rents despite poorer yields. In 1935-6, occupancy tenants in Agra paid on average 4.9 Rupees an acre as rent, while tenants without customary rights paid 7.9 Rupees an acre, so a rough calculation would give them 3 Rupees an acre of rent.²²⁹ The other tenants were tenants-at-will or leaseholders.²³⁰ Here occupancy tenancies could have disappeared with the passage of time, but they instead persisted, and if anything became more common. Since they were substantially inferior than those in Bengal, I view this as a bit of a puzzle. Here customary tenancies were likely to have been rather inefficient. Interwar legislation provided statutory life tenancies to virtually all tenants, by which point the original aim of tenancy legislation - the protection of pre-existing rights - had been long forgotten.

At last we come to the one concrete example of a *mahalwari* region where the tenants were actually at the mercy of their landlords - Oudh. Oudh was the last part of North India to come under British rule in 1856. There they found *taluqdars* in possession of large estates, which, in the popular anti-landlord story, were supposedly the product of the anarchic period of the 18th and 19th centuries, having been expanded by the use of force and political machinations.²³¹ While there is certainly some truth to this statement, a glance at the family histories reported in the District Gazetteers suggests that the rights of the *taluqdars* were often of much older origin.²³² However, there were a number of estates of the standard *zamindari* and *pattidari* types, plus a number of "sub-settlements", where the *taluqdar* merely received a small rent as recognition of his superior right, and the village *zamindars* (petty landlords) were really in control.²³³ There was also an extensive debate within the government whether or not tenant right existed in Oudh. Detailed local enquiries were made, and the answer was almost always no.²³⁴ As a result, tenant right was not put into legislation. The contrast here is with the Punjab (or Bengal), where after a prolonged back and forth on the matter, a tenancy act was passed to protect only those with rights, although the majority did not have any.²³⁵ Official ideas about policy ultimately

²²⁹(Pant, 1948, Vol II, Page 88). See also (Stokes, 1975).

²³⁰(Moreland, 1911, Pages 60-61).

²³¹E.g. (Sleeman & Reeves, 1971). See also (Irwin, 1880).

²³²E.g. (Nevill, 1904, Pages 84-120). See also (Sarvadhikari, 1882).

²³³(Irwin, 1880, Page 13).

²³⁴(Sarvadhikari, 1882, Chapter III).

²³⁵E.g. (Hambly, 1964).

Table 3.25: Distribution of Land Revenue Payments: United Provinces

| Annual Revenue Payment | Number of Payers | Revenue (Lakhs) | Implied Post Tax Recorded Rental | Cumulative Payers (Top Down) | Cumulative Post Tax Rent (Top Down) |
|------------------------|------------------|-----------------|----------------------------------|------------------------------|-------------------------------------|
| <25 | 1,710,530 | 100.5 | 159.13 | 2,016,783 | 1,077.842 |
| 25 to 50 | 142,890 | 50.02 | 79.2 | 306,253 | 918.709 |
| 50 to 75 | 53,288 | 32.52 | 51.49 | 163,363 | 839.504 |
| 75 to 100 | 28,369 | 24.57 | 38.91 | 110,075 | 788.013 |
| 100 to 150 | 27,861 | 34.05 | 53.92 | 81,706 | 749.102 |
| 150 to 200 | 14,473 | 24.83 | 39.31 | 53,845 | 695.185 |
| 200 to 250 | 9,230 | 20.68 | 32.75 | 39,372 | 655.875 |
| 250 to 500 | 16,758 | 59.2 | 93.74 | 30,142 | 623.122 |
| 500 to 1,000 | 7,491 | 51.73 | 81.91 | 13,384 | 529.383 |
| 1,000 to 1,500 | 2,362 | 28.76 | 45.54 | 5,893 | 447.472 |
| 1,500 to 2,000 | 1,076 | 18.68 | 29.57 | 3,531 | 401.934 |
| 2,000 to 2,500 | 588 | 13.19 | 20.88 | 2,455 | 372.36 |
| 2,500 to 3,000 | 393 | 10.74 | 17 | 1,867 | 351.476 |
| 3,000 to 3,500 | 242 | 7.85 | 12.43 | 1,474 | 334.475 |
| 3,500 to 4,000 | 179 | 6.72 | 10.63 | 1,232 | 322.043 |
| 4,000 to 4,500 | 135 | 5.71 | 9.05 | 1,053 | 311.409 |
| 4,500 to 5,000 | 114 | 5.39 | 8.54 | 918 | 302.362 |
| 5,000 to 10,000 | 414 | 29.29 | 46.38 | 804 | 293.819 |
| 10,000 to 15,000 | 148 | 18.41 | 29.15 | 390 | 247.441 |
| 15,000 to 20,000 | 65 | 11.17 | 17.69 | 242 | 218.289 |
| 20,000 to 25,000 | 26 | 5.87 | 9.3 | 177 | 200.599 |
| 25,000 to 30,000 | 31 | 8.4 | 13.29 | 151 | 191.302 |
| 30,000 to 35,000 | 16 | 5.26 | 8.32 | 120 | 178.008 |
| 35,000 to 40,000 | 20 | 7.49 | 11.87 | 104 | 169.686 |
| 40,000 to 45,000 | 11 | 4.65 | 7.37 | 84 | 157.819 |
| 45,000 to 50,000 | 6 | 2.87 | 4.55 | 73 | 150.449 |
| 50,000 to 100,000 | 38 | 27.71 | 43.88 | 67 | 145.899 |
| 100,000 < | 29 | 64.43 | 102.02 | 29 | 102.021 |

Source: (Pant, 1948, Vol II, Pages 1-2). **Notes:** Page 87 gives the ratio between post tax rent and revenue payments as 1.583. I use this figure to get the implied post tax rental from revenue payments. This table ignores sub-settlement holders etc, of which there were 324,782 (some double counting), in 1945 (Pant, 1948, Vol II, Page 52).

Table 3.26: Distribution of Land by Tenure: United Provinces

| Year | Landlord Home Farm | Customary Tenants | Tenants-at-Will, Leaseholders, Misc | Statutory Tenants | Total Area |
|-----------------------|--------------------|-------------------|-------------------------------------|-------------------|------------|
| 1899-1900 | 7,150,000 | 10,240,000 | 18,920,000 | 0 | 36,310,000 |
| 1926-27 | 6,930,000 | 16,290,000 | 2,170,000 | 13,050,000 | 38,440,000 |
| 1935-36 | 7,330,000 | 15,180,000 | 2,770,000 | 14,030,000 | 39,310,000 |
| Economic Rents | Yes | No | Yes | No* | |

Source: (Pant, 1948, Vol II, Page 90). **Notes:** *Statutory tenants had life long leases, which meant that they had to pay a premium (*nazrana*) at the start of a lease; this was the capitalised value of the expected difference between the existing rent and the economic rent. Perhaps the law made any future tenants worse off, since they could have purchased a lifetime lease in the first place, unless it dealt with landowner monopoly power.

mattered less than the pre-existing state of things. Although unconstrained by custom, the *taluqdars* proceeded to do next to nothing to improve their estates. In the 1920s, most existing tenants were given life tenancies by statute - custom and private property rights had once again been lost sight of.

3.H.3 Summary

In this quick tour of the historical land revenue and land tenure systems of the majority of the Indian subcontinent, I hope to have convinced the reader that the Bengali *zamindars* were not a particularly well-off bunch, and that their contribution to inequality has been greatly over-stated, even in comparison to the *ryotwari* regions that were supposedly full of owner-cultivators. Table 3.27 presents estimated Gini Coefficients for some of the regions discussed here. It is worth noting that the landless are excluded from these figures and data limitations mean that these estimates are not perfect. In all regions, independently of the revenue set up, inequality was high, especially when you look at revenue paid (which correlates better with actual rents earned) rather than areas held.

That there was substantial inequality in the supposedly peasant proprietor regions of India invites us to reconsider the causes of agricultural stagnation. Small peasant proprietors may not have had the resources, education, or credit to finance higher yields. But the majority of land in India, ignoring regions where tenant right was important, was controlled by small number of

Table 3.27: Estimated Gini Coefficients for the Other Provinces

| Where? | Inequality of What? | Gini | Notes |
|------------|---------------------|-------|---|
| Madras (F) | Area | 0.497 | Excludes Estates and Inam Land: Understatement. |
| Madras (F) | Revenue/Rent | 0.641 | Excludes Estates and Inam Land: Understatement. |
| Bombay (F) | Area | 0.574 | Excludes Estates and Inam Land: Understatement. |
| Sind (F) | Area | 0.735 | |
| Punjab (E) | Revenue/Rent | 0.655 | Excludes Occupancy Tenants: Small Overstatement. |
| UP (E) | Revenue/Rent | 0.794 | Excludes Customary Tenants: Substantial Overstatement.* |

Sources: Calculated from Tables 3.23, 3.22, 3.21, 3.24, and 3.25. **Notes:** F stands for field system, and E stands for estate based revenue systems. All figures exclude the landless from comparisons; they are underestimates for this reason. Since larger holdings also tended to hold more valuable land, the Bombay and Sind figures are probably underestimates (note the difference between the two Madras estimates). * Table 3.26 gives around 15 million acres held by customary tenants. In the main text I suggested that they got 3 Rupees an acre as the gap between the economic rent and their own rent, implying that they kept 45 million rupees of land rents. An attempt to update the gini coefficient to account for these would require assumptions about inequality within this class, as ignoring it leads to a figure of 0.58 - too low.

wealthy, presumably educated people. Each year they earned a handsome rent, even accounting for the fact that they paid the most taxes out of anyone in India. Being literate, or easily capable of becoming so, they were in a position to learn about agricultural advances elsewhere and the experiments made by the agricultural departments. It does not take a rare genius to think that applying fertilisers and irrigation may increase your income. Yet this they did not do. Making an effort would certainly not have bankrupted Indian landowners. In the tenant right regions, landlords could have bought out their tenants and built up their home farms, if they thought they were bad cultivators. But they did not - small farmers passed the market test. Substantial agricultural growth required the HYVs of the Green Revolution, and by that point climate mattered much more than historical inequality.

Chapter 4

Indian Deindustrialization: Trade or Technology?

4.1 Introduction

The standout industry of the Industrial Revolution was the cotton textile industry in England, and, since India was the largest producer and exporter of cotton textiles before the 19th century, English industrial growth is meant to have caused major economic problems and industrial job losses for India - deindustrialization. By the 20th century this was a core component of nationalist thinking in India, and the fact that India was a British colony at the time seems to provide a clear motive.¹ Indeed, cotton textiles were the major Indian import from the UK during the colonial era. A story, which would fit in nicely with the modern institutionalist literature, may go like this: Indian industries were destroyed, the people were forced to resort to a crowded agriculture, where the majority of land was owned by a few exploitative landlords (but see Chapter Two). India was "reduced" from an exporter to manufactures to an exporter of raw cotton. Poverty was the result, this past distribution of wealth was perhaps unfavourable for later economic growth.²

The inclusion of the spinning wheel, the *charka*, on the Indian flag is emblematic of the potency of such an argument. Upon deeper reflection, however, the facts appear rather confusing. Unlike in Europe, hand loom weaving survived to a large extent in India. Even more curiously, by the early 20th century India had one of the world's largest factory cotton textile industries.³ It seems that India, in fact, had the best of both worlds: the survival of artisanal tradition and the adoption of industrial modernity. British textile imports received no imperial preference until a time when the Indian industry was already sheltered behind high tariffs. Much Indian cotton was used by home manufacturers, and very little of it went to the metropole. This is extremely hard to square with the basic intuitive political economy argument, surely a colony could not be allowed to industrialize? Surely the whole point of colonies is to extract raw materials for the metropole and form a captive market for exports? Non-settler colonies are supposed to have insecure property rights, and yet Indian capitalists never got expropriated.⁴

British India is a striking demonstration of the limits of the simple political economy argument and much of the puzzle can be resolved if we note that among the strongest proponents of the

¹(Chandra, 1966).

²The institutionalist framework is outlined in (Acemoglu *et al.*, 2004).

³(Pearse, 1930).

⁴(Acemoglu *et al.*, 2001).

”deindustrialization” argument were Indian factory owners themselves. A truly deindustrialized India would not have had such a class in the first place. They clearly stood to benefit by excluding cheaper foreign imports, and since their economic interest happened to align with the nationalist movement, they worked together, politically speaking.⁵ During the late colonial era, Indian industrialists eventually successfully maneuvered for tariffs to protect the supposedly infant Indian factory industry. It mattered not that, as Alfred Marshall pointed out in a response to a student asking for his support for the protectionist cause, ”an industry that employs a quarter of a million people cannot be described as ’an infant.’”⁶ Since economic planning and control by the state was in vogue after the war, Indian textile industrialists found themselves restricted and handicapped left, right, and center: The ultimate result of their bargain was that of Marlowe’s Faust, not Goethe’s. The Gandhian strand of nationalist political thought was not just anti-import, but also anti-technology. Spinning wheels and hand looms were idolised more than the ring spindle or the power loom. Investment in the factory sector so far as weaving was concerned was restricted to favour the hand loom weaver.⁷ Imports had been a minor factor since the 1930s, and yet employment in cotton textiles was not particularly high. Someone in the Indian government must have thought that technology was a more important factor in the decline in cotton manufacturing employment than trade.⁸

Both the magnitude and timing of deindustrialization have been subjects of dispute. Early accounts focused on European tariffs and bans on the importation of Indian cotton cloths in the 18th and early 19th centuries. However useful exaggerating the scale of former Indian exports was to the British Mercantilists and other protectionists (including, entertainingly, later Indian ones), this, and the superior availability of archival sources from the European East India Companies, has resulted in a major over-emphasis on foreign trade in much of the literature.⁹ Exports were a small share of production, and their rise and fall are really a minor sub-plot in the overarching story of Indian textiles. Most accounts would now place the timing of deindustrialization in the latter half of the 19th century, after all of the technological advances of the Industrial

⁵(Markovits, 1985) , (Leadbeater, 1993).

⁶(Marshall *et al.*, 1925, Page 457).

⁷Small scale power loom factories tended to negate this. (Mazumdar, 1984).

⁸Technology can harm labour, see (Acemoglu & Restrepo, 2019) for a modern perspective and (Schneider, 2023) for the decline of hand spinning in the UK during the Industrial Revolution.

⁹On the Mercantilists, see (Thomas, 1926). For Indian early modern textile trade see (Riello & Roy, 2009).

revolution in cotton textiles, particularly the power-loom, were made.¹⁰ The introduction of the railway and steamship reduced trade costs, and allowed for the spread of mill made products, including those manufactured domestically, to the interior of India. On the subject of magnitude, spinning and weaving must be considered separately.¹¹ The advance in labour productivity due to mechanization was greater for spinning than in weaving, and since weaving is downstream from spinning, machine spun yarn helped hand loom weavers by lowering input costs.¹²

Part of the debate has been on whether population growth resulted in higher weaving employment in absolute terms, although with a decline in the workforce share. This is the distinction between absolute and relative deindustrialization. Alternatively, one could use "deindustrialization" to mean the fact that India did not see major structural change into industry in this period - deindustrialization relative to the rest of the world. I don't think this is a particularly useful definition, as India did in fact see the growth of a major modern industrial sector in the colonial era that would be cited as successful industrialization by the standards of any other country without such a large population.

This chapter consists of two main sections. The first examines the facts of the case. I build on existing work and construct my own estimates of cotton textile employment. I then examine the big picture up to 1940, particularly the relationship between power loom and hand loom cloth, the path of earnings, and regional variation, in order to develop a coherent story for the cotton textile industry in this period. The second section examines the "what ifs". I use is a general equilibrium model. After outlining and calibrating the model, assuming an open economy, I consider two counterfactual scenarios, both with a closed economy, but in one modern technology in textile manufacturing is permitted, and in the other technology is forced to stay at early 19th century levels, which were little different to those in the 17th and 18th centuries. By comparing the path of employment in the three scenarios, we can determine whether trade or technology was more important in the decline in employment. The simulations suggest the latter was.

¹⁰E.g. (Ray, 2009), (Broadberry & Gupta, 2009) (Twomey, 1983) (Roy, 2020, Chapter 2). Clingingsmith and Williamson argue that most deindustrialization took place between "c1750-c1860", but, as we will see, this does not seem to be the case (Clingingsmith & Williamson, 2008).

¹¹A. K. Bagchi pioneered the quantitative analysis of deindustrialization in an article that looked at Bihar. (Bagchi, 1976). His article provoked quite a large debate, see (Orr, 1980), (Krishnamurty, 1985), and (Vicziány, 1979).

¹²(Morris, 1963).

4.2 The Facts

4.2.1 Output

What can be said about the facts and figures of deindustrialization? Table 4.1 presents Tirthankar Roy's estimates of the production and trade of cotton yarn and cloth in India between 1820-1940, to which I have made a few adjustments, particularly in 1900.¹³ Let us start with weaving. Throughout the period, consumption of cloth in India grows. Imports do become an important component of cloth consumption after 1840. Hand loom output falls between 1860 and 1880, but has exceeded its previous peak by 1900. Around half of this decline is made up for by the growth of Indian factory output between 1860 and 1880. The factory weaving sector continuously grows, and overtakes imports by 1920. Hand loom output grows after 1880, and is higher than ever in the 20th century. Spinning is a slightly different story. Yarn output never actually declines. The growth in Indian mill production between 1860 and 1880 exceeds the decline in hand spinning. Hand spinning does not survive on a large scale after 1880. Yarn output continues to grow, but much of this is consumed abroad, and so net exports formed a major share of production between 1880 and 1920. By 1940, Indian weaving has grown to the extent that India is a net importer of yarn again.

4.2.2 Employment

So much for output, what about employment? Table 4.2 divides the output figures above by my estimates of average labour productivity (see Appendices 4.G and 4.F) to get series for employment. I have been conservative in my productivity estimates, so these are more likely to be over rather than underestimates (of employment, and therefore also job losses), and removing this conservatism would probably reduce weaving employment before 1900 by 25 per cent.¹⁴ Since Roy had no hand spun yarn produced in 1900 and 1920, hand spinning employment is zero for these years, but in reality it was probably close to the 1940 figure. There are two employment

¹³Roy also offers a range of figures for 1795, 171-200 million lb of yarn spun, i.e. 6 to 24 per cent more than his 1820 estimate. These figures are difficult to square with his description of his estimation procedure, which assumes that cotton production was either constant or per capita consumption of cloth in India was constant (Roy, 2020, Chapter 2). His figures for net exports of cloth are 22 and 23 million yards in 1795 and 1820 respectively, suggesting that local manufacture did not decline by much (see also Figure 4.6 below), so the growth in raw cotton exports was the result of increased production rather than reduced local consumption.

¹⁴Appendix 4.H compares my employment estimates with previous work.

declines of note. The first takes place between 1860 and 1880: Employment in both spinning and weaving drops. For weaving, this is partially due to Indian power loom weaving but also due to imports, and was at most 0.9 million between 1860 and 1880 (although employment temporarily rose thereafter). For spinning, there is an employment decline of 3.75 million. Yarn output never declines, so it is clearly due to the growth of the Indian mills. Were these large employment declines relative to the population? Robert Allen estimates around 0.25 million cotton hand loom weavers losing their occupation in Britain as a result of the power loom, and Benjamin Schneider has estimated that there were half a million hand spinners just before mechanization.¹⁵ Given that the British population in this period was no more than 10 per cent of the Indian level in 1860 (circa 250 million), the industrial revolution was more disruptive in the former than the latter.¹⁶ However, there is a second "deindustrialization" in India - a hand loom weaving employment decline between 1900 and 1940 - that has largely been ignored by the literature. What on earth was going on?

The above figures only provide employment for seven baseline years. To gain a clearer picture, Figure 4.1 presents my estimates for hand loom employment in the early 20th century at a higher frequency. The underlying output data were taken from the 1942 Report of the Fact Finding Committee (Handlooms and Mills), henceforth FFC, but I adjusted the square yardage using Roy's yarn to cloth ratio rather than the FFC's.¹⁷ I then used the production function from the model below (with the productivity parameter interpolated) to estimate employment.¹⁸ There is a clear employment decline, particularly after 1905.

Our estimated weaving employment decline during the first deindustrialization was approximately 0.89 million. The second deindustrialization appears to have a comparable decline between the early 1900s and the 1930s. Table 4.2 suggests a drop of 0.74 million, which is consistent with our figures here. It is remarkable how little emphasis the second decline has received. Cer-

¹⁵(Allen, 2018, Table 1), (Schneider, 2023, Figure 4), see also (Muldrew, 2012). As a guess, at least 150,000 wool and linen weavers should be added.

¹⁶Later on I'll estimate 6.49 million hand spinner jobs lost to technology in China. Between 1850 and 1887 Japanese farmers apparently grew 49-67 million lb of raw cotton (Ramsmeier, 1993, Page 155). Using my figures for raw cotton to yarn conversion and productivity, that would be an average of 1.059 million hand spinners before mechanization. India was not unique.

¹⁷(GoI, 1942, Page 288, Appendix XVIII). For the Years up to 1930, the FFC use a ratio of 4 square yards per lb, while Roy uses 5.2.

¹⁸ $Y = AL^\alpha$, and so $L = (Y/A)^{1/\alpha}$, I assume α equals 0.75.

Table 4.1: The Indian Cotton Textile Industry, Output 1820-1940

| Year | Spinning Millions of lb of Yarn | | | | Weaving Millions of Square Yards | | | |
|------|------------------------------------|--------------|-----------------|----------------|-------------------------------------|----------------|--------------|-------------------|
| | Total Output | Hand Spun | Indian Mills | Net Exports | Total Output | Net Exports | Hand Loom | Indian Factory |
| 1820 | 161 | 161 | 0 | -3 | 1066 | 25 | 1066 | 0 |
| 1840 | 142 | 142 | 0 | -16 | 1027 | -198 | 1027 | 0 |
| 1860 | 168 | 168 | 0 | -31 | 1034.8 | -825.2 | 1034.8 | 0 |
| 1880 | 188 | 107 | 81 | 34 | 800.8 | -1332.2 | 677 | 123.8 |
| 1900 | 573 | 0 | 573 | 247 | 1695.2 | -2118.4 | 1144 | 551.2 |
| 1920 | 660 | 0 | 660 | 136.8 | 2984.8 | -1366.2 | 1284.4 | 1700.4 |
| 1940 | 1265 | 30 | 1235 | -16.4 | 5894.4 | -534.6 | 1945 | 3949.4 |

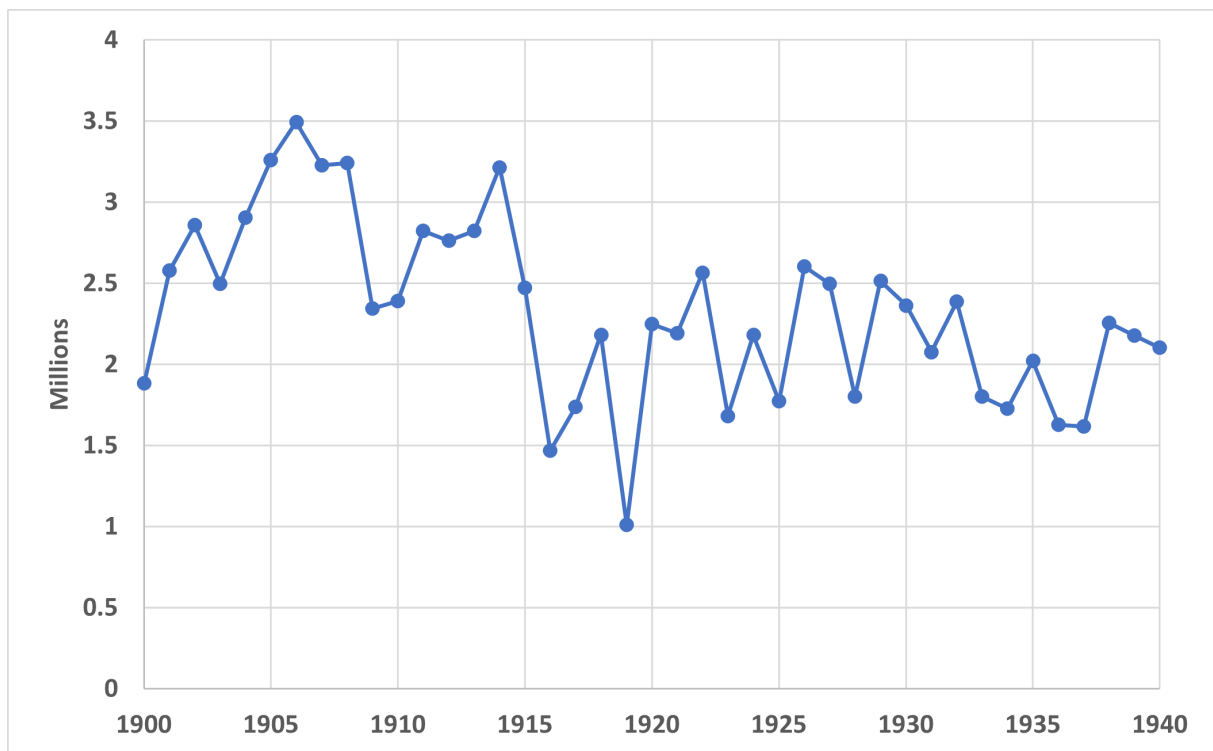
Source: The majority of figures come from (Roy, 2020, Chapter 2). Some of the export figures are calculated from official trade statistics. **Notes:** I have replaced Roy's 1900 figure with the FFC's figures for 1901-2. This was because yarn output in 1900 was unusually low due to a plague outbreak in Bombay. I have adjusted the FFC's lb of yarn to square yards of cloth ratio to Roy's in order to get consistent series for 1900 and 1920.

Table 4.2: The Indian Cotton Textile Industry, Employment 1820-1940

| Year | Spinning Employment (Millions) | | | Weaving Employment (Millions) | | |
|------|-----------------------------------|---------|-------|----------------------------------|---------|-------|
| | Hand | Factory | Total | Hand | Factory | Total |
| 1820 | 4.35 | 0 | 4.35 | 2.65 | 0 | 2.65 |
| 1840 | 3.84 | 0 | 3.84 | 2.55 | 0 | 2.55 |
| 1860 | 4.54 | 0 | 4.54 | 2.57 | 0 | 2.57 |
| 1880 | 2.89 | 0.035 | 2.925 | 1.68 | 0.009 | 1.689 |
| 1900 | 0 (0.81) | 0.133 | 0.133 | 2.84 | 0.029 | 2.869 |
| 1920 | 0 (0.81) | 0.226 | 0.226 | 2.43 | 0.085 | 2.515 |
| 1940 | 0.81 | 0.355 | 1.165 | 2.1 | 0.176 | 2.276 |

Sources: Employment equals output divided by labour productivity. Output figures are from Table 4.1. For hand spinning and weaving productivity, see Appendices 4.F and 4.G. For factory employment, see Appendix 4.M. **Note:** The 1940 figures are adjusted for the adoption of double shifts.

Figure 4.1: Estimated Hand Loom Employment, 1900-1940



Source: Employment inferred from a production function using output and productivity series: $Y = AL^\alpha$, and so $L = (Y/A)^{1/\alpha}$, I assume α equals 0.75. See text for details.

tainly, it has been remarked upon by specialists, but not by the popular accounts.¹⁹ Trade cannot have been to blame for this major employment decline, as tariff barriers were going up. Technology was responsible. After 1900, the hand loom weaver adopted the flying shuttle (already almost 200 years old, and known in India since the late 18th century) and other mechanical advances, which raised labour productivity.²⁰ An exception to this trend seems to have been the Punjab, where very few (five per cent) of the looms had fly shuttles, compared to Bengal and Madras (67 and 81 per cent respectively), and as a result it still had a disproportionate number of looms and employment.²¹ The persistence of hand spinning there may have been responsible, as such yarn often broke under the strain of the flying shuttle - productivity advances in hand loom weaving required the demise of the hand spinner.

4.2.3 Why the Hand Loom Weaver Survived, and then Declined Again

The evidence presented above suggests that there were two major deindustrializations. The reasons why the hand loom weaver largely survived the first deindustrialization, and why the second one occurred, are intimately linked. Let us examine the relationship between power loom cloth and hand loom cloth in more detail. Traditionally, the literature has stressed the displacement of hand loom production by the power loom, in particular imported power loom cloth. Our figures, however, suggest that this was a rather minor factor in the grand scheme of things. Once the segment of the market that was vulnerable to power loom competition was wiped out by 1880, it was instead as if the power loom and the hand loom had become friendly rivals, if not allies.

The main advantage of the power loom was speed. Mechanization allowed for faster weaving, but only for routine weaves. Cloths with complicated patterns tailored to individual tastes and coloured ones required frequent changes of weft yarns, slowing things down. Here the lower capital costs of the hand loom were to its advantage, since the power loom no longer had the advantage of higher loom productivity.²² So the hand loom did have a product niche. Most people do not care about the total square yardage of their wardrobe alone, they care about its

¹⁹Notably (Guha, 1989) and (Iftikhar-ul Awwal, 1982, Chapter 7).

²⁰(Roy, 2002).

²¹(GoI, 1942, Table IX, Page 32).

²²(GoI, 1942, Page 117).

make-up: Fashion matters. This suggests that people may have been unwilling to substitute between different types of cloth.

There are a few ways to motivate this. Outfits are usually made up of several parts. Each of these may be better suited to either the power loom or hand loom. Reductions in the cost of production by one method may then encourage expenditure on the products of the other. Cheaper *dhotis* may have encouraged people to purchase more hand woven turbans, for example. Different groups wore different outfits too. The *dhoti* was worn by men and the *sari* by women. The former was usually plain white cloth, easy to mass produce on the power loom, while the latter was usually decorated and therefore suited to the hand loom.²³ If the men of the family get new clothes thanks to cheaper power loom cloth, intra-household fairness norms may encourage expenditure on new hand loom woven outfits for the women. In addition, special clothing worn on cultural occasions, such as weddings, was better suited to the hand loom. In short, India's long history of artistic achievement with the hand loom created cultural preferences, even for poor consumers, which the power loom alone could not satisfy.

What does the data suggest? Figure 4.2 plots estimated hand loom cloth consumption against estimated power loom consumption for 1880 and 1900-1940. The underlying figures were from the FFC, adjusted to Roy's yarn to cloth ratios.²⁴ There is a clear positive relationship, suggesting that the two looms were not that antagonistic after the first deindustrialization. The FFC, however, considered that this was not enough to show a complimentary relationship, and that "price" competition was key.²⁵ What can then be said about the relationship between relative consumption and relative prices? Since much power loom cloth was imported, we have fairly good price series for it.²⁶ Hand loom cloth rarely entered the official statistics, and in any case there were hundreds of different types with different prices. I have calculated an implied price per square yard for "representative" hand loom cloth by combining the price of yarn per square yard of cloth with implied marginal labour costs from a production function and Sivasubramonian's estimates of artisan wages.²⁷ The relationship between the implied relative price of hand loom

²³(GoI, 1942, Page 178).

²⁴(GoI, 1942, Page 288, Appendix XXVIII).

²⁵(GoI, 1942, Page 158).

²⁶E.g. as in the Statistical Abstracts (GoI, 1920), see also Appendix 4.C for details on the price series.

²⁷Yarn costs were those for 20s yarn, taken from the trade statistics (see Appendix 4.C). Wages from (Sivasubramonian, 2000, Page 283, Table 4.4). Prices are therefore: *Hand Loom Price* = *Unit Yarn Price* +

and power loom cloth and their relative consumption is presented in Figure 4.3.

The ratio of consumption is basically constant, even though prices change significantly over time, primarily due to the adoption of the flying shuttle by the hand loom weavers. Indeed, regressing the log of the ratio between hand loom and power loom consumption for 1900-1938 on the log of the ratio of their prices provides a coefficient (an estimate of the elasticity of substitution) that is not significantly different from zero (which is the case with Leontief preferences) at 5 per cent significance level.²⁸ After the power loom invasion 1860-1880, it seems to me that the remaining products of the two types of loom were to a large degree complimentary. Holding the price of power loom cloth constant, in terms of things other than hand loom cloth, marginal productivity advances in the hand loom sector did not result, at the margin, in a large substitution of hand loom cloth for power loom cloth.²⁹ Indeed, the figures above suggest that it would be a reasonable approximation over long periods to assume that the two types of cloth were consumed in fixed proportions, i.e. they were complimentary in the mathematical sense, and reductions in the price of one resulted in increased purchases of the other. This tends to point towards an inelastic demand for any one type of cloth. My figures from the calibration process below cannot reject the hypothesis that Cobb-Douglas preferences (elasticity of substitution equal to one) represent Indian preferences between cloth and other goods, and combining this with Leontief preferences between the two types of cloth implies an inelastic demand curve for each type of cloth individually.

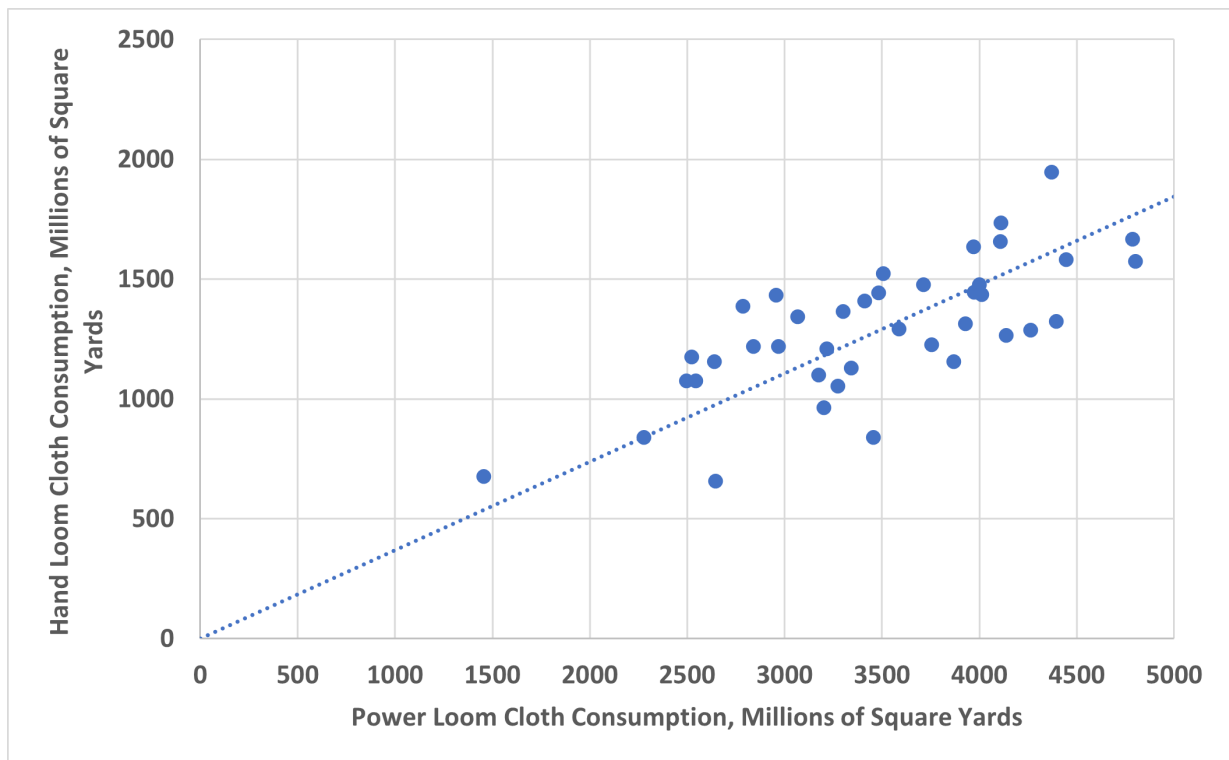
We can now figure out the relationship between the two deindustrializations. Product differentiation and a low elasticity of substitution between different styles of cloth in consumer preferences resulted in the survival of the hand loom weaver on the whole. This was to his advantage in the 19th century. After 1900, however, these factors worked against him. His impressive productivity advance over this period resulted in lower prices, but not much of an increase in the equilibrium quantity supplied/demanded. As labour productivity rose, employment fell. The increase in productivity was enough to displace labour, but not enough to encroach upon the territory of

W/MPL , where W is the wage, and MPL is the marginal product of labour from the production function.

²⁸This is robust to (a) using my alternative factory cloth price series, (b) including a shock dummy for 1900 (the famine year) and the WW1 years, and (c) using productivity in the hand loom sector as an instrumental variable (i.e. an exogenous shift in the supply schedule identifying the demand schedule so the results are not due to changes in preferences).

²⁹For extremely large changes in hand loom productivity, they would encroach on the factories' territory.

Figure 4.2: The Hand Loom and the Power Loom, 1880-1940: Consumption



Source: See text and (GoI, 1942, Page 288, Appendix XXVIII). **Notes:** The dotted line represents the average ratio of the two types of cloth over the period, i.e. a slope of 0.378, implying an average hand loom share of 0.274 in total cloth consumption.

Figure 4.3: The Hand Loom and the Power Loom, 1880-1940: Prices



Source: See text and Figure 4.2. **Note:** Using an alternative power loom cloth price series, which sees a smaller rise in the 1930s, doesn't change the picture by much. See Appendix 4.C for details on this price series.

the power loom, which would have raised weaving employment.

By contrast, hand spun yarn and mill yarn were, by and large, good substitutes. Indeed, nominally comparable mill yarn was of better quality: it was more uniform and better able to survive strain than hand spun yarn of the same count (the inverse of how many lb a thread of yarn of 840 yards weights) according to tests made by government officers.³⁰ There were next to no product niches to shelter the hand spinners. Their main advantage, in early years, was that spinning machinery was not well adapted to all types of Indian cotton, e.g. those with the shortest staples (fibre length), and even this disappeared following technical change in the wake of the American Civil War. From a very early date, hand weavers threw the hand spinners under the bus and eagerly bought up mill yarn.³¹ And so the hand spinner (almost) went extinct, but the hand loom weaver lived on.

4.2.4 Earnings

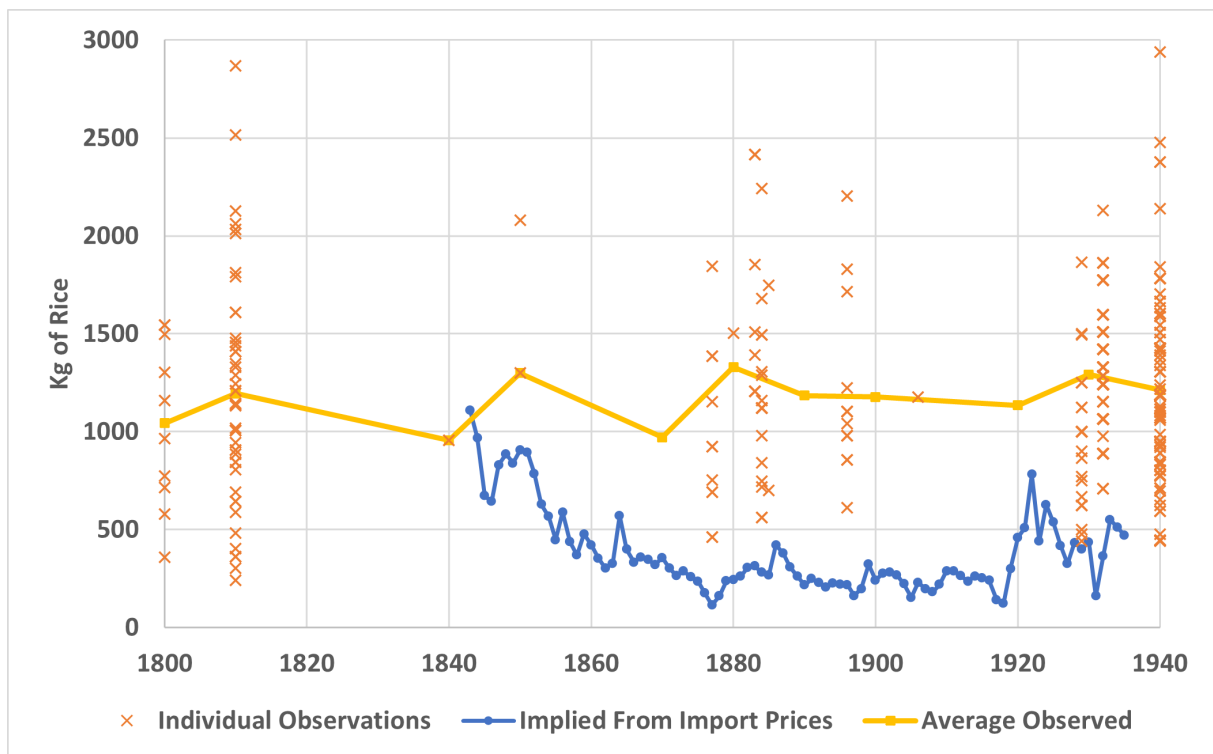
Let us link our tales about output and employment by examining earnings. Figure 4.4 presents two series of hand loom weaver earnings in terms of rice. One series is my implied earnings for a weaver producing cloth identical to imported power loom cloth in an area with good transport connections (e.g. the ports) between 1843 and 1940. This is based upon the difference between the import price of cloth and yarn and estimated hand loom productivity. The second series consists of average weaver earnings, in terms of rice, as reported by a wide range of historical sources. There are a total of 593 observations, which are also individually plotted on the figure, but some years have very few, and others lots, see Appendix 4.L.

At the start of the period, grain wages were low (compare Chapter One), reflecting poor marginal labour productivity. If you produced factory competing cloth, your real (rice) income would have declined considerably between 1840 and 1880. Since much cloth was produced inland and transport costs were high before the railways came in, for most regions the earnings decline was later. In response to this earnings decline, this type of weaver changed occupations, and so the first deindustrialization occurred. But, as we saw, the majority of weavers did not give

³⁰(Amalsad, 1924, Appendix F), (Rao, 1923).

³¹James Taylor, a British official who lived in Dacca (a hand loom centre), reported that machine spun yarn was first imported there in 1824 (Taylor, 1840, Page 170).

Figure 4.4: Hand Weaver Earnings, 1800-1940: Kg of Rice per Year



Source: See text and Appendix 4.L. **Notes:** After 1934 implied earnings were based on my alternative power loom cloth price series, as the main series was erratic. See Appendix 4.C for details on the alternative factory cloth price series. The highest observation for 1850 was excluded from the average, as it was for an unusually fine cloth. Averages done by decade.

up weaving. This was not because they persisted in the face of an earnings decline: our second series here shows no decline in average rice earnings over the period 1800-1940.

Weavers switched to the types of cloth that did not compete with power loom cloth, or were already producing them. Towards the unskilled end of the weaver class, real wages were set by (basically unchanging and low) agricultural wages and people moved between the two occupations according to the movement of prices. The skilled type of weaver earned substantial rents above the agricultural wage, and did not usually cultivate, but his human capital was largely not threatened by the power loom, as it could not produce his types of cloth. Their earnings therefore did not fall. The post 1900 productivity boom did not result in higher earnings for either group, because an inelastic demand ensured that lower prices counterbalanced higher output, and real unskilled wages were still largely determined by stagnant agriculture.³² Productivity advances due to the flying shuttle were not enough to allow the hand loom weaver to compete with the power loom in producing the same type of cloth, as the post 1920 rise in the implied earnings series shows. Only for the very lowest paid hand loom weavers here would making power loom style cloth be potentially attractive.³³

Spinning is a completely different tale altogether. Figure 4.5 presents implied and observed hand spinner earnings in terms of rice, for those producing rather coarse yarn (fine yarn spinners could earn more, Buchanan's figures suggest at least double), which formed the bulk of output.³⁴ The implied series was constructed from import prices of yarn (adjusted to account for differences in average count and a mill quality premium), an estimate of annual productivity, and a figure for the implied share of cotton in yarn costs. Here the two series follow much the same trend, although the decline was later for areas with poor transport connections. As a result the industry declined. The majority of hand spinners, however, were very poorly paid in the first place, suggesting that this was not a major loss on the whole, society wide. The exception may be in areas that focused on very fine spinning. On the other hand, it took a fair price decline to get people to give up spinning, which indicates limited alternatives, and therefore an important loss

³²The weavers recognised this; the fall in price after the department of industries provided fly shuttles to weavers in one town in Central India resulted in a "caste resolution" to burn them and go back to the throw shuttle (PBE, 1930, Page 228).

³³The lowest paid observations may be part timers.

³⁴Details, again, are in Appendix 4.L.

Figure 4.5: Hand Spinner Earnings, 1820-1940: Kg of Rice per Year



Source: See text and Appendix 4.L. **Notes:** This is supposed to be the earnings of the average hand spinner, those capable of spinning fine yarns could earn more, particularly in the earlier years.

for individuals, particularly those on the margins of society. A few women continued to spin, since the patriarchal customs of some families prevented them from doing anything else for the market.

4.2.5 The Regional Question

So hand loom weaving survived on an All-India basis: briefly down but not out. What about a regional perspective? Table 4.3 presents the regional distribution of the hand-loom industry in 1942. Two provinces stand out. Assam in the North East had the largest number of looms, but the majority of these were only used part time, and fewer were pure cotton. Local wild silk was important. Weaving was a female dominated subsidiary industry in Assam, which makes it more like the Far East than the rest of India.³⁵ Among the major provinces, Madras does best. Its population was less than that of Bengal, and yet it had over twice as many looms. Bombay has a fair number of hand-looms, but it was probably the only province to have had more power looms in the factory sector than hand looms. Although not shown separately, within the Princely States, Hyderabad had the largest hand-loom industry.

Estimated hand loom cotton yarn consumption series for two major provinces, Bengal and Madras, are presented in Figure 4.6. The Bengal industry has been the focus of the debate about decline. I have collected various authors' estimates (the longest is A. Z. M. Iftikhar-ul-Awwal's for the 20th century), and made a number of my own, for the consumption of cotton yarn in Bengal from 1750 to 1940. See Appendix 4.I for details. These figures are for Bengal proper, but the earliest estimates were for "Greater Bengal", including Bihar and sometimes Benares and Orissa. Iftikhar-ul-Awwal's series excludes Bihar only after 1911, with the ratio between this and the preceding year being 0.82. I adjusted the earlier estimates by 0.75 to account for Bihar and Benares.³⁶ There are some significant gaps, but it does confirm that large absolute decline was a post 1850 phenomenon and was largely over by 1890. Certainly, Susil Chaudhury's assertion that the "Company and its servants ... ruined the Bengal hand loom industry in the

³⁵On cotton textiles in Assam, see (Samman, 1897). In China, the weaving of coarse cotton cloths was a major subsidiary industry for peasants, in contrast with India, where weaving was a full time thing. By 1939, the result was that the factory weaving industry in India was much larger than in China, but the factory spinning industries were closer in size (Zhao, 1977).

³⁶Bengal proper's population was more than that of Bihar and Benares combined, so this is not an underestimate of its share in the total.

Table 4.3: Regional Distribution of the Indian Hand Loom Industry, 1942

| Province | Pure Cotton Looms | Total Looms | Share of Full Time Weavers | Full Time Looms | Part Time Looms | Total Looms, FTE | Share of FTE Looms |
|----------------------------|-------------------|------------------|----------------------------|------------------|------------------|------------------|--------------------|
| Assam | 208,022 | 411,022 | 0.01 | 4,110.22 | 203,455.9 | 207,566.1 | 12.84 |
| Bengal | 113,969 | 142,461 | 0.75 | 106,845.8 | 17,807.63 | 124,653.4 | 7.71 |
| Bihar | 92,390 | 103,096 | 0.81 | 83,507.76 | 9,794.12 | 93,301.88 | 5.77 |
| Bombay | 88,150 | 117,100 | 0.88 | 103,048 | 7,026 | 110,074 | 6.81 |
| C. P & Berar | 65,214 | 73,338 | 0.75 | 55,003.5 | 9,167.25 | 64,170.75 | 3.97 |
| Madras | 269,306 | 329,492 | 0.87 | 286,658 | 21,416.98 | 308,075 | 19.06 |
| Orissa | 46,000 | 48,000 | 0.6 | 28,800 | 9,600 | 38,400 | 2.38 |
| Punjab | 244,916 | 284,155 | 0.81 | 230,165.6 | 26,994.73 | 257,160.3 | 15.91 |
| Sind | 3,211 | 3,823 | NA | 2,446.72 | 688.14 | 3,134.86 | 0.19 |
| UP | 161,913 | 244,252 | 0.75 | 183,189 | 30,531.5 | 213,720.5 | 13.22 |
| Total British India | 1,293,091 | 1,756,739 | 0.63 | 1,106,746 | 324,996.7 | 1,431,742 | 88.56 |
| Indian States | 124,109 | 214,847 | 0.73 | 156,838.3 | 29,004.35 | 185,842.7 | 11.5 |
| Total All-India | 1,417,200 | 1,971,586 | 0.64 | 1,261,815 | 354,885.5 | 1,616,701 | 100 |

Source: (GoI, 1942, Tables VII and XI). **Notes:** Full time looms are estimated by multiplying the share of full time weavers by the number of looms. Part time looms converted to full time equivalents by multiplying the share of part time weavers by the number of looms and by 0.5. No figure for part time weavers in Sind is given separately, so I have assumed that the average figure there was the same as the India wide average. A few of the smaller British Indian provinces and the smaller States are excluded. FTE means full time equivalents.

post-Plassey period” cannot be maintained: There is a growth from 23-25 million lb of yarn consumed in 1711-1750 to just under 30 million lb for decades after Plassey.³⁷ It would be surprising if they did, considering that they were taking money from the Bengali *zamindars* (landlords) as tax or the perquisites of office and using it to purchase textiles for export.

These figures fit in well with Roy’s India wide estimates in Table 4.1. Two Bengal estimates have been made by Indrajit Ray. Ray argues for a decline in employment of around half a million in greater Bengal between the 18th century and the late 1840s.³⁸ This figure, however, assumes that the entire increase in net imports substituted for home manufactures without increasing aggregate consumption. As a result it is not an estimate of the absolute decline in employment: it is an estimate of the additional weaving employment there would have been if exports continued and all imports were replaced by home weaving. In addition, Ray’s cotton consumption decline appears to mainly be due to an underestimation of the volume of machine spun imports into Bengal in the 1840s, see Appendix 4.I for details. Tirthankar Roy’s India wide figures suggest that major absolute decline was not the case until the 1860s, and my estimates for the early 19th century suggest that this was also true in Bengal in particular. The figure suggests a slight decline in normal years from the 18th century peak until the 1830s. The figures for 1816 and 1818 are much lower, but these were years of exceptionally high raw cotton exports.³⁹ Suppose, then, a drop from 29 million lb of cotton yarn consumed to around 25 million lb as an upper bound for the decline in normal years. This apparent drop in yarn consumption of 4 million lb implies a decline of 25 million square yards woven. This would mean a decline of around 31,250 looms, 62,500 weavers, and around 100,000 spinners, using my deliberately conservatively low productivity figures. If exports were much more labour intensive then the employment declines would be larger. After the early 1820s yarn consumption by hand looms then grew until 1860, although much of this increase used machine spun yarn. It seems that population growth basically made up for the loss of export markets, with a bit of lag. Things were not that traumatic for the existing hand loom weaver, unless he had specialized in catering to foreign customers. The level immediately before the American Civil War is unusually high, largely due to unusually low levels

³⁷(Chaudhury, 1999, Page 320).

³⁸(Ray, 2009, Table 16).

³⁹Bengal cotton was speculatively exported to Europe, but it was found that machinery was not suitable for it. This was a preview of the post 1861 period.

of raw cotton exports; deducting 15 million lb, approximately the usual annual export equivalent at the time, would still give us around 30 million lb of yarn consumed, so still no big decline yet.⁴⁰ Two wars apparently resulted in reduced raw cotton exports: the Mutiny (1857), which also disrupted supplies for Bengal, and the Second Opium War, which seem to have lowered exports to the main foreign purchaser of Bengal cotton up to this point, China.⁴¹

After 1861, however, there is a major decline - the first deindustrialization. The main reason for this (besides the power loom invasion, which had started two decades earlier) was higher cotton prices thanks to higher external demand resulting from a third war: the American Civil War. The decline, however, was persistent and outlived the Confederacy. Before the American Civil War, mechanised cotton spinners only used (North) Indian cotton as a desperate last resort, owing to its short staple, and so Indian hand spinners had their own "protected" cotton supply with which to produce yarns only suitable for throw shuttle hand looms, but when American supplies were cut off, foreign textile firms innovated to accommodate Indian cotton, the result of which was a long term upwards shift in the demand for North Indian cotton (known as Bengal cotton, even though little of it was actually grown in Bengal), which was short-stapled even by Indian standards, from mechanised spinners worldwide.⁴² It was not only Bengali hand spinners who took advantage of this protected supply before innovation got in the way: Bengal's cotton exports in the first half of the 19th century overwhelmingly went to China, where there was not a single mechanized spinning mill, rather than Britain and the rest of the West.⁴³ The result was that the hand spinners, wherever they were, lost their protected supply, and therefore so too did the hand loom weavers who had not yet adopted machine yarn. The fall in yarn consumption suggests that employment declines, seemingly in weaving as well as spinning, did take place between 1850 and 1880. Around 1880 a number of spinning mills were set up in Calcutta that

⁴⁰E.g. (Mann, 1860, Page 102).

⁴¹Between 1795 and 1859, China took 74 per cent of all cotton exported from Bengal, while the UK took just under 19 per cent, although some of this was re-exported. Half of the total UK import was in the years 1816-1819. See (Mann, 1860, Pages 101-2).

⁴²(Hanlon, 2015).

⁴³The Yangtze Delta has been the focus of the Chinese debate. Philip Huang reports cotton cloth exports from the Yangtze Delta in the 1830s of 40 million bolts, approximately 145 million square yards (Huang, 1990, Pages vii, 45-6). This would have taken 51 million lb of (cleaned) cotton from his figures. Adding in local consumption of 73.07 million square yards (based on Huang's population figures from 1816) results in a grand total of 82.7 million lb of cotton consumed for cloth production. The Yangtze Delta had a smaller population than either Bengal or Madras in this period. In the Yangtze Delta weaving was a sideline occupation for the majority of families, many of which grew and spun their own cotton, whereas in India it was a specialised profession undertaken by comparatively few people.

spelled the end of hand spinning but were a symptom of the revival of hand weaving. After WW1, the Calcutta mills at long last realised (it took them around a century to figure this out - the first was set up in 1832) that they could weave the yarn they spun, but I have excluded Iftikhar-ul-Awwal's figures for power loom consumption, and the figure only refers to hand loom consumption.⁴⁴

When writing about deindustrialization it is customary to lament the decline in the importance of the cotton textiles of Dacca, in East Bengal. As our figures show, it is a major mistake to extrapolate this story to the whole of India or even to all of Bengal. The Dacca export trade was basically extinct by 1820, yet Figure 4.6 suggests that overall yarn consumption in Eastern India did not decline by much until 1860. The coarse spinning of short stapled cotton, which made up the bulk of the Bengal yarn output and input into weaving, was not exposed to mill competition at this stage. We have good documentation of the Dacca manufacture thanks to James Taylor.⁴⁵ The fine textiles that the city was most famous for, according to Taylor, fell into the non-factory competing category, even if the average type of cloth produced there at the peak of its trade did not. *Jamdani* cloths, for example, are patterned on the loom, something which the power loom could not do. The skilled spinners who made the fine yarns needed did, however, usually have to compete with the mills and therefore that specific industry declined at an early date. There are some figures from which we can try to estimate the degree of decline. According to K. N. Chaudhuri, a 1776 report gave the number of looms producing cloth for export (which at this point meant to other parts of India too) at 8,400, employing 25,200 weavers and 80,000 spinners in the consumption of only 8,000 maunds of cleaned cotton (0.658 million lb).⁴⁶ The export trade held up until shortly before 1800, and the EIC ended its purchases at Dacca in 1817.⁴⁷ Rajat Datta reports figures of only 7,000 looms in 1776 and 5,658 in 1786 - Dacca like muslin had started to be manufactured in Europe in 1781.⁴⁸ By 1846 there were around 4,410 looms in Dacca producing cloth from yarn above 30s count, but the majority of this was

⁴⁴(Iftikhar-ul Awwal, 1982, Chapter 7).

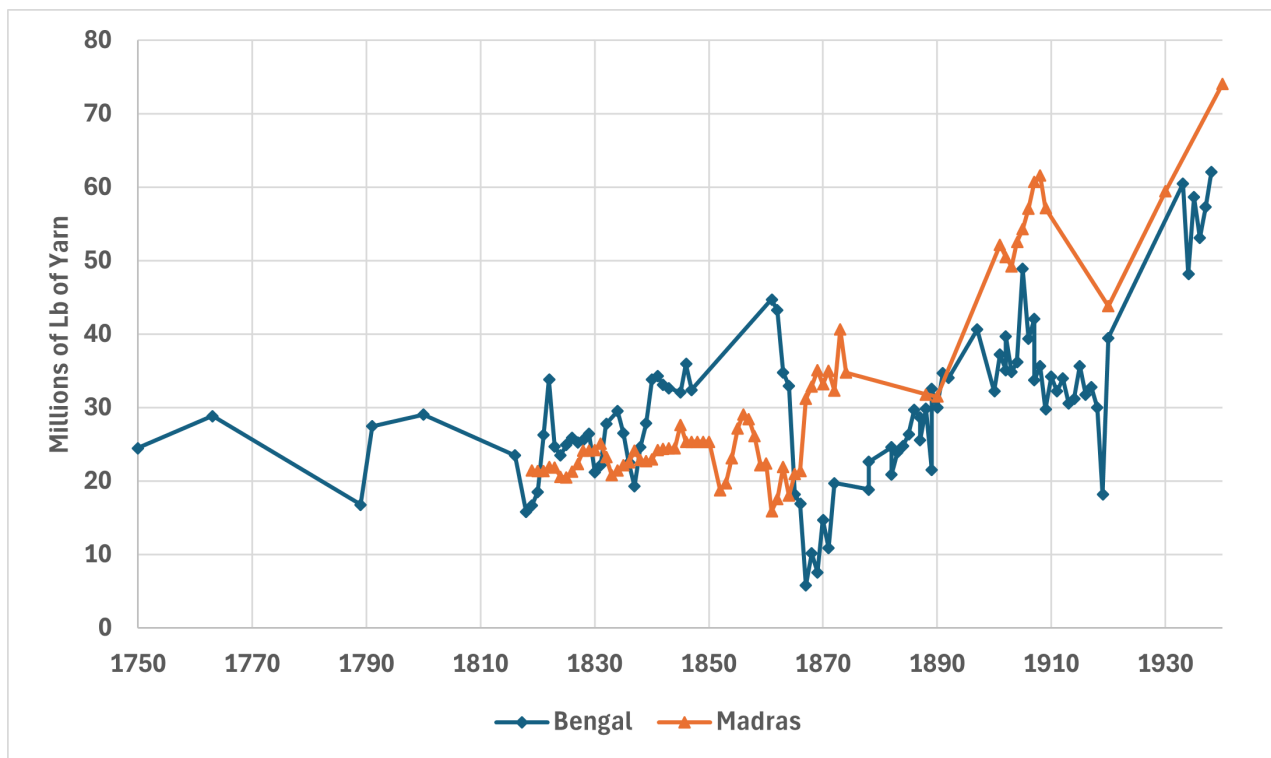
⁴⁵(Taylor, 1851). His book was originally published anonymously, but John Forbes Watson states the name of the author (Watson, 1866, Page 64).

⁴⁶(Chaudhuri, 1974, Table 1). These spinners apparently spun 4 seers of cotton yarn a year on average. This is 8.228 lb a year, which, given the figures in Table 4.28 in Appendix 4.F, would suggest an average count between 40s to 50s.

⁴⁷(Taylor, 1851, Pages 80 and 133).

⁴⁸(Datta, 2000), Taylor reports the 1781 figure (Taylor, 1851, Page 132).

Figure 4.6: Estimated Hand Loom Consumption/Availability of Cotton Yarn in Bengal and Madras



Source: See text and Appendices 4.I and 4.J. **Notes:** My assumptions tend to be more generous in earlier years than later ones. The unusually high Bengal figures just before the US Civil War are the result of unusually low cotton exports, seemingly in the aftermath of the Mutiny and the Second Opium War. The unusually low figures for Bengal in 1789 and 1837 are due to poor cotton crops in Northern India, and that in 1816-18 was due to unusually high exports to the West. Not included is an estimated cotton yarn consumption figure for Bengal of 22.75 million lb around 1715, see text for details. Two Madras estimates have been excluded, one in 1900 for being too low, and another in 1938 for being too high.

imported and machine-spun (6/6.5 of the total).⁴⁹ Using Chaudhuri's figure gives a decline of 13,230 weavers and 73,846 spinners in the production of the finer cloths over the course of 70 years - not enough to have mattered much in the aggregate. Would this have led to a decline in total textile employment, however? The displaced weavers and spinners, given their skills, could have switched to producing coarser yarns and cloth for the home market, although this would have still meant an income decline - a major one for spinners.

It is worth noting, however, that the extremely fine muslins woven there that everyone waxes lyrical about, with counts of yarn above 200s, continued to use hand spun local thread.⁵⁰ Some of these extraordinarily fine Dacca Muslins had been produced to send to the Great Exhibition of 1851, and these, according to Taylor, were "fully equal" to those used by the court in the Mughal heyday.⁵¹ These famous types of cloth had never been exported to the West, and relied on special orders from the Indian elite.⁵² In 1898, it was said to have been "very difficult now to obtain the finest Dacca muslins", but when had it not been given their price and difficulty to manufacture?⁵³ By the interwar years there were still a number of families who specialised in the famous high count Dacca muslins and *Jamdani* cloths, but this rather late decline must be accounted for by changes to preferences within India because they did not compete with the product of the power loom and were therefore immune from foreign competition.⁵⁴ "Persons of rank and wealth", as Taylor put it: Princes, big landlords, merchants and (by, say, 1890) industrialists all had the means to support this industry - if they pleased. If you were to look at Benares instead, you would find a major silk weaving industry, including *Jamdani* style cloths copied from Bengal, but this is not as catchy a story as Dacca's fall from grace and it would not help you agitate against the colonial government.⁵⁵

Notably, my estimates do not align with Clingingsmith and Williamson's argument that deindustrialization in India was largest between 1750 and 1860.⁵⁶ They rely on two mechanisms, (a)

⁴⁹(Taylor, 1851, Page 79), (Taylor, 1840, Page 172).

⁵⁰(Taylor, 1840, Page 172).

⁵¹(Taylor, 1851, Page 59).

⁵²(Taylor, 1851, Page 58).

⁵³(Banerjei, 1898, Page 28).

⁵⁴(Department of Industries, Bengal, 1929, Pages 59-60).

⁵⁵Nirad Chaudhuri's account of his childhood in East Bengal (near Dacca) mentioned "the ladies, who were donning their best Benares silk saris [for a festival]", but significantly did not mention any Dacca cloths (Chaudhuri, 1951, Page 64). The K. N. Chaudhuri cited in this Chapter is his son.

⁵⁶(Clingingsmith & Williamson, 2008), (Williamson, 2011, Chapter 6).

higher (non-tradable) grain prices, owing to the Mughal collapse and climate shocks, making local manufacturing of tradable goods less competitive, and (b) unfavourable shifts in the intersectoral terms of trade between textiles and tradable agricultural commodities, and they argue that the former was more important between 1760 and 1810 while the latter predominated between 1810 and 1860. Decreased competitiveness was then partially masked by tributary exports via the East India Company. This could explain why yarn consumption in Bengal did not decline in the 18th century, but not why it grew after 1815 until the 1860s, and exceeded its 18th century peak for domestic consumption. Personally, I doubt that the decline of the Mughals had major effects on the productivity of Indian agriculture, since they contributed little to it in the first place, particularly in Bengal (see Chapter Two). That said, the acceleration of population growth and the decline of the export trade presumably caused some relative deindustrialization before 1860.

What about Madras, in the South? In Madras the traditional *Moturpha* tax, which included a tax on looms, was abolished at a rather late date (1862), and a hand loom census was conducted just beforehand.⁵⁷ Thereafter, the Madras government occasionally enquired into the state of the hand loom industry before the All-India surveys of the 20th century.⁵⁸ The figure suggests that there was no decline in the number of hand looms in Madras presidency, but a decline relative to the population until 1900.⁵⁹ There is a large expansion in the 20th century, again due to the flying shuttle but, unlike in Bengal, also thanks to an expansion in loomage. It appears that Madras did not deindustrialize in absolute terms, except for hand spinners.

Table 4.4 presents my estimates of cotton yarn consumption in the Punjab, in North-West India, see Appendix 4.K for details. Between 1861 and 1940, hand loom cotton yarn consumption in

⁵⁷*Moturpha* was a small flat sum per loom, so it would not have affected the factory industry very much. But, no one had thought to establish a factory in Madras by the time it was abolished.

⁵⁸See Appendix 4.J for details. On the Madras Industry in particular, see (Specker, 1989) and (Dietrich Wielenga, 2020).

⁵⁹Some of my estimates for yarn consumption rely on loom counts. Parthasarathi criticizes this method, arguing that looms were worked part time in response to imports and that there was a major decline between 1790 and 1820, based, strangely enough, on two minor reports about loom counts (Parthasarathi, 2009). The first was from Rajahmundry, which was an important export center, but the decline is 3,000 looms (out of at least 200,000 in Madras Presidency, and at least 12,000 in Rajahmundry in 1820 (Specker, 1989, Table 1)). The second is from Vizagapatnam district, where one portion apparently had 10,710 looms before 1800 and the whole only 11,000 in 1819. The problem is that looms in Vizagapatnam were understated as late as 1860: the reported figure went from 7,287 in 1860 to 34,004 in 1870 (Boswell, 1873, Page 294)! My estimates include an adjustment factor (1.44) for understated looms in years before 1870. Parthasarathi also suggests a further decline in the 3rd quarter of the 19th century. My figures support the view of a major decline in hand spinning, but an expansion of hand weaving. Since the 20th century figures are usually based on free mill yarn estimates, another decline between 1850 and 1880 would imply extraordinary rates of growth after 1880. The Madras industry coped with the US civil war shock far better than the Bengal one.

Table 4.4: Estimated Hand Loom Cotton Yarn Consumption, The Punjab

| Year | 1861 | 1870 | 1879 | 1880 | 1881 | 1882 | 1883 | 1921 | 1940 |
|---|-------|-------|--------|--------|--------|-------|--------|--------|--------|
| Estimated Yarn Consumption (Millions of lb) | 31.06 | 30.37 | 41.29 | 48.95 | 49.1 | 55.38 | 49.99 | 62 | 65.14 |
| 1861 = 100 | 100 | 97.77 | 132.94 | 157.62 | 158.08 | 178.3 | 160.97 | 199.64 | 209.74 |

Sources: See Appendix 4.K. **Notes:** Years 1861-1883 estimated from cotton availability plus yarn imports, while the 1921 and 1940 figures are implied yarn consumption from full time cotton loomage. One of the FFC tables reports an estimate of only 48.88 million lb of yarn being consumed in the Punjab (35.38 of which was hand spun) presumably in 1940 (GoI, 1942, Page 105). This is inconsistent with the reported yardage, unless the cloth was particularly light - but we have reason to believe that it was heavier than average.

the Punjab approximately doubled, although much of this increase seems to have been made as early as 1880. Since the flying shuttle was not adopted to any large degree in this province, it is unlikely that there was any large decline in employment, but this factor was probably responsible for the lack of 20th century growth. The cloths made in the Punjab were far coarser than those in Bengal and Madras (hand spinning survived there more than anywhere else) and so the value of output was probably less, even if cotton consumption was comparable. Yarn consumption before 1861 is unlikely to have been more than 40 million lb, as only a small share of the crop was exported in that year, or even as late as 1884.

What about elsewhere? Francis Buchanan's estimates for the number of looms in South Bihar around 1810 was 42,888, while the FFC figures for these districts was 21,598.⁶⁰ It is interesting that decline appears to have been largest in Bihar, which was the center of the debate around A. K. Bagchi's paper - let us be generous and concede that battle to him, even if we doubt Buchanan's figures.⁶¹ Sumit Guha's estimates for the Central Provinces imply that, while spinning employment declined after 1860 (with yarn production rising due to the growth of local mills), hand loom weaving employment did not fall until the 20th century. But the decline was largely due to weavers adopting the flying shuttle and shedding labour while output probably

⁶⁰(GoI, 1942, Appendix XXVII). (Buchanan, 1936, Table 42, Page 774), (Hamilton *et al.*, 1934, Page 412), (Buchanan-Hamilton, 1810-11, Pages 612-6). See also (Vicziány, 1979, Page 140).

⁶¹Buchanan's population estimates, upon which his spinning employment figures, and perhaps looms, are based appear to be too high (Orr, 1980), as is his figure for spinners per loom (Guha, 1989), and his implied cotton consumption figure for South Bihar is too high given my estimates, and is closer to what my figures suggest for all of Bihar.

rose - which is basically the same as our aggregate story.⁶² I have been unable to find or construct series for Bombay presidency and most of the rest of the country. Over the long run it appears that the cotton textile industry shifted location within India: The South dominated the hand loom market and the West the power loom market, while the East declined in relative importance.

To summarize the facts, it is odd that India is used as the prime example of deindustrialization when there was actually so little of it. Hand loom weaving survived on a very large scale. By 1900 it was larger than it ever had been before, but after that point technological change within the sector meant that output and employment went in opposite directions. Hand spinning, it is true, declined, but it makes no sense at all to call this "deindustrialization", since this occurred precisely as India was undergoing an industrial revolution in this sector, and was very poorly paid in the first place. British Imperialism created the conditions for modern industrial growth in India, and had done so before elsewhere in Asia, even if the reaction was less than spectacular. Far from the decline of the hand loom industry being a cause of poverty, it seems to me to be more true to say that its survival was a symptom of it.

4.3 The "What-Ifs"

It is true that imports were a major factor, so far as quantities were concerned, so trade may have depressed employment relative to a closed economy counterfactual, and that relative deindustrialization seems to have occurred. The rest of this chapter explores the relative importance of trade, the traditional explanation, and technology in Indian deindustrialization using a general equilibrium model. The relevant "what-ifs" are a closed economy without technology, and a closed economy with technology. Comparing these with the observed case allows us to examine whether trade or technology was more important for employment.

4.3.1 Model Set Up

The general equilibrium model has five sectors producing three final consumption goods and two intermediate inputs. The final consumption goods are agricultural goods, representing staple

⁶²(Guha, 1989).

grains and the rest of the non-cotton economy, factory (competing) cotton cloth and hand loom cotton cloth. The two intermediate goods are raw cotton and cotton yarn. The structure of production is presented in Figure 4.7. Production in each sector is given by a standard diminishing returns production function with labour as the only explicit factor of production. Raw cotton is an intermediate input into spinning, and yarn is an intermediate input into weaving. The role of capital in the factory spinning and weaving sectors is represented by a markup over direct labour costs. With capital modelled this way, the exponent on labour in the factory sectors is at a high figure of 0.95, reflecting the near constant returns to scale provided by reproducible means of production, but deducting the payments to capital, labour gets around half of the value added. In hand spinning and weaving, the exponents are 0.9 and 0.75 respectively. Both were notoriously labour intensive, and so these are higher than usual, but the weaving exponent is less than the spinning one as it took more skill. The 0.25 remaining after a direct labour share of 0.75 therefore represents rents earned by skilled weavers. Fixed capital investment in hand spinning and weaving was minimal. In 1898, for example, the cost of a spinning wheel was between 5 and 8 annas, or around one to two days worth of male wages.⁶³ The throw shuttle loom cost at the most 5 rupees in the 1940s, or just shy of 15 days wages.⁶⁴ In cotton and non-cotton agriculture, the labour share is 0.6, representing the role of land rents.

On the consumption side of things, the utility function is represented by a Cobb-Douglas function combining the agricultural good and a composite industrial good. This industrial good is a combination of hand loom and factory (competing) cloth in fixed proportions. The structure of consumption is outlined in Figure 4.8. With the elasticity of substitution between the two types of cloth equal to zero, they are perfect complements. This ensures that hand loom weaving survives on a large scale in the face of the power-loom and is consistent with the evidence presented above.⁶⁵ The entire model is presented in detail and worked out in Appendix 4.A.

When we consider the closed economy, production has to equal consumption for markets to clear. The equilibrium price vector, is such that (a) labour allocation maximises firm profits

⁶³(Banerjei, 1898, Page 41).

⁶⁴(GoI, 1942, Page 32).

⁶⁵Earlier drafts of this chapter used Constant Elasticity of Substitution (CES) functions for both the higher level and nested functions, but this was a result of the spuriously low output values for 1900. With the adjusted figures, Cobb-Douglas (higher level) and Leontief preferences (nested) are implied as limiting cases of the CES specification.

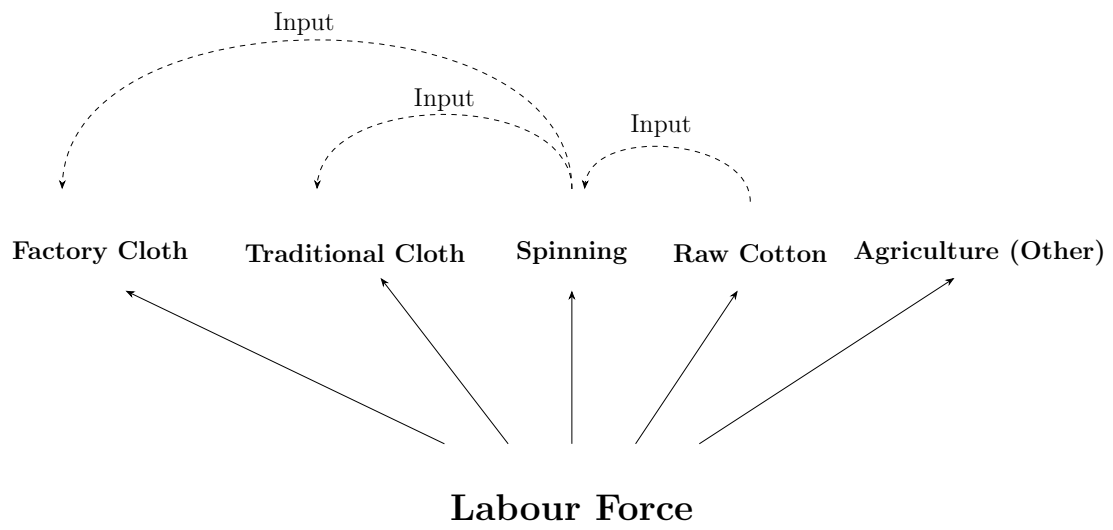


Figure 4.7: Structure of Production

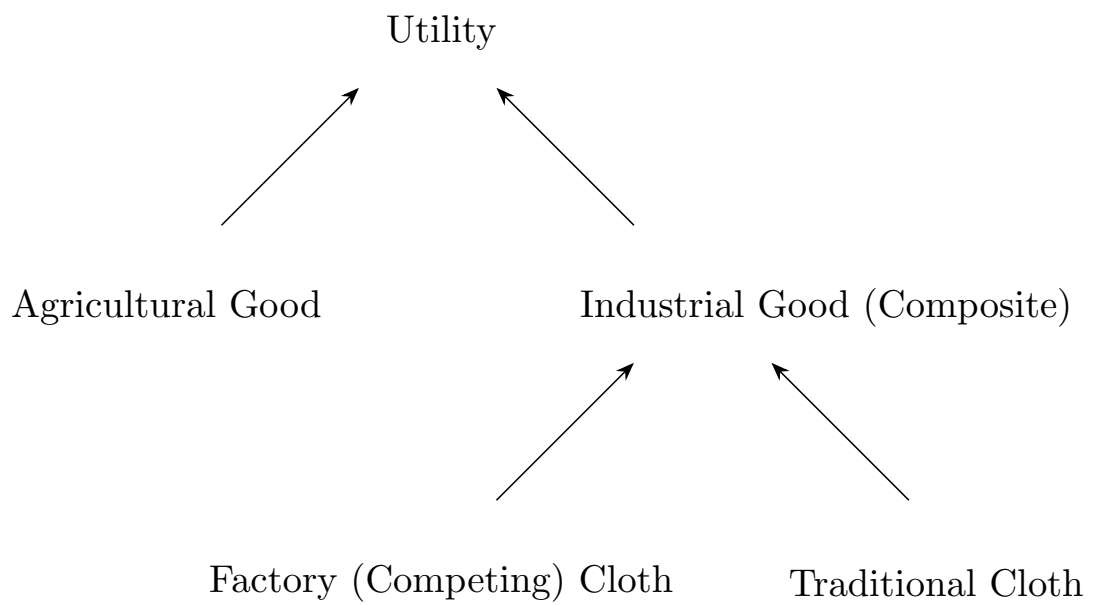


Figure 4.8: Structure of Consumption

Table 4.5: Calibration Summary

| Parameter | Role | How Calibrated | Time Varying? |
|-----------|-----------------------------------|--|---------------|
| γ | Exponent in production functions | Assumed | No |
| A | Productivity parameter | Production Function | Yes |
| μ | Mark up in factory sector | To match observed factory-rural wage premium and labour share in factory value added | Yes |
| δ | Expenditure share on cloth | To match a first order condition | Yes* |
| β | Ratio between types of cloth | Estimated using baseline years | No |
| c | Yarn (lb) to cloth (square yards) | From Roy (2020) | Yes |
| k | Cotton to yarn | From Roy (2020) | No |
| L | Workforce | 0.35 times Population from Roy (2020) | Yes |

Note: * Cobb-Douglas preferences imply constant expenditure shares, but in the (static) model I allow δ to vary slightly each year to match the data.

with income from the factory sectors penalised by the mark up, and (b) given the value of total income corresponding to the firm's optimal labour allocation (the difference is due to the mark up), the consumption of each good at the equilibrium price vector equals its production. The solution method in this case is outlined in Appendix 4.E.

4.3.2 Calibration: Outline

Calibration of the model is rather involved and the finer details are relegated to Appendix 4.B and discussion of the data sources is contained in Appendix 4.M. The key parameters and how they are set are presented in Table 4.5. Here is the outline: The data used are (a) series on prices of cotton, prices of cereals and wages for the years 1820-1940, (b) Tirthankar Roy's estimates of cotton, yarn and cloth production for the years 1820-1940, as well as his estimates for conversion ratios and populations, (c) series for employment in the factory sector, and (d) data on the components of the markups, consisting of labour share in manufacturing costs in factory spinning and weaving and the factory-agriculture wage differential. I then assume the values of the curvature parameters for the production functions.

From output and employment in the factory sector, assuming the model to be correct, the implied price of yarn can be estimated for the years 1880-1940.⁶⁶ I then assume that hand spinning

⁶⁶For the years 1840-1940, the model's implied price of yarn closely tracks the observed prices of yarn from the trade statistics, see Appendix 4.C.

technology remained unchanged between 1820 and 1880, which allows us to get an implied price of yarn before 1880. While hand spinning technology was unchanged, the earnings of spinners were not. Given my physical productivity estimates, and spinning value added figures, I can get spinning employment in male full time equivalents (i.e. adjusting for the low pay of spinners).

With a price of yarn, we can derive the prices of factory cloth and hand loom cloth and the productivity parameters from the FOCs, output and employment figures for the years 1880-1940. However, we only have a figure for total hand loom output for 1820-1860, which (in the model) consisted of the sum of traditional cloth and factory competing cloth. Since the data for consumption of hand loom and factory cloth after 1880 essentially has them consumed in fixed proportions, while relative prices vary considerably, I use the average ratio between hand loom and factory cloth consumption between 1880 and 1940 to recover output of each type of cloth before 1880, assuming that in 1880 and after hand looms only produce the factory resistant type of cloth.⁶⁷

Employment, and productivity in the cotton cultivating sector is estimated from the model FOC and data on prices, output, and wages. For (non-cotton) agriculture, employment is determined by aggregate labour endowment minus employment in the other sectors. This, and the model FOC then allows us to estimate output and the productivity parameter. Implied net exports of this good are then found via the balance of trade from the cotton sectors. The parameter of the higher level (Cobb-Douglas) utility function is then estimated from the consumption and price of this good and those of the composite cloth good for each of the years 1820-1940.⁶⁸

4.3.3 Counterfactuals

I examine two counterfactuals. In the first, there is no trade and technology is restricted to traditional pre-industrial revolution methods. This is the "Gandhian" Counterfactual. In the second, there is still no trade, but industrial revolution technology gets adopted, with the associated historical mark ups, in 1880 and beyond in the spinning and factory (competing) weaving sectors. Productivity in cotton and other agricultural sectors, as well as the size of the workforce

⁶⁷The implied number of hand loom weavers choosing to produce power loom competing cloth from the model equations if we hold wages and prices constant from the baseline calibration (i.e. a partial equilibrium estimate) is extremely low, (less than 2,000) for 1880-1940, so this is not a bad assumption.

⁶⁸Note that the utility function does not match Engel's law.

remains unchanged in each period relative to the observed historical case.⁶⁹ The estimated path of the productivity (A) parameters in the historical case is presented in Table 4.6. The assumed paths of productivity in the Gandhian counterfactual is presented in Table 4.7.

After 1880 I adjusted each figure slightly upwards to account for population growth so that Y/L in a sector is constant when the share of the workforce in a sector is the same as in the previous period. The 1860 spinning figure is adjusted downwards, assuming that the gap between spinner's earnings and male earnings did not rise without the threat of trade or technology.

The assumed paths of productivity in the second counterfactual, without trade but with technology are presented in Table 4.8. In this counterfactual all productivity parameters follow their historical paths except for spinning in 1860, for the same reason as in the first counterfactual above. It is important to note that this counterfactual places the No Trade productivity in the factory sector too high. In practice trade was overwhelmingly important for inputs into factory production. Virtually all machinery was imported, and many of the managerial and skilled staff were originally brought from the West. A more likely counterfactual would have reduced productivity to account for the role of openness in boosting factory productivity.

There are also some important factors which tend to overstate employment and output in this counterfactual. The first is that imported and Indian factory cloth are assumed to be perfect substitutes. Imported British cloth was usually woven from long staple American or Egyptian cotton, while the Indian power-looms tended to stick with short staple Indian cotton (although some long staple foreign cotton, much of it from nearby Uganda, was imported in the inter-war period). The international cotton market certainly did not think that these were perfect substitutes: Indian cotton traded at substantially lower prices than American did in Liverpool, even though exported Indian cotton tended to be finer than average.⁷⁰ There were differences in spinning too. For example, the ratio between the number of spindles in the UK and India was far larger than the ratio between the amounts of cotton consumed, indicating finer yarn production in England. Since I model the factory weaving sector to be close to constant returns to scale

⁶⁹Is this likely to be true? Our prices were for unginned cotton, so there is some technological progress in ginning. Agricultural productivity does not seem to move by very much in the long run over the 120 years examined here.

⁷⁰E.g. (Royle, 1851, Pages 80-81).

Table 4.6: Observed Productivity Paths in Cotton Textiles

| Year | Ast | Asf | Awt | Awf |
|------|-----|-------|-------|--------|
| 1820 | 221 | | 458 | 458 |
| 1840 | 199 | | 458 | 458 |
| 1860 | 404 | | 458 | 458 |
| 1880 | 416 | 1,957 | 458 | 10,869 |
| 1900 | | 3,895 | 523 | 15,923 |
| 1920 | | 2,711 | 660 | 17,685 |
| 1940 | 408 | 3,303 | 1,115 | 20,573 |

Source: See Appendix 4.B. **Notes:** st stands for "spinning traditional", i.e. hand spinning, sf for "spinning factory", wt for "weaving traditional", i.e. the surviving types of hand loom cloth, wf for "weaving factory", i.e. factory competing cloth.

Table 4.7: Assumed Productivity Paths in the no technology and no trade Counterfactual

| Year | Ast | Awt | Awf |
|------|-----|-----|-----|
| 1820 | 221 | 458 | 458 |
| 1840 | 199 | 458 | 458 |
| 1860 | 221 | 458 | 458 |
| 1880 | 221 | 458 | 458 |
| 1900 | 224 | 475 | 475 |
| 1920 | 226 | 485 | 485 |
| 1940 | 231 | 514 | 514 |

Source: See text.

Table 4.8: Assumed Productivity Paths in the technology but no Trade Counterfactual

| Year | As | Awt | Awf |
|------|-------|-------|--------|
| 1820 | 221 | 458 | 458 |
| 1840 | 199 | 458 | 458 |
| 1860 | 221 | 458 | 458 |
| 1880 | 1,957 | 458 | 10,869 |
| 1900 | 3,895 | 523 | 15,923 |
| 1920 | 2,711 | 660 | 17,685 |
| 1940 | 3,303 | 1,115 | 20,573 |

Source: See text.

(the exponent was 0.95), marginal costs do not rise by much as output expands, making it easier to replace imports than it actually was.⁷¹

The second is a result of our modelling trick to put payments to capital in a static model. These are modelled as an exogenous markup over marginal cost, and this difference gets returned to the representative consumer. This drives a wedge between the private cost of consuming an extra unit of domestically produced factory cloth (or yarn), which takes into account the markup, and the social (India-wide) cost, which does not and is simply the opportunity cost of the labour involved. In other words, there is an positive externality to home factory production, and as a result, purchasing domestically made cloth raises domestic income relative to buying foreign cloth.⁷² In reality, payments to capital represent the opportunity cost of deferred consumption in an earlier period when the investment in capital goods was made (plus depreciation and quasi-rents) and there is no externality. There may have been an externality, to the extent that the factory wage was above the rural wage, adjusting for difference in the cost of living - rural rents were a few rupees a year, urban rents a few rupees a month - and compensating differences for the comparative rigidity of factory life and urban squalor. Bombay millworkers did successfully fight wage reductions in the interwar years, but for the marginal unit of output, the new up country mills with no such historically determined wage were probably more relevant.

Given that our markups are approximately in the range of 4 to 7 times marginal (social) labour cost, this, at first glance, is a rather large effect. Purchasing domestic factory goods therefore tends to raise employment in both the factory sector and the hand loom sector. Directly in the factory sector, and indirectly as some of the additional income gets spent on either type of good, relative to the observed case with trade, that the calibration was based upon, since to buy foreign cloth labour would have to be allocated to the raw cotton and other agricultural sectors (or perhaps spinning) to finance the imports. In practice, the effect is not large because cotton textiles were a small share of GDP, trade or no trade. If you are a big fan of the infant industry argument, then you can consider this as a concession to it. I proceed despite these factors to keep the model simple, and in order to bias the situation in favour of trade being responsible for

⁷¹This increased productivity in the factory sector, by reducing the cost of factory cloth, tends to raise hand loom employment in the closed economy (once the original displacement has occurred). In an open economy, with the price of factory cloth set by the world market, this would not be the case.

⁷²The same applies to factory yarn.

employment declines rather than technology.

4.4 Results

4.4.1 Market Shares

Before we jump into the examination of counterfactuals, let us look at a by-product of the calibration process: the shares of the cotton cloth market for hand looms, Indian mills, and imports by value. These are presented in Table 4.9. How reasonable are these estimates? Appendix 4.C shows that my implied power loom (competing) cloth price tracks the observed prices from the trade statistics. In addition, my estimate for the value of hand loom cotton cloth in 1940 is 46.29 crores (tens of millions of Rupees), while the estimate provided by the FFC was 47.10 crores - a close correspondence.⁷³ The market shares for value present a different story to quantities (as in Table 4.1): in all periods Indian production forms a majority of consumption by value. Hand loom cloth was worth more than factory cloth per square yard on average given observed consumption. The power loom mainly took the middle section of the cloth market, and the coarsest cloths as well as the finest were left to the hand loom.⁷⁴ The finer cloths were naturally of higher value. At the much coarser end of the market, hand loom cloth was more durable than comparable power loom cloth, and therefore worth more per square yard than it would seem at first glance. The hand loom starts to lose market share in the 20th century as adoption of innovations, such as the flying shuttle, began to lower the price of hand loom cotton cloth in combination with an inelastic demand. These figures only account for cotton cloth. Once you account for non-cotton textiles, the hand loom wove the majority of value in inter-war India, and therefore presumably also in earlier periods.⁷⁵ The market share of imported cloth is at its maximum around 1860. At this stage it was cheaper than the hand loom for the types of cloth they competed over, but only marginally so. While imports rose after 1860, this was outweighed by the fall in the price of power-loom cloth, and so Lancashire was a victim of its own success.

These total values may seem low in early years given the value of Indian cloth exports, which

⁷³(GoI, 1942, Table XXIV, Page 61).

⁷⁴(GoI, 1942, Table LIV).

⁷⁵(Roy, 1988).

it must be said were a small share of production, to the rest of the world in the decades before 1820.⁷⁶ There are a few things to note. First, the value of these are usually given based upon the UK, or importing country, price, which includes freight and a substantial mark up based upon customs and the EIC's monopoly on cloth imports to the UK. For example, Twomey notes that, in 1797-1806, the sale price in the UK was "almost double invoice price in India.", and our figures are for the latter.⁷⁷ Second, exported cloths were probably somewhat more valuable than the average cloth produced for home consumption, which is not really modelled here because I assumed symmetric production functions for the two types of cloth. In addition, the model does not account for finishing and printing, which would tend to add value to the cloth.

4.4.2 Weaving

So what do the model and the counterfactuals suggest? The relative roles of trade and technology can be examined by comparing employment in the three cases. The difference between the closed economy without technology and the observed series represents the combined effect of trade and technology. Essentially,

$$\textit{Employment Decline} = \textit{Trade Contribution} + \textit{Technology Contribution} \quad (4.1)$$

Or in terms of our results:

$$L_{w1} - L_{w0} = (L_{w1} - L_{w2}) + (L_{w2} - L_{w0}) \quad (4.2)$$

This states that the difference between the closed economies without and with technology (subscripts 1 and 2 respectively) represents the effect of technology alone, and the difference between the closed economy with technology and the observed series (subscript 0) represents the effect of trade alone. Employment figures and the relative contributions of trade and technology are presented in Table 4.10.

⁷⁶Twomey gives exports at the peak of the trade in the late 18th century as 50 million square yards. Our output figure in 1820 was 1066 million square yards, so 4.7 per cent. On the other hand, exports were more important in certain regions. This was a small share of a small figure. India did not produce particularly large quantities of cloth, in comparison with what the Europeans and Americans were about to do, in the first place.

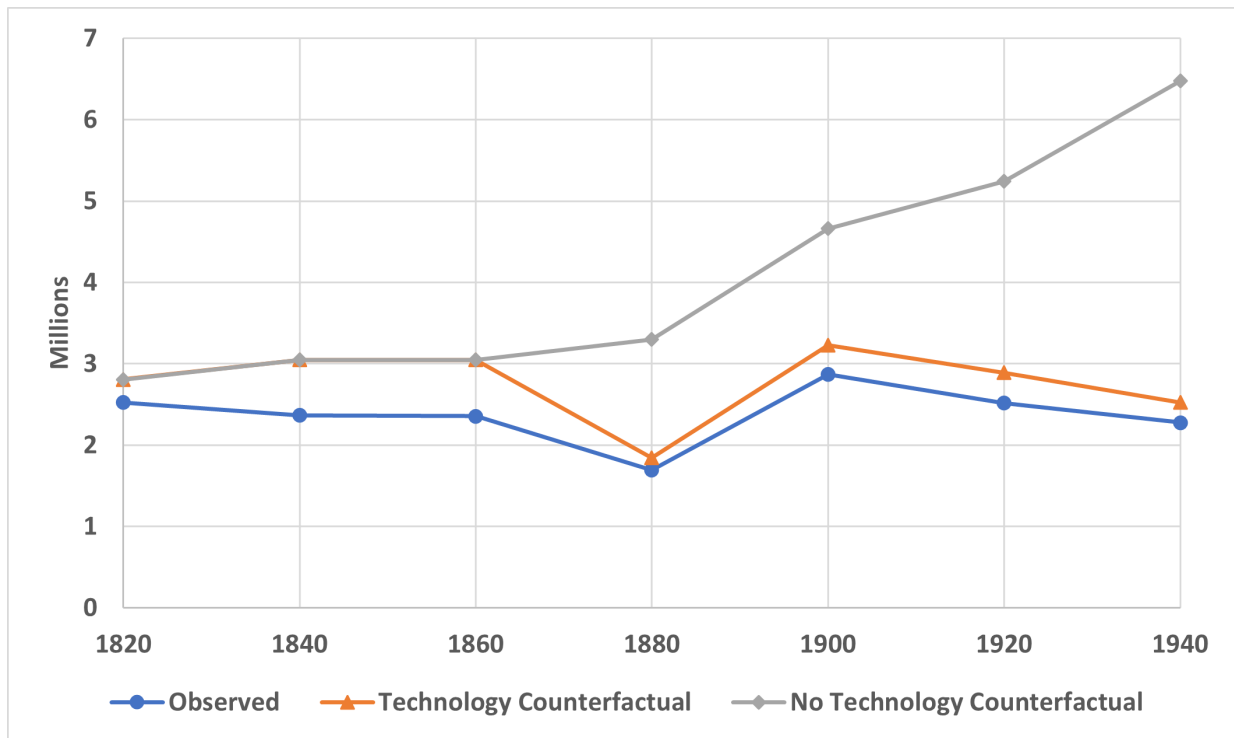
⁷⁷(Twomey, 1983, Page 43).

Table 4.9: Cotton Cloth Market Value Shares by Producer

| Year | Total Value (Rs. Crores) | Hand Loom Share | Indian Mill Share | Import Share | Indian Share |
|------|--------------------------|-----------------|-------------------|--------------|--------------|
| 1820 | 18.26 | 97.6 | 0 | 2.4 | 97.6 |
| 1840 | 18.87 | 83.29 | 0 | 16.71 | 83.29 |
| 1860 | 56.05 | 56.22 | 0 | 43.78 | 56.22 |
| 1880 | 33.44 | 53.27 | 3.97 | 42.76 | 57.24 |
| 1900 | 64.09 | 58.07 | 8.77 | 33.16 | 66.84 |
| 1920 | 171.22 | 49.24 | 28.15 | 22.62 | 77.38 |
| 1940 | 107.56 | 43.04 | 50.17 | 6.79 | 93.21 |

Notes: Value is historical quantity (see Table 4.1) times the implied price from the calibration process, see Appendix 4.B. A Crore is 10 million Rupees, which for the 1800s was approximately £1 million. By the 1900s a Crore was around £0.75 million. There may be some rounding errors. The 1860s figure is valued at prices during the US Civil War, and does appear to be an overestimate, but since the price ratio between the two types of cloth was similar in this period, the market shares should be fairly accurate.

Figure 4.9: Weaving Employment Results



Source: See text.

When imports become an important factor, the contribution of trade to the counterfactual decline in employment drops, because at this point labour saving technology would have been adopted in India to produce the factory competing type of cloth. Virtually all of the employment decline can be attributed to technology rather than trade. At its peak, the trade contribution is only 20 per cent of the total decline in employment.

So much for employment, what about output? Figure 4.10 presents the observed and simulated paths of consumption and production of cotton cloth. Weaving output takes a good deal of time to exceed the no trade and no technology counterfactual. By 1940, it has almost caught up to the no trade counterfactual level. This is intuitive because trade was an unimportant factor historically at this time. Consumption of cloth in the technology but no trade counterfactual exceeds the observed path of consumption in most years. Since British weaving was competitive with Indian and dominated the factory competing market one would expect cloth consumption to be lower without trade. So what is going on here?

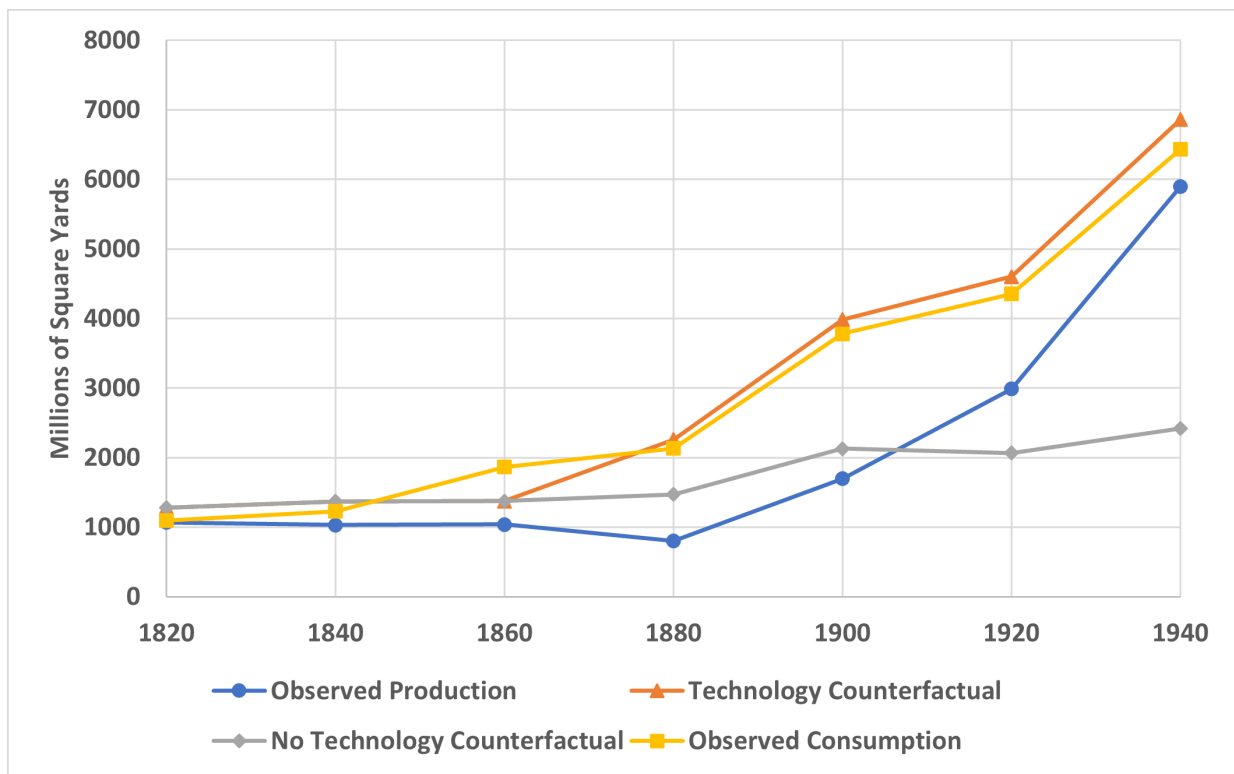
As noted above there are a number of factors that tend to make factory cloth production in this counterfactual higher than it should be in the first place: the role of trade in boosting productivity, the assumption that imported cloth and domestic factory cloth are perfect substitutes, and the modelling trick that essentially leaves a positive externality to domestic factory production. I therefore have not biased the model against import substitution. If anything we have perhaps gone too far in the other direction. On the other hand, direct trade in woven cloth is only one way in which trade could have reduced Indian production of cotton textiles. Trade in raw cotton also mattered, as cotton exports raised the price of cloth even if manufactured imports lowered them. Since raw cotton formed the largest element in the cost of power-loom cloth, cotton exports tended to lower Indian consumption of cloth, even if outsourcing manufacture promoted it. Still, the difference between the observed consumption and the technology counterfactual is a minor one. To summarize the weaving results, trade was unimportant for employment compared to technology, even with the model's bias towards trade being responsible. However, it was more important for the level of physical output in the factory sector, but perhaps not so much for the consumption of cloth. Despite this, the Indian factory sector grew up.

Table 4.10: Weaving Employment Results

| Year | Observed | Technology Counterfactual | No Technology Counterfactual | Technology | Trade | Total | Trade Contribution (Percentage) |
|------|----------|---------------------------|------------------------------|------------|-------|-------|---------------------------------|
| 1820 | 2.524 | 2.807 | 2.807 | 0 | 0.283 | 0.283 | 100 |
| 1840 | 2.366 | 3.045 | 3.045 | 0 | 0.679 | 0.679 | 100 |
| 1860 | 2.355 | 3.048 | 3.048 | 0 | 0.694 | 0.694 | 100 |
| 1880 | 1.691 | 1.846 | 3.297 | 1.451 | 0.155 | 1.606 | 9.676 |
| 1900 | 2.871 | 3.227 | 4.66 | 1.433 | 0.356 | 1.789 | 19.912 |
| 1920 | 2.516 | 2.891 | 5.241 | 2.35 | 0.375 | 2.725 | 13.768 |
| 1940 | 2.276 | 2.524 | 6.478 | 3.954 | 0.248 | 4.202 | 5.901 |

Source: See text. Note: Weaving employment in millions.

Figure 4.10: Weaving Production Results



Source: See text.

4.4.3 Spinning

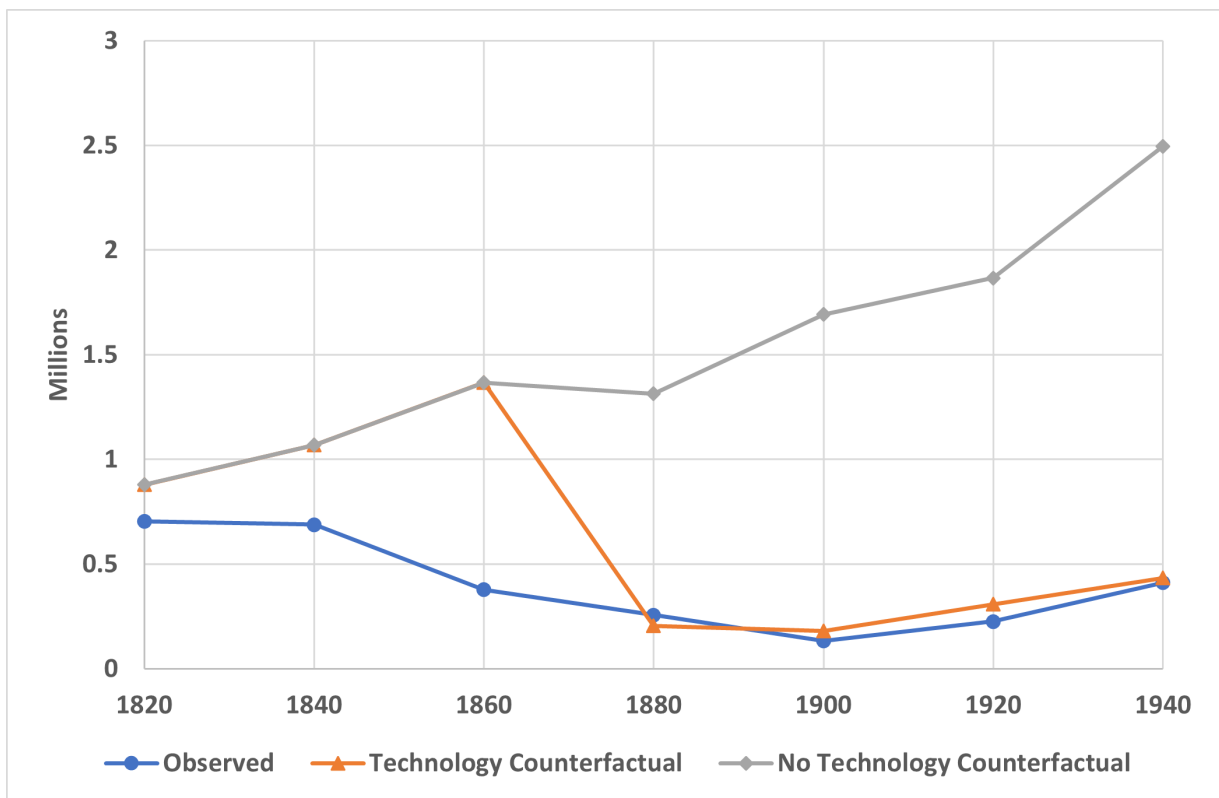
What about spinning? Our figures for spinning employment are in male full time equivalents (FTEs), and therefore the decline in spinning employment (in terms of "people who spin" for some part of the working year) is understated. Figure 4.11 presents the observed and simulated paths of spinning employment in terms of FTEs. There is a large drop between 1840 and 1860. As we shall see, this does not reflect the actual extinction of hand spinning, but rather the reduction in rents accruing to spinners. As their incomes fell relative to non-spinners, their market value in terms of FTEs falls. After 1860 FTE employment continues to fall in the two cases with technology due to the establishment of spinning mills, but gradually picks up to a small extent as the demand for yarn grows. In the Gandhian counterfactual, spinning employment grows to a large extent even in male FTEs. Without technology to erode hand spinner rents, the value the market places on hand spinning does not drop to any large extent.

What can we say about actual employment rather than in male full time equivalents? Many households owned a spinning wheel, but they were often only used on a part time basis, and women made up the majority of spinners.⁷⁸ I am going to give employment figures in terms of full time female spinners. My figures in Appendix 4.F suggest that a woman spun, on average, 37 lb of yarn a year using the traditional spinning wheel.

Let us now count these adjusted figures as "spinning employment", and examine what the path of employment looks like given our figure for spinners per FTE. Factory spinning employment gets counted as a single job, as the workforce was overwhelmingly male (unlike in most countries) and full time. The resulting figures are presented in Figure 4.12. Now we see a cataclysmic decline in spinning employment between 1860 and 1900 in the observed path and the closed economy with technology counterfactual. In 1880 (and 1940), the observed figure is higher than the technology counterfactual because both hand spinning and mill production coexisted in Roy's figures. In the technology counterfactual, only mills are allowed to spin yarn in 1880 and beyond.

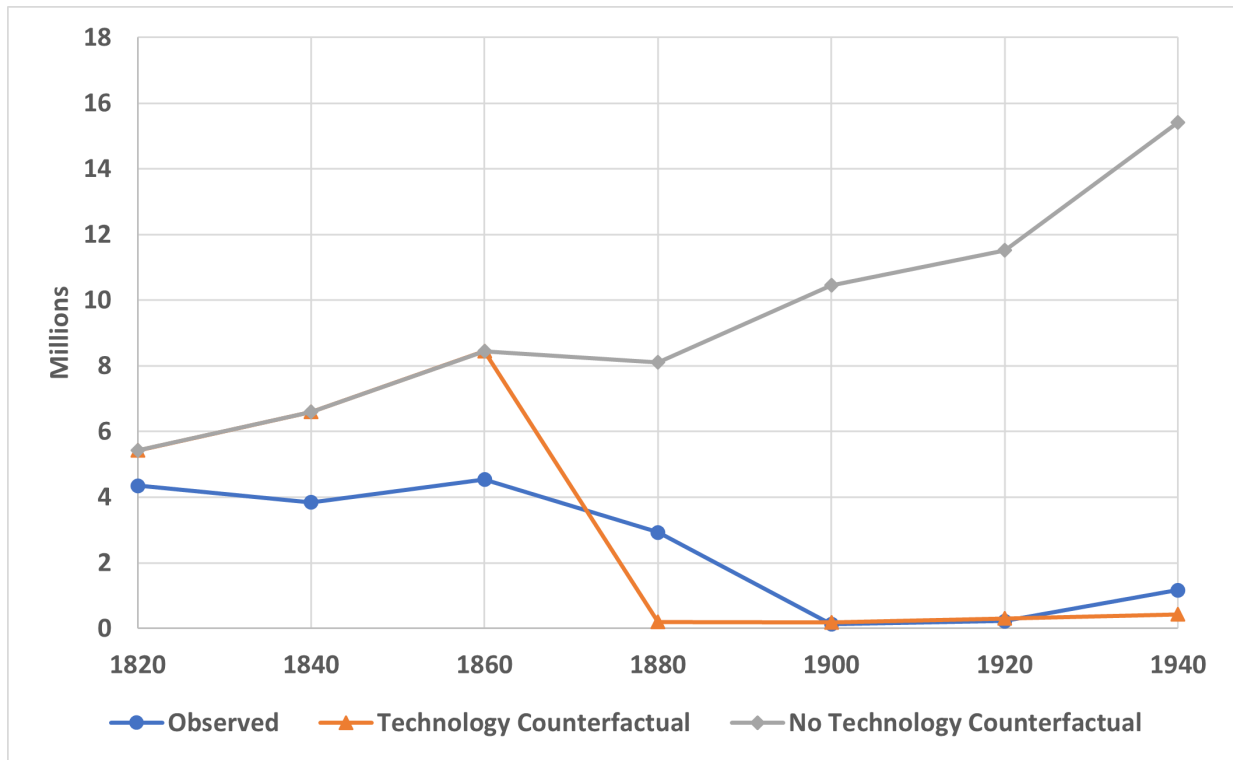
⁷⁸Arno Pearse, for example, (without providing a source) stated, as late as 1930, that "It is estimated that there are in India intermittently at work 50,000,000 spinning wheels", (Pearse, 1930, Page 25). It seems that he misunderstood the figure of "50 lacs" (5 million) provided by two hand spinning propagandists. Since hand spinning meant "one spindle, one spinner", at 37 lb for a full time spinner per year, we would get 185 million lb spun, slightly higher than Roy's 161 million lb. Many wheels, however, were only used part time. Households may have retained spindles for domestic purposes and winding after spinning for the market became unprofitable (Puntambekar & Varadachar, 1926, Page 159).

Figure 4.11: Spinning Employment (FTEs) Results



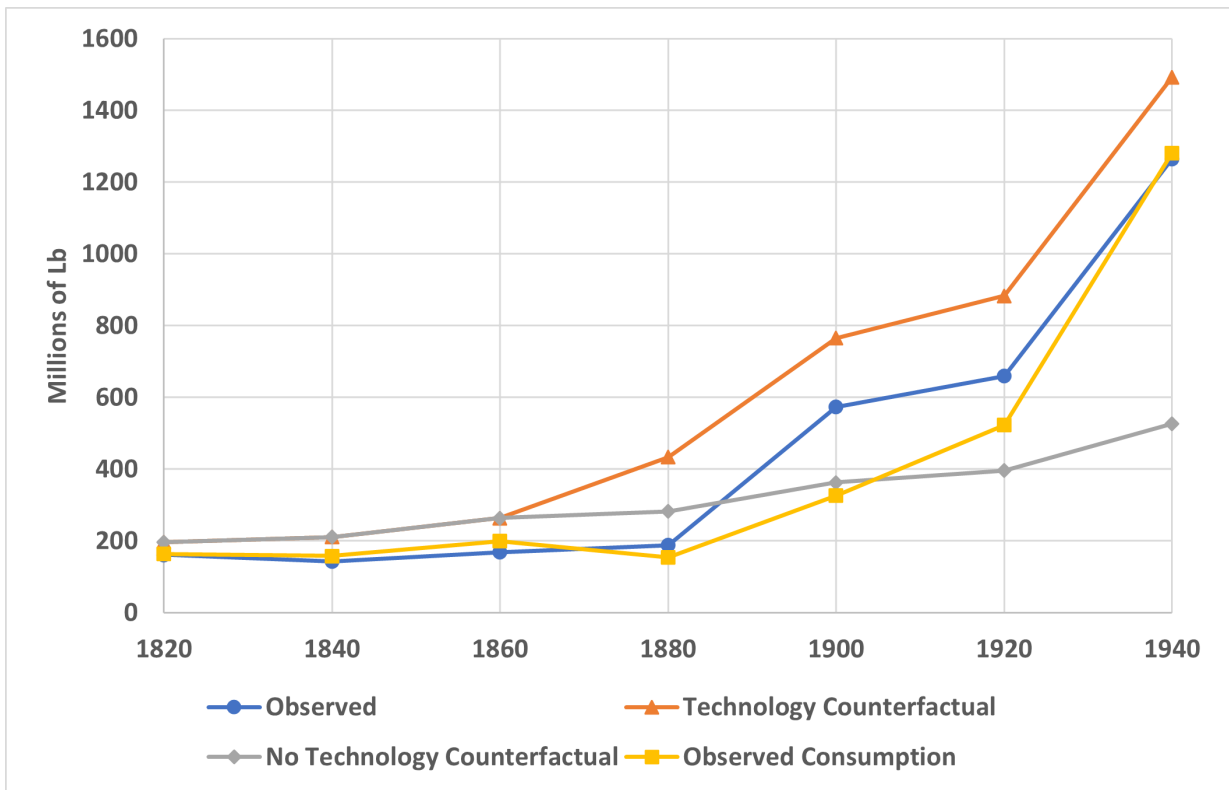
Source: See text.

Figure 4.12: Spinning Employment, Adjusted



Source: See text. Adjusted here refers to employment in terms of actual spinners, not FTEs evaluated at market prices.

Figure 4.13: Yarn Production Results



Source: See text.

Next, let us turn to yarn output. In the observed path, yarn production does not decline, unlike weaving output. This is because the factory sector grew faster in India for spinning than it did in weaving, plus the effect of net yarn exports. Although not modelled here, as all yarns are assumed to be homogeneous, Indian mills specialised in lower counts of yarn than English ones and forced the latter out of much of the external Asian market. While agitation against British imports into India took place because of their impact on employment (usually not by those displaced, and primarily years after the first deindustrialization occurred), Indian mills were doing the exact same thing to Chinese hand spinners.⁷⁹ Exports of Indian mill yarn in the 1890s were around 160-200 million lb a year, more than the entire output of Indian hand spinners just before the introduction of mill yarn.⁸⁰ It seems likely that the Indian mills caused more industrial unemployment abroad in absolute terms than the British ones did in India.⁸¹ Chinese protectionism (and Japanese productivity) after WW1 eventually limited the trade, and so Shanghai did to Bombay what Bombay did to Lancashire in the interwar years.

Whatever the case, employment in both scenarios is far below that of the closed economy without technology counterfactual. This makes sense, because the real "deindustrialization" in India was the decline of hand spinning. Hand weaving survived domestic and foreign mechanised competition, and arguably thrived in the 20th century even before government policy discriminated in its favour after independence. But note that while the major job losses were in spinning, yet historically yarn output did not decline. It seems that deindustrialization, insofar as we interpret it in terms of cotton textile jobs - as almost everyone does - was the necessary corollary of industrialization.

4.5 Discussion

These results suggest that a Gandhian scenario would have resulted in far higher cotton textile employment, at the cost of substantially reduced consumption of cloth. Banning trade but

⁷⁹(Huang, 1985, Page 132).

⁸⁰(India Office, 1905, Table 141).

⁸¹Table 4.29 in Appendix 4.F suggests that Chinese hand spinners spun 39-40 lb of cotton a year, approximately my average when including Indian estimates of 37 lb. Table 4.1 reports net exports of 240 million lb of cotton yarn in 1900. This is equivalent to the output of 6.49 million hand spinners - which is greater than my estimated Indian employment decline.

permitting technology would not have preserved spinning and weaving employment, but would have had limited effects on consumption of cloth, perhaps increasing it by a tiny bit due to lower raw cotton prices, at least if machinery could be produced domestically at a similar price to those actually imported. As my model is static, it is not useful for comparing welfare, which is inherently dynamic. Would the combined prevention of raw cotton exports and shutting out of cloth imports have had beneficial effects in the aggregate?

A standard argument for protection is to take advantage of increasing returns to scale that are external to the firm. However, historically, the Indian industry grew rather large but without generating any important spillover effects. By comparison, the smaller (until the 1930s) Japanese industry, which developed decades after the Indian one, was remarkably innovative.⁸² In Bombay, much criticized labour market institutions from the early days of industry persisted, few bothered to develop innovations or set up machinery works - where was the Indian Toyoda? - despite the presence of substantial local demand in an industrial agglomeration and an institutional environment seemingly conducive to economic activity.⁸³ Rather than productively engaging in collective innovation, it seems that the main activity of the Bombay Mill-owners Association was rent seeking via lobbying for tariffs.⁸⁴ The cotton textile factory industry was not a particularly dynamic sector, and in any case, as Marshall noted, it did not really need protection to grow in the first place. The very small scale of the average hand loom operation suggests that external spillovers may have been more important for it than the factory sector where a large degree of vertical integration was possible. The hand loom deserved state support - here the nationalists were right - although not to the extent of restricting the factory sector.

The heart of the problem of the Indian industry was low labour productivity. This was because workers there refused to tend similar numbers of spindles or looms to their international competitors, despite (a) lower incomes, which should have spurred on work effort, and (b) long experience with the industry. The result was that apparently low wages did not really translate into low unit labour costs - low pay reflected low effort levels.⁸⁵ I sympathise with the workers -

⁸²(Wolcott & Clark, 1999). For a different Indo-Japanese comparison, see (Otsuka *et al.*, 1988), but this account covers Japan far better than India.

⁸³Although traditional labour market institutions started to change in the late 1930s (Chandavarkar, 2008).

⁸⁴Arno Pearse spoke of "very energetic protectionist propaganda" from Bombay (Pearse, 1930).

⁸⁵(Clark, 1987), (Wolcott & Clark, 1999).

I did after all decide to become a graduate student rather than working for much more money in finance or law, but I face a very high marginal tax rate on pecuniary income (national insurance, income taxes, plus consumption taxes etc come close to a marginal tax rate of 50 per cent for most workers) compared to what the factory workers did; the modern British state is arguably much more extractive than the British Indian colonial state was. Had Indian workers and their managers managed to agree to put in a modicum of more effort (closer to international norms) for a slightly smaller modicum of more pay, imports would have been kicked out far faster and exports may have even boomed, as was the case with the Japanese industry in the early 20th century.⁸⁶ The impressive Japanese expansion was concentrated in a very small number of large companies, so all it would have taken was for a small fraction of Indian textile firms to shape up to international competition - and this was in an industry with next to no barriers to entry.⁸⁷

Perhaps preventing trade and technology would have had beneficial effects on the distribution of income. The decline of hand spinning most likely lowered womens' bargaining power within the family, and left them with the meager amount custom otherwise gave them. It was common for many women in India, depending on your family status and background, to be forbidden from working outside the household. Hand spinning was ideal for women in *purdah*, and factory spinning, whether abroad or in India, presumably left them with few market employment options (they still had a lot of non-market work). Unlike in most countries, factory cotton spinning in India was male dominated - maybe a factor in the industry's relative failure compared to Japan.⁸⁸ Bangladesh's recent garment export driven industrialization has relied almost entirely on women workers, for example.

What about between classes? Land tends to be more unequally distributed than labour (assuming slavery is not permitted), and so anything tending to shift the composition of output towards agriculture and away from more labour intensive sectors tends to raise inequality. However, industrialization replaced labour with capital, so its effect on inequality should depend on the distribution of capital, which in India was extremely skewed. My model has Cobb-Douglas production functions for each sector, so the labour share cannot change within each sector. It

⁸⁶(Wolcott & Clark, 1999).

⁸⁷(Yonekawa, 1979).

⁸⁸(Wolcott, 1994).

may, however, do so in the aggregate by shifts in the share of GDP between sectors. In the observed case, the labour share (excluding rents) falls from 60.6 per cent in 1820 to 60.0 per cent in 1940. If we add in two thirds of the rents from hand weaving and spinning, the fall is from 61.1 to 60.2 per cent. So these rough figures do suggest a fall in the labour share over the course of 120 years, but not a very large one. Most families had some sort of right in some plot of land, however small, but very few owned shares in cotton mills. These were concentrated in the hands of small merchant/business groups like the Parsis, the Marwaris, and the Europeans. In Chapter Two we saw that the agricultural export trade helped defeat, not empower, the big bad landlords. Obviously this does not help you, income distribution-wise, if you were landless (defeating the big landlords helped the middle classes with tenancy rights), but neither did the mechanization of manufacturing.

4.6 Conclusion

The first section of this chapter re-examined the facts of Indian deindustrialization, and argued that technology drove employment dynamics. The examination of the "what-ifs" in the second part supports this view. Trade was really only important for the factory weaving sector. Imports of yarn and power loom cloth were largely in the interest of the hand loom weaver. Raw cotton exports were probably the most harmful part of trade to him. Given that the hand loom weaving decline was limited, how come it has achieved such notoriety? It was localised, for a start, and apparently concentrated in Eastern India more than elsewhere. Owing to the paucity of statistics in this period, it was easy to merely accept the (at first glance reasonable) idea that the handloom was on the way out in the face of factory competition.⁸⁹ Part of Tirthankar Roy's story about the handicrafts is their commercialisation and urbanisation. So observed rural decline may have been remarked upon more than urban growth, mistaking this Schumpeterian creative destruction for pure decline. And we cannot ignore the political importance of painting tales of woe and imagining a prosperous past in the early 20th century. Spinning a completely different type of yarn was a highly profitable industry in late colonial India.

⁸⁹N. N. Banerjei, author of the "Monograph on the Cotton Fabrics of Bengal", dated 1898, could write of "the undoubted fact, that the indigenous cotton industry of these Provinces is in a moribund condition" right in the middle of what the data in Figure 4.6 suggest was a period of rapid expansion! (Banerjei, 1898).

In the grand scheme of things, it appears rather strange that international trade got the blame across India for what deindustrialization there was. By 1940, the Indian cotton textile factory industry was over-whelmingly concentrated in Bombay Presidency, and in particular, the two cities of Bombay and Ahmedabad. Table 4.11 presents the regional distribution of the Indian cotton factory industry in 1939, by which point imports were a minor factor. Bombay Presidency, which had a smaller population than most other individual major provinces, had approximately 60 per cent of the total Indian employment in cotton mills. These figures exclude night shifts, but Bombay almost certainly led the way in these. Regional concentration suggests that even in our closed economy counterfactual, most provinces in India would not have produced very much cloth by factory methods and instead imported it from one of the others, even while provincial production of the factory competing cloth by hand loom and yarns by hand spinners, and therefore employment, declined. Intra-national trade would have taken the place of international trade.

For reasons that are not clear to me, Bengal did not bother to any large extent with factory cotton textiles, despite the first mill (from the 1830s) being located there to supply local weavers. Table 4.11 shows that both the Central Indian States and the Central Provinces & Berar (considered as one) individually had more cotton factory workers than much more populous Bengal. Bengal instead manufactured Jute cloth by factory methods, from raw material grown in what is now Bangladesh. Employment in the factory jute industry in the early 20th century was around 300,000, and, unlike cotton, it was able to out-compete the British Industry without resort to tariff protection - trade also gave some manufacturing jobs.⁹⁰ Indeed, it had to, because it was dependent on foreign consumers. Mill-owners from Ahmedabad liked to whine about rail freights for importing coal from where it was produced near Calcutta, but no one forced them to situate their factory on the opposite end of the country from all of the coal mines.⁹¹ Perhaps they should have set up shop in Bengal instead. In such a world, deindustrialization may never have been such a hot topic.

Many provinces, such as Bihar, saw the decline in factory-competing hand-loom weaving and

⁹⁰The key reason was that the ratio between number of spindles/looms tended per worker was not as large between the UK and India as in the cotton textile industry (Clark, 1989).

⁹¹(GoI, 1927b, Page 390).

Table 4.11: Regional Distribution of the Indian Factory Cotton Textile Industry, 1939

| Province/Region | Mills | Spindles (000's) | Looms (000's) | Average Number of Hands Employed on Day Shift (000's) | Share of Employment |
|----------------------------|------------|---------------------|------------------|---|---------------------------|
| Bombay City and Island | 68 | 2,850 | 67 | 113 | 25.57 |
| Ahmedabad | 77 | 1,902 | 47 | 78 | 17.65 |
| Rest of Bombay (inc. Sind) | 62 | 1,264 | 27 | 63.5 | 14.37 |
| Bombay Total | 207 | 6,016 | 141 | 255 | 57.69 |
| Rajputana | 6 | 89 | 2 | 5 | 1.13 |
| Berar | 4 | 68 | 1.5 | 4 | 0.9 |
| Central Provinces | 8 | 324 | 8 | 18.5 | 4.19 |
| Bihar and Orissa | 2 | 28 | 0.25 | NA | NA |
| Hyderabad | 6 | 124 | 2 | 7 | 1.58 |
| Central Indian States | 16 | 389 | 11 | 26 | 5.88 |
| Bengal | 30 | 555 | 10 | 22 | 4.98 |
| Punjab | 8 | 111 | 2.5 | 6.5 | 1.47 |
| Delhi | 6 | 109 | 3 | 5 | 1.13 |
| United Provinces | 26 | 725 | 11.5 | 26.5 | 6 |
| Madras (inc. Cochin) | 58 | 1,368 | 7 | 51.5 | 11.65 |
| Travancore | 1 | 12 | 0.3 | 0.5 | 0.11 |
| Mysore | 8 | 165 | 2.5 | 9 | 2.04 |
| Pondicherry (French) | 3 | 88 | 2 | 5 | 1.13 |
| Grand total | 389 | 10,059 | 202.5 | 442 | 100 |

Source: (Pry, 1940, Page 40). **Notes:** Spindles, looms, and employment figures are rounded to the nearest thousand or 0.5 of a thousand, except for the Travancore figure for looms (which was 300 precisely). No Employment figures were provided for Bihar and Orissa, but they were most likely less than a thousand.

hand spinning, but had very few people decide to set up factories locally.⁹² Thus both employment and production declined in these places, while production soared in India as a whole over the long run. In the 20th century at least, they should really blame Bombay rather than Manchester. At partition West Pakistan had next to no cotton textile factories, but rather rapidly built capacity once imports from Bombay were excluded - something Bihar and the other backwards Indian states were not permitted to do.⁹³ But this may have just been them following their comparative advantage, and industrialization would not have brought back very many textile jobs, unless they were productive enough to export on a large scale. As the simulations in this paper suggest, technology was the ultimate reason for job losses.

That said, we cannot let imperialism off the hook: it's main contribution to Indian deindustrialization was that it created the conditions for an industrial revolution in India. That the UK just so happened to be the world's lowest cost producer of cotton cloth and fine yarns as well as India's metropole is, at the end of the day, merely a coincidence that explains the role of imports. What India needed was for her managers and workers in the factory sector to agree to tend more spindles or looms per person.⁹⁴ While the modern sector refused to cut labour per loom, the traditional sector was adopting the flying shuttle which did so.⁹⁵ Rapid factory output expansion would not have required much extra investment: Indian mills refused to run double or triple shifts, unlike their East Asian competitors, until the 1930s. The Indian industry took so long to put its house in order that import replacement took a long time, and ultimately had to be spurred on by protection. India had decades of an industrial head start in comparison with Japan and China. Yet it largely squandered its Asian first mover advantage. Japan managed to slightly overtake in the interwar years, and with exceedingly rapid postwar growth left India far behind. Now India attempts to exclude Chinese manufactures while old rivals, Bombay and Manchester, are both noted for their old mill buildings no longer in operation: *sic transit gloria mundi*.

⁹²The sole mechanised industry in Bihar proper of any size by 1940s was the sugar industry, which grew rapidly after protection was granted. This was a highly capital intensive seasonal industry which employed few people - as with cotton textiles, sugar industrialization didn't bring much in the way of industrial jobs. Since sugar has to be processed close to where it is grown, it did bring lots of agricultural ones.

⁹³(Minyard, 1963).

⁹⁴(Clark, 1987).

⁹⁵(Roy, 2002).

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4.A The Full Model

4.A.1 Consumer's Problem

Consider a representative consumer with preferences over non-cotton textile goods, C_a , and industrial goods (cotton cloth), C_w represented by a Cobb-Douglas utility function.

The problem of the representative consumer, given prices and income, is:

$$\begin{aligned} \max_{C_a, C_w} \quad & C_a^{(1-\delta)} C_w^\delta \\ \text{s.t.} \quad & P_a C_a + P_w C_w = E \end{aligned} \tag{4.3}$$

Where:

1. δ is the preference parameter between food and cloth.
2. E is his nominal income
3. P_a, P_w are the nominal prices of each good.

Given prices, the resulting FOC is:

$$\frac{C_a}{C_w} = \left(\frac{1-\delta}{\delta} \frac{P_w}{P_a} \right) \tag{4.4}$$

Given E , the optimal consumption choices are:

$$C_a = \frac{(1-\delta)}{P_a} E \tag{4.5}$$

$$C_w = \frac{\delta}{P_w} E \tag{4.6}$$

However, the cloth good is actually a composite good, composed of traditional and factory cloth. I model this with Leontief preferences (see the main text for justification). The problem of the representative consumer in allocating his cloth budget, given prices and income, is:

$$\begin{aligned} \max_{C_{wt}, C_{wf}} \quad & C_w = \min(C_{wt}, \frac{C_{wf}}{\beta}) \\ \text{s.t.} \quad & P_{wf}C_{wf} + P_{wt}C_{wt} = E_w \end{aligned} \tag{4.7}$$

Where:

1. β is the preference parameter between the two types of cloth.
2. P_{wt}, P_{wf} are the nominal prices of each good.
3. $E_w = P_w C_w$

This implies that:

$$C_{wf} = \beta C_{wt} \tag{4.8}$$

Given E_w , the optimal consumption choices are:

$$C_{wt} = \frac{E_w}{P_{wt} + \beta P_{wf}} \tag{4.9}$$

$$C_{wf} = \frac{\beta E_w}{P_{wt} + \beta P_{wf}} \tag{4.10}$$

Where P_w is a price index associated with buying one "wardrobe" unit of cloth:

$$P_w = P_{wt} + \beta P_{wf} \tag{4.11}$$

4.A.2 Non-cotton Supply Side

Now let us look at the production side. Consider the Non-cotton good, subscript a . This is a stand in for (non-cotton) agriculture, which dominated output and employment in India in this period. Suppose that there are decreasing marginal returns to labour and the market is perfectly competitive.

$$P_a Y_a = P_a A_a L_a^{\gamma_a} = \pi_a + W L_a \quad (4.12)$$

This implies (price equals marginal cost) that

$$P_a = \frac{W}{\gamma_a A_a L_a^{\gamma_a - 1}} \quad (4.13)$$

Where W is the nominal wage, π_a is the profit (rent) of the agricultural sector, and γ_a is the degree of diminishing returns in agriculture (between zero and one).

4.A.3 Cotton Supply Side

There are five cotton related sectors, but some time periods and counterfactuals will only have some of them in operation: Traditional Weaving, Factory (competing) weaving, hand spinning, factory spinning, and cotton cultivation. Spinning uses cotton as an input at rate k lb per lb of yarn, weaving uses yarn as an input at rate c lb of yarn per yard of cloth.

Weaving

The weaving sectors must also purchase yarn, at a rate of c lb per square yard produced. Consider factory weaving (subscript wf):

$$\pi_{wf} = ((P_{wf} - cP_s)/\mu_{wf})A_{wf}L_{wf}^{\gamma_{wf}} - W L_{wf} \quad (4.14)$$

μ_{wf} is a mark up over labour costs (in terms of rural wages), representing payments to capital and the factory-rural wage differential. Without a mark up, its price would be equal to unit labour costs plus the necessary yarn. But we need to raise its cost, because labour was not the only cost component net of raw materials - industrialization was about using more capital. We can model this by ensuring that P_{wf} (net of yarn) is some multiple of unit labour costs:

$$P_{wf} = P_s c + \mu_{wf} \frac{W}{A_{wf} \gamma_{wf} L_{wf}^{\gamma_{wf} - 1}} = P_s c + \mu_{wf} \frac{W}{\gamma_{wf} (Y_{wf} / L_{wf})} \quad (4.15)$$

Where μ_{wf} is the markup, representing the combined effect of payments to capital and the rural-urban wage differential. At P_{wf} the firm would like to produce more, but since we have fixed a markup, it will only produce up to the quantity demanded by the consumer at that price.

By including a markup we can incorporate, for our purposes, the use of capital in a static model which does not explicitly include capital accumulation. Making the model dynamic would substantially complicate things, so instead I assume that so long as you are willing to pay proportionately to labour costs, capital will have been accumulated accordingly.⁹⁶ I assume that factory industry, once you include capital, will very nearly have constant returns to scale by my later choices of the γ parameters.

Similarly for "traditional weaving", subscript wt , which does not have a markup:

$$\pi_{wt} = (P_{wt} - cP_s)A_{wt}L_{wt}^{\gamma_{wt}} - WL_{wt} \quad (4.16)$$

Perfect competition and profit maximisation result in:

$$P_{wt} = P_s c + \frac{W}{\gamma_{wt} A_{wt} L_{wt}^{\gamma_{wt}-1}} \quad (4.17)$$

Spinning

We can repeat this for spinning, but with μ_{sf} and κ .

$$\pi_{st} = (P_s - kP_k)A_{st}L_{st}^{\gamma_{st}} - WL_{st} \quad (4.18)$$

$$\pi_{sf} = (P_s - kP_k)/\mu_{sf} A_{sf} L_{sf}^{\gamma_{sf}} - WL_{sf} \quad (4.19)$$

⁹⁶If the production function is Cobb-Douglas in labour and capital, the markup will be a constant (factor shares are constant), but the A parameter will depend (among other things) on the equilibrium wage, the price of capital and the equilibrium interest rate. If we assume that the latter is exogenously determined, and that the price of capital is directly proportional to wages (perhaps because capital goods are produced by labour), then the wage term gets cancelled out. However, my model is not this complicated, and so this shortcoming must be acknowledged.

Unlike weaving, both the hand spinning (st) and factory (sf) sectors produce the same output, and so profit maximisation results in:

$$P_s = P_k\kappa + \frac{W}{\gamma_{st}A_{st}L_{st}^{\gamma_{st}-1}} \quad (4.20)$$

$$P_s = P_k\kappa + \mu_{sf} \frac{W}{\gamma_{sf}A_{sf}L_{sf}^{\gamma_{sf}-1}} \quad (4.21)$$

Cotton Cultivation

Next, consider cotton cultivation, subscript k (from the Hindi word for cotton, *Kapas*):

$$Y_k = A_k L_k^{\gamma_k} \quad (4.22)$$

This industry is perfectly competitive so we have:

$$P_k = \frac{W}{\gamma_k A_k L_k^{\gamma_k-1}} \quad (4.23)$$

Where γ_k is the degree of diminishing returns in cotton cultivation (between zero and one).

4.A.4 Aggregate Income

In general equilibrium, the representative consumer's income is endogenous and has to equal the sum of the net values of his equilibrium production in each sector:

$$E = P_a Y_a + (P_s - P_k\kappa) Y_{st} + (P_s - P_k\kappa) Y_{sf} + (P_{wt} - P_s c) Y_{wt} + (P_{wf} - P_s c) Y_{wf} + P_k Y_k \quad (4.24)$$

Since firms face a markup, representing payments to capital and the premium to factory workers, the difference gets returned to households and gets included in E . Let \tilde{E} be the maximand of the firm. Then:

$$E = \tilde{E} + \left(\frac{\mu_{wf} - 1}{\mu_{wf}}\right)(P_{wf} - P_s c)Y_{wf} + \left(\frac{\mu_{sf} - 1}{\mu_{sf}}\right)(P_s - P_k \kappa)Y_{sf} \quad (4.25)$$

In other words, payments to capital and the excess wage earnings of factory workers need to be included in total income.

4.A.5 Equilibrium

Assume that all prices are set exogenously by the world economy. Trade means that we can consider production and consumption separately. Given prices and nominal income, we have determined the consumer's optimal consumption choices above. We have also determined each sector's optimal production choices, given the wage. Consider the problem of labour allocation, which is to maximise:

$$\tilde{E} = P_a Y_a + (P_{st} - P_k \kappa)Y_{st} + \frac{(P_{sf} - P_k \kappa)}{\mu_{sf}} Y_{sf} + (P_{wt} - P_s c)Y_{wt} + \frac{(P_{wf} - P_s c)}{\mu_{wf}} Y_{wf} + P_k Y_k \quad (4.26)$$

Subject to an aggregate labour endowment:

$$L = L_a + L_k + L_{wt} + L_{wf} + L_s \quad (4.27)$$

(and non-negativity constraints, but our Cobb-Douglas set up ensures that these will not be violated in at the maximum, since the marginal product of labour in a given sector goes to infinity as labour allocated to that sector tends towards zero.)

The non-factory wage will equal the Lagrangian multiplier on this constraint. The first order conditions (FOCs) for equilibrium are:

$$P_a = \frac{W}{\gamma_a A_a L_a^{\gamma_a - 1}} \quad (4.28)$$

$$P_k = \frac{W}{\gamma_k A_k L_k^{\gamma_k - 1}} \quad (4.29)$$

$$P_s = P_k \kappa + \frac{W}{\gamma_{st} A_{st} L_{st}^{\gamma_{st} - 1}} \quad (4.30)$$

$$P_s = P_k \kappa + \mu_{sf} \frac{W}{\gamma_{sf} A_{sf} L_{sf}^{\gamma_{sf} - 1}} \quad (4.31)$$

$$P_{wf} = P_s c + \mu_{wf} \frac{W}{A_{wf} \gamma_{wf} L_{wf}^{\gamma_{wf} - 1}} \quad (4.32)$$

$$P_{wt} = P_s c + \frac{W}{\gamma_{wt} A_{wt} L_{wt}^{\gamma_{wt} - 1}} \quad (4.33)$$

4.B Calibration: Details

We need to calibrate the model before we use it. I do so by considering the economy to have been open. Given that India either had low tariffs or was on a free trade basis before 1920 (and tariffs really only went up after 1920), this is not too inaccurate an assumption. One problem is that the cereals that make up (non-cotton) "agricultural goods" in the model were not really traded before 1880, owing to their low value to bulk, but this is just a stand in for every other sector in the economy. The data sources used in calibration are described in further detail in Appendix 4.M.

Table 4.12 presents the price of cotton (P_k), price of the agricultural good, Price of Jowar (millet) (P_j), the cotton to yarn conversion ratio, the yarn to cloth conversion ratios, and the nominal wage. P_a is an average of the price of wheat, rice and millet, the three major foodgrains in India. For 1820-1880 nominal wages and prices were taken from the Bombay District Gazetteers. After 1880, I assumed that wages in terms of jowar were constant, given the stagnation of Indian per capita income, and the nominal wage is therefore the average jowar wage for 1820-1880 times the jowar price.

Table 4.13, outlines Indian production of cotton, net exports of cotton, and consumption of cotton 1820-1940, using Roy's figures plus the official trade statistics.

Tables 4.14 and 4.15 calculate the relevant markups for the factory sectors. Table 4.16 presents employment in the factory sectors, as well as the implied parameters of the production functions given Roy's output series.

We now need to use the model and the data to calibrate the rest of the parameters. These depend on prices, and we are missing those of cloth and yarn.

4.B.1 Spinning

First consider the spinning sector. From the model:

$$P_s = P_k \kappa + \mu_{sf} \frac{W}{\gamma_{sf} A_{sf} L_{sf}^{\gamma_{sf}-1}} \quad (4.34)$$

Table 4.12: Calibration: Base Prices and Parameters

| Year | Pk | Pa | Pj | k | c | Nominal Wage | L |
|------|----------|---------|---------|----------|----------|--------------|-------|
| 1820 | 137611.6 | 1846357 | 1240436 | 1.481481 | 0.153846 | 34667969 | 102.5 |
| 1840 | 120454.9 | 1725927 | 1163561 | 1.481481 | 0.153846 | 32084537 | 106 |
| 1860 | 291501.6 | 2803126 | 1976680 | 1.481481 | 0.192308 | 62640625 | 116 |
| 1880 | 242760.3 | 3208037 | 2203485 | 1.481481 | 0.192308 | 51662071 | 127 |
| 1900 | 243534.9 | 3610387 | 2606367 | 1.481481 | 0.192308 | 72103906 | 147 |
| 1920 | 682079.1 | 7367667 | 5812000 | 1.481481 | 0.192308 | 160786202 | 159.5 |
| 1940 | 243894.6 | 4345238 | 3062500 | 1.481481 | 0.217391 | 84722599 | 200 |

Sources: See Appendix 4.M. **Notes:** All prices are per million lb (cotton), maunds (around 37 kg, foodgrains), workers etc. L is the assumed workforce in millions. k lb of raw cotton are needed for 1 lb of yarn. c lb of yarn are needed for 1 yard of cloth.

Table 4.13: Cotton Observed Figures

| Year | Yk | Xk | Ck |
|------|----------|--------|----------|
| 1820 | 328.5185 | 90 | 238.5185 |
| 1840 | 310.3704 | 100 | 210.3704 |
| 1860 | 452.8889 | 204 | 248.8889 |
| 1880 | 721.5185 | 443 | 278.5185 |
| 1900 | 1487.289 | 638.4 | 848.8889 |
| 1920 | 1796.778 | 819 | 977.7778 |
| 1940 | 2866.034 | 991.96 | 1874.074 |

Source: See Appendix 4.M. **Notes:** Yk is output of cotton in millions of lb. Xk is net exports of cotton. Ck is Indian consumption of cotton.

Table 4.14: Capital Cost Factory Markups

| Spinning | | | | |
|-----------------------------------|----------|------------|----------|----------|
| Pies per spindle per day | Bombay | Up country | Average | Markup |
| Wages | 5.04 | 3.86 | | |
| Total Manufacturing and overheads | 9.97 | 10.01 | | |
| Wage share | 0.505517 | 0.385614 | 0.445565 | 2.244339 |
| Weaving | | | | |
| Pies per loom per day | Bombay | Up country | Average | Markup |
| Wages | 317.64 | 255.5 | | |
| Total Manufacturing and overheads | 514.13 | 471.17 | | |
| Wage share | 0.61782 | 0.542267 | 0.580044 | 1.724008 |

Source: (GoI, 1927a, Pages 119-20) **Note:** A Pie is 1/12 of an Anna, which is 1/16 of a Rupee.

Table 4.15: Total Markups, Factory Sectors

| Year | Factory-Rural Wage ratio | Spinning Markup Over wages | Weaving Markup Over wages | Total Spinning Markup | Total Weaving Markup |
|------|--------------------------|----------------------------|---------------------------|-----------------------|----------------------|
| 1880 | 2.25 | 2.244339 | 1.724008 | 5.049763 | 3.879018 |
| 1900 | 2.25 | 2.244339 | 1.724008 | 5.049763 | 3.879018 |
| 1920 | 2.25 | 2.244339 | 1.724008 | 5.049763 | 3.879018 |
| 1940 | 3 | 2.244339 | 1.724008 | 6.733017 | 5.172024 |

Source: Factory-Rural wage ratio from (Wolcott, 2013, Figure 5).

Table 4.16: Factory Employment and Parameters

| Year | Lsf | Lwf | Ywf/Lwf | Ysf/Lsf | Gamma sf | Gamma wf | Asf | Awf |
|------|-------|-------|----------|---------|----------|----------|---------|---------|
| 1880 | 0.035 | 0.009 | 13755.56 | 2314.29 | 0.95 | 0.95 | 1957.13 | 10869 |
| 1900 | 0.133 | 0.029 | 19006.9 | 4308.27 | 0.95 | 0.95 | 3894.89 | 15923.2 |
| 1920 | 0.226 | 0.085 | 20004.71 | 2920.35 | 0.95 | 0.95 | 2711.07 | 17684.9 |
| 1940 | 0.355 | 0.176 | 22439.56 | 3478.87 | 0.95 | 0.95 | 3303.32 | 20572.6 |

Source: See Appendix 4.M. **Note:** Gamma and A are the parameters of a Cobb-Douglas Production Function.

Which gives us P_s from the data in the above tables for the years 1880-1940.

Note that:

$$P_s = P_k \kappa + \frac{W}{\gamma_{st} A_{st} L_{st}^{\gamma_{st}-1}} = P_k \kappa + \frac{W}{\gamma_{st} Y_{st}/L_{st}} \quad (4.35)$$

I assume that $\gamma_{st} = 0.9$. Hand spinning was a labour intensive process, and the labour share was likely to be very high. This then allows us to calculate Y_{st}/L_{st} , and since we have an estimate of Y_{st} , then also L_{st} and A_{st} , for the years 1880 and 1940, when both factory and hand spinning

Table 4.17: Factory Spinning Calibration

| Year | kPk | W | Markup | Lsf | Ysf/Lsf | Asf | Gamma sf | Ps-kPk | Ps |
|------|----------|------------|--------|------|---------|---------|----------|----------|----------|
| 1880 | 359644.8 | 51662071.1 | 5.05 | 0.04 | 2314.29 | 1957.13 | 0.95 | 118659.4 | 478304.2 |
| 1900 | 360792.5 | 72103906.3 | 5.05 | 0.13 | 4308.27 | 3894.89 | 0.95 | 88961.73 | 449754.2 |
| 1920 | 1010488 | 160786202 | 5.05 | 0.23 | 2920.35 | 2711.07 | 0.95 | 292658.2 | 1303146 |
| 1940 | 361325.4 | 84722598.7 | 6.73 | 0.36 | 3478.87 | 3303.32 | 0.95 | 172602.4 | 533927.8 |

Source: See Appendix 4.M.

Table 4.18: Adjusting Hand Spinning to Women's Earnings

| Year | Yst/Lst per Woman | Implied Yst/Lst from Ps | Ratio | Hand Spinner Earnings (Rs per Million) | Ratio with Male Wages | Implied Yst/Lst |
|------|-------------------------|----------------------------------|-------|--|--------------------------------|--------------------|
| 1820 | 37 | | | 5614583 | 6.17 | 228.46 |
| 1840 | 37 | | | 5750000 | 5.58 | 206.46 |
| 1860 | 37 | | | 5210000 | 12.02 | 444.86 |
| 1880 | 37 | 483.8 | 13.03 | 3910000 | 13.21 | 488.87 |
| 1900 | 37 | 900.6 | 15.05 | | | |
| 1920 | 37 | 610.4 | 16.49 | | | |
| 1940 | 37 | 545.4 | 14.76 | | | |

Source: For output per woman, see Appendix 4.F. Implied Yst/Lst from Table 4.19. Male Earnings from Table 4.12. Hand spinner earnings from Appendix 4.F.

coexisted.

My figures suggest that a woman working full time spun approximately 37 lb of cotton a year. The implied Y_{st}/L_{st} from the prices calculated using the factory sector is far higher than this. There is a simple explanation: spinners were paid a good deal less than the full time male workers in which our L_{st} is measured. What we can do is adjust our 37 lb figure by the ratio between spinner earnings and male wages. The latter are presented in Table 4.12. I have collected a few estimates of full time hand spinner earnings from various sources. These, male wages, their ratio and the implied ratio in productivity are presented in Table 4.18.

Now, if we assume that γ_{st} was constant 1820-1880, we can estimate A_{st} (in terms of male FTEs) for those years too. There was no technological progress in hand spinning. The results are presented in Table 4.19. The implied L_{st} figures at first glance seem rather low, around 0.7 million. It has to be remembered, however, that this figure is in male full time equivalents, and the actual larger number of women spinning is separately presented. The large difference comes from the poor pay spinners earned. These figures, alongside the equilibrium conditions of the model also allow us to estimate the price of yarn before 1880.

Table 4.19: Traditional Spinning: Calibration

| Year | γ_{st} | Yst/Lst | Yst | Implied Lst (Male FTE) | Implied/Assumed Ast | Implied Women Spinning |
|------|---------------|---------|-----|---------------------------|---------------------|------------------------------|
| 1820 | 0.9 | 228.46 | 161 | 0.7 | 220.6 | 4.35 |
| 1840 | 0.9 | 206.46 | 142 | 0.69 | 198.87 | 3.84 |
| 1860 | 0.9 | 444.86 | 168 | 0.38 | 403.58 | 4.54 |
| 1880 | 0.9 | 482.18 | 107 | 0.22 | 414.79 | 2.89 |
| 1900 | 0.9 | 556.73 | 0 | 0 | 414.79 | 0 |
| 1920 | 0.9 | 610.19 | 0 | 0 | 414.79 | 0 |
| 1940 | 0.9 | 546.14 | 30 | 0.05 | 408.59 | 0.81 |

Source: See text. **Note:** A_{st} for 1900 and 1920 are assumed rather than implied, as Roy's figures have no hand spun yarn for those years. In practice there was a small amount spun.

4.B.2 Weaving

Factory Weaving 1880-1940

First, consider the factory sector after 1880. From the Production function:

$$Y_{wf} = A_{wf} L_{wf}^{\gamma_{wf}} \quad (4.36)$$

From the FOC:

$$P_{wf} = P_s c + \mu_{wf} \frac{W}{A_{wf} \gamma_{wf} L_{wf}^{\gamma_{wf}-1}} = P_s c + \mu_{wf} \frac{W}{\gamma_{wf} Y_{wf} / L_{wf}} \quad (4.37)$$

I assume that $\gamma_{wf} = 0.95$ (capital costs are included in the markup). This high figure captures the idea that diminishing returns set in slower in modern industry than in agriculture thanks to capital accumulation. This allows us to calculate A_{wf} and then P_{wf} . The results are presented in Table 4.20.

Hand Loom Weaving 1880-1940

Next, consider hand loom weaving. I assume that all hand loom production after 1880 counts as Y_{wt} . From the Production function:

Table 4.20: Factory Weaving Production Function: 1880-1940

| Year | cPs | W | Markup | Lwf | Ywf/Lwf | Awf | Gamma wf | Pwf-cPs | Pwf |
|------|----------|------------|--------|------|----------|----------|----------|----------|----------|
| 1880 | 91981.59 | 51662071.1 | 3.88 | 0.01 | 13755.56 | 10869.02 | 0.95 | 15335.28 | 107316.9 |
| 1900 | 86491.2 | 72103906.3 | 3.88 | 0.03 | 19006.9 | 15923.23 | 0.95 | 15489.8 | 101981 |
| 1920 | 250604.9 | 160786202 | 3.88 | 0.09 | 20004.71 | 17684.92 | 0.95 | 32818.2 | 283423.1 |
| 1940 | 116071.3 | 84722598.7 | 5.17 | 0.18 | 22439.56 | 20572.63 | 0.95 | 20555.21 | 136626.5 |

Source: See Appendix 4.M.

Table 4.21: Hand loom Weaving Production Function: 1880-1940

| Year | Assumed Ywt/Lwt | Ywt | Lwt | Gamma wt | Awt | Implied Pwt |
|------|--------------------|--------|------|----------|---------|-------------|
| 1880 | 402.55 | 677 | 1.68 | 0.75 | 458.42 | 263097.9 |
| 1900 | 402.55 | 1144 | 2.84 | 0.75 | 522.66 | 325315.4 |
| 1920 | 528.35 | 1284.4 | 2.43 | 0.75 | 659.73 | 656364.7 |
| 1940 | 926.19 | 1945 | 2.1 | 0.75 | 1114.95 | 238037 |

Source: See Appendix 4.M and Appendix 4.G.

$$Y_{wt} = A_{wt}L_{wt}^{\gamma_{wt}} \quad (4.38)$$

From the relevant FOC:

$$P_{wt} = P_s c + \frac{W}{\gamma_{wt} A_{wt} L_{wt}^{\gamma_{wt}-1}} \quad (4.39)$$

I assume that $\gamma_{wt} = 0.75$. Hand loom weaving took some skill, and so there would be diminishing marginal returns to labour. Labour productivity in weaving is assumed based upon figures for output per loom and workers per loom. These figures allow us to estimate P_{wt} .

Weaving 1820-1860

Before 1880, the model has factory competing cloth being produced in India by the same production function as the traditional style cloth. We observe X_{wf} , i.e. net cloth imports, which I assume to be entirely of the factory competing good. We observe hand loom output, which before 1880 equals $Y_{wt} + Y_{wf}$, but we do not observe each component separately. What can we

do?

The relationship between power loom and hand loom cloth was explored in the main text. Figure 4.14 plots the consumption of hand loom cloth against power loom (imported or domestic) cloth for our baseline years from 1880 to 1940. The ratio between the two is basically constant, implying a hand loom share of approximately 0.304, which is a little higher than that from the full sample.

What about the relative price of the two types of cloth? For the years 1880-1940 this is presented in Figure 4.15, indexed so that 1880 = 100. As with the full sample, the constant ratio of consumption is not due to constant relative prices. After 1900 the relative price of hand loom cloth falls relative to factory cloth due to the adoption of the flying shuttle and other technological advances. With fixed proportions, independent of the relative price, Leontief preferences suit the underlying data. Thankfully, they make modelling and calibration far easier. Earlier drafts of this chapter had to solve a non-linear system of equations to determine the shares of the two types of cloth before 1880. Instead we can simply multiply observed total consumption of cloth by a fixed ratio, 0.304, to get the consumption of non-factory cloth before 1880. The production of the factory competing type is then simply the difference between this and total production of cloth. Employment and prices follow if we assume symmetric production functions equal to that of 1880 for the traditional sector.

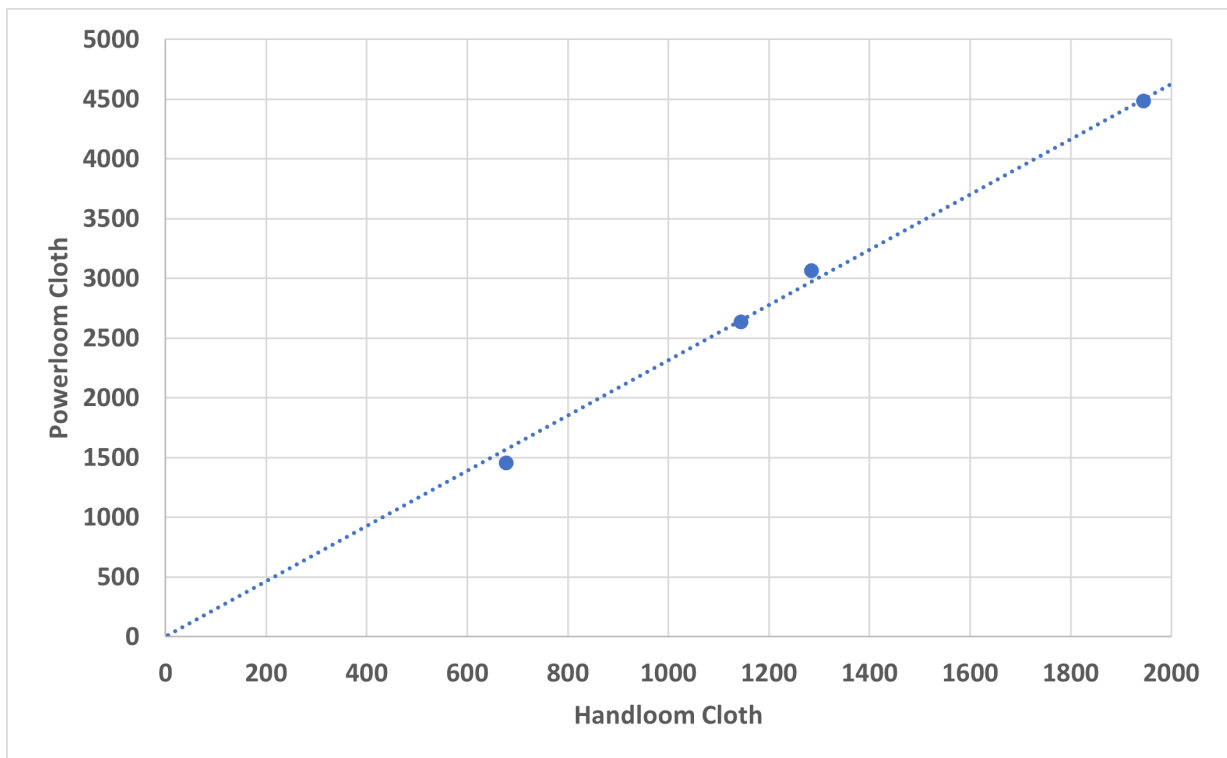
4.B.3 Cotton

Compared to spinning and Weaving, calibration of the cotton production function is simple. From the model:

$$P_k = \frac{W}{\gamma_k A_k L_k^{\gamma_k - 1}} = \frac{W}{\gamma_k Y_k / L_k} \quad (4.40)$$

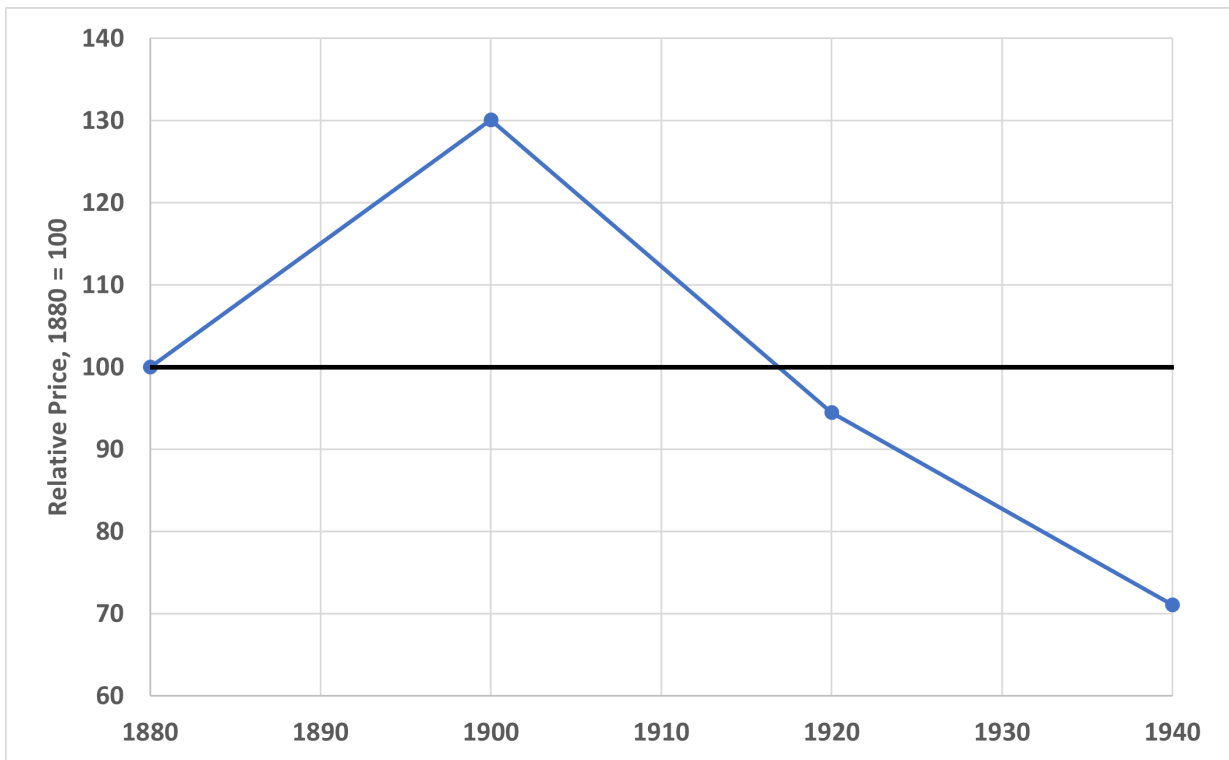
I assume that $\gamma_k = 0.6$. Although the cultivation methods in vogue in India at this time were labour intensive and used very little capital, land rents absorbed a fair amount of output. I therefore assume a labour share of 0.6. Employment in cotton cultivation rises substantially over 1820-1940. Unlike cotton textile manufacturing, there was little technological change in this

Figure 4.14: Power Loom vs Hand Loom Cloth Consumption



Source: See text. This figure corresponds to Figure 4.2 but only with the baseline years.

Figure 4.15: Relative Price of the Two Types of Cloth



Source: See text. This Figure corresponds to figure 4.3 but only with the baseline years.

Table 4.22: Cotton Production Function

| Year | Pk | Yk | Gamma k | W | Yk/Lk | Lk | Ak |
|------|----------|---------|---------|------------|--------|------|---------|
| 1820 | 137611.6 | 328.52 | 0.6 | 34667968.8 | 419.88 | 0.78 | 380.62 |
| 1840 | 120454.9 | 310.37 | 0.6 | 32084537.3 | 443.94 | 0.7 | 384.72 |
| 1860 | 291501.6 | 452.89 | 0.6 | 62640625 | 358.15 | 1.26 | 393.4 |
| 1880 | 242760.3 | 721.52 | 0.6 | 51662071.1 | 354.69 | 2.03 | 471.2 |
| 1900 | 243534.9 | 1487.29 | 0.6 | 72103906.3 | 493.45 | 3.01 | 767.2 |
| 1920 | 682079.1 | 1796.78 | 0.6 | 160786202 | 392.88 | 4.57 | 721.7 |
| 1940 | 243894.6 | 2866.03 | 0.6 | 84722598.7 | 578.96 | 4.95 | 1097.74 |

Source: See Appendix 4.B.

period for cotton cultivation, and so employment in this sector rose. The main development after 1900 was the expansion of production in the irrigated areas of the Punjab and Sind. Traditionally, Indian cotton was rarely irrigated. This is accounted for by the growth in A_k over time. Since our prices and out-turns refer to ginned cotton, the growth in productivity also captures the development of ginning. I model cotton as a homogenous input, but in reality staple length was an important trade factor.

4.B.4 Non-Cotton Agriculture

Agriculture here really means non-cotton related sectors. Since we have determined employment in spinning, weaving and cotton cultivation, employment in agriculture can be calculated from:

$$L_a = L - (L_k + L_{wt} + L_{wf} + L_s) \quad (4.41)$$

From the model FOCs:

$$P_a = \frac{W}{\gamma_a A_a L_a^{\gamma_a - 1}} = \frac{W}{\gamma_a Y_a / L_a} \quad (4.42)$$

I assume that $\gamma_a = 0.6$. This gives us Y_a / L_a , and since we have L_a , we can calculate Y_a .

The resulting values of A_a capture the rather poor performance of Indian agriculture (excepting cotton) and the broader economy over this period.

Table 4.23: Agriculture (Non-cotton): Implied Employment and Output 1820-1940

| Year | Pa | W | Gamma A | L Non A | L | La | Ya/La | Ya | Aa |
|------|---------|------------|---------|---------------|--------|--------|-------|---------|--------|
| 1820 | 1846357 | 34667968.8 | 0.6 | 4.01 | 71.75 | 67.74 | 31.29 | 2119.77 | 168.96 |
| 1840 | 1725927 | 32084537.3 | 0.6 | 3.75 | 74.2 | 70.45 | 30.98 | 2182.61 | 169.93 |
| 1860 | 2803126 | 62640625 | 0.6 | 4 | 81.2 | 77.2 | 37.24 | 2875.42 | 211.89 |
| 1880 | 3208037 | 51662071.1 | 0.6 | 3.98 | 88.9 | 84.92 | 26.84 | 2279.21 | 158.63 |
| 1900 | 3610387 | 72103906.3 | 0.6 | 6.02 | 102.9 | 96.88 | 33.29 | 3224.76 | 207.37 |
| 1920 | 7367667 | 160786202 | 0.6 | 7.32 | 111.65 | 104.33 | 36.37 | 3794.86 | 233.42 |
| 1940 | 4345238 | 84722598.7 | 0.6 | 7.64 | 140 | 132.36 | 32.5 | 4301.33 | 229.37 |

Source: See text.

4.B.5 Food-Cloth Preferences

To estimate the preference parameters we need aggregate consumption of food and aggregate consumption of the composite cloth good, as well as their prices. However, we estimated Y_a , not C_a . We can estimate X_a via the balance of trade.

$$X_{wf}P_{wf} + X_sP_s + X_kP_k = -X_aP_a \quad (4.43)$$

And so:

$$C_a = Y_a - X_a \quad (4.44)$$

It is worth noting that, historically, India ran a noticeable surplus on the commodity balance of trade in order to meet its external obligations, primarily consisting of interest on foreign debt, returns on investment, and services imported from abroad such as freight charges (including, controversially, those provided by British officials), which are not explicitly modelled here.

How can we represent preferences over cloth and non-cloth goods? A simple representation would be a Constant Elasticity of Substitution (CES) utility function. It has two parameters which can be estimated by regressing the logarithm of the ratio of the consumption of the two goods on a constant and the logarithm of their relative price. Running this regression for our seven periods (which, admittedly, is not a large sample) results in an estimated coefficient of -0.9363 (standard error of 0.1640), and -1 falls within the 95 per cent confidence interval. This value

implies a special case of the CES utility function, and corresponds to Cobb-Douglas preferences, making life much easier for us.

Consider the FOC from the higher level problem:

$$\frac{C_a}{C_w} = \left(\frac{1 - \delta}{\delta} \frac{P_w}{P_a} \right) \quad (4.45)$$

We have all of these variables for each year, and can therefore estimate delta individually for each year. Cobb -Douglas preferences imply constant expenditure shares, which are determined by δ . Estimating this parameter for each year introduces variation in expenditure shares, but I do so to fit the model to each year. Most of these estimated δ parameters do not stray far from the average. Four of the seven are under ten percent away, and the other three are -14.3 , -15.7 , and 29.1 per cent away from the overall average. This highest absolute figure is for 1860. Since this is a large deviation, I use the average estimated delta figure from the other years for that year, because the American Civil war prices are messing things up.

4.B.6 Calibration: Bringing it All Together

We now have calibrated values of $(A_{st}, A_{sf}, A_{wf}, A_{wt}, A_a, A_k)$, $(\gamma_a, \gamma_k, \gamma_{wf}, \gamma_{wt}, \gamma_{sf}, \gamma_{st})$, $(\mu_{wf}, \mu_{sf}, \delta, \beta, c, \kappa, L)$.

What we want to do is solve for the general equilibrium allocation under the assumption of a closed economy, and then repeat the experiment with different assumptions about the A parameters. But, first let us recap all of the parameters.

Table 4.24: Observed and Inferred Productivity Parameters

| Year | Aa | Ak | Ast | Asf | Awt | Awf |
|------|--------|---------|--------|---------|---------|----------|
| 1820 | 168.96 | 380.62 | 220.6 | | 458.42 | 458.42 |
| 1840 | 169.93 | 384.72 | 198.87 | | 458.42 | 458.42 |
| 1860 | 211.89 | 393.4 | 403.58 | | 458.42 | 458.42 |
| 1880 | 158.63 | 471.2 | 416.01 | 1957.13 | 458.42 | 10869.02 |
| 1900 | 207.37 | 767.2 | | 3894.89 | 522.66 | 15923.23 |
| 1920 | 233.42 | 721.7 | | 2711.07 | 659.73 | 17684.92 |
| 1940 | 229.37 | 1097.74 | 408.09 | 3303.32 | 1114.95 | 20572.63 |

Source: See text.

Table 4.25: Assumed Gamma Parameters

| Year | γ_a | γ_k | γ_{st} | γ_{sf} | γ_{wt} | γ_{wf} |
|------|------------|------------|---------------|---------------|---------------|---------------|
| 1820 | 0.6 | 0.6 | 0.9 | | 0.75 | 0.75 |
| 1840 | 0.6 | 0.6 | 0.9 | | 0.75 | 0.75 |
| 1860 | 0.6 | 0.6 | 0.9 | | 0.75 | 0.75 |
| 1880 | 0.6 | 0.6 | 0.9 | 0.95 | 0.75 | 0.95 |
| 1900 | 0.6 | 0.6 | 0.9 | 0.95 | 0.75 | 0.95 |
| 1920 | 0.6 | 0.6 | 0.9 | 0.95 | 0.75 | 0.95 |
| 1940 | 0.6 | 0.6 | 0.9 | 0.95 | 0.75 | 0.95 |

Source: See text.

Table 4.26: Assumed and Inferred Values: Misc. Parameters

| Year | μ_{wf} | μ_{sf} | β | δ | c | k | L |
|-------------|------------|------------|---------|----------|------|------|--------|
| 1820 | 1 | | 2.29 | 0.0444 | 0.15 | 1.48 | 71.75 |
| 1840 | 1 | | 2.29 | 0.0479 | 0.15 | 1.48 | 74.2 |
| 1860 | 1 | | 2.29 | 0.0498 | 0.19 | 1.48 | 81.2 |
| 1880 | 3.88 | 5.05 | 2.29 | 0.0451 | 0.19 | 1.48 | 88.9 |
| 1900 | 3.88 | 5.05 | 2.29 | 0.0518 | 0.19 | 1.48 | 102.9 |
| 1920 | 3.88 | 5.05 | 2.29 | 0.0559 | 0.19 | 1.48 | 111.65 |
| 1940 | 5.17 | 6.73 | 2.29 | 0.0537 | 0.22 | 1.48 | 140 |

Source: See text.

4.C Verification

Another aspect of general equilibrium modelling is verification: how well does the model match things of interest that were not explicitly targeted in the calibration process? I present three things of interest here that suggest that the model does the job it is required to do fairly well.

One way is to look at GDP. The model is highly abstracted, with only five sectors, but if it tracks estimated GDP fairly closely, we can say it is not too highly abstracted. Sivasubramonian has constructed GDP estimates for undivided India in the first half of the 20th century from the bottom up. My figures, a by-product of the calibration process, are compared to his in Table 4.27 (my 1940 figure is compared to his 1938-39, before the war began). The model is fairly close. Over 1900-1940, however, the gap between my implied GDP and Sivasubramonian's increases, probably due to the growth of the non-cotton secondary and tertiary sectors in this period. My model only has agriculture in addition to the cotton sectors, and so it probably is picking up India's poor agricultural performance before the late 20th century. Using an alternative nearby year also suggests that we are fairly close.

Looking at GDP is not enough, since we are concerned with cotton, and it formed only a small share of aggregate value added. Matching GDP may just reflect the overwhelming importance of agriculture in employment and its relative importance in output. We derived implied yarn and cloth prices in the calibration process, rather than using them as the baseline data. So another way to verify the model is to compare its derived values with observed prices. Figures 4.16 and 4.17 compare the model's implied prices of yarn and mill (competing) cloth with historical price series. Before 1902, imported cloth and yarn prices are taken from Prices and Wages in India

Table 4.27: Indian Nominal GDP Verification

| Year | Mine | Sivasubramonian | Percentage Difference | Sivasubramonian Alternative Year | Alt Year | Percentage Difference |
|------|---------|-----------------|-----------------------|----------------------------------|----------|-----------------------|
| 1900 | 1233.76 | 1265 | -2.4699 | 1334 | 1902-3 | -7.51 |
| 1920 | 2999.5 | 3369 | -11.09 | 2840 | 1918-19 | 5.48 |
| 1940 | 1992.61 | 2394 | -16.77 | 2240 | 1934-5 | -11.04 |

Source: My figure is a by-product of the calibration process. Sivasubramonian's figures from (Sivasubramonian, 2000, Table 6.1). **Notes:** All figures (except for years) are in crores, i.e. tens of millions of Rupees.

(1902) Table 39, Calcutta prices, between that year and 1919 they are from the 1919 edition of Prices and Wages in India. Exported cloth and yarn prices are taken from Index Numbers of Indian prices 1861-1931, Page 7, Table V. After these dates they are from the prices section of the Statistical Abstract for British India. For the 1930s, I include an alternative series from the annual Review Of The Trade Of India.⁹⁷ This alternative series matches the predicted cloth price, while the statistical abstract series is erratic and higher than my predicted figure. For yarn the two series tend to agree and are both close to the model prediction.

Imported yarn tended to be finer than usual, and so I have included a lower bound, based upon the price of 20s exported yarn. This yarn was, on average, 2/3rds the price of the 40s yarn for the years I could find data, and so I reduced the import price to this degree to place a lower bound for earlier years. The cloth figure lower bound is constructed similarly, but the adjustment is smaller at only 5/6.

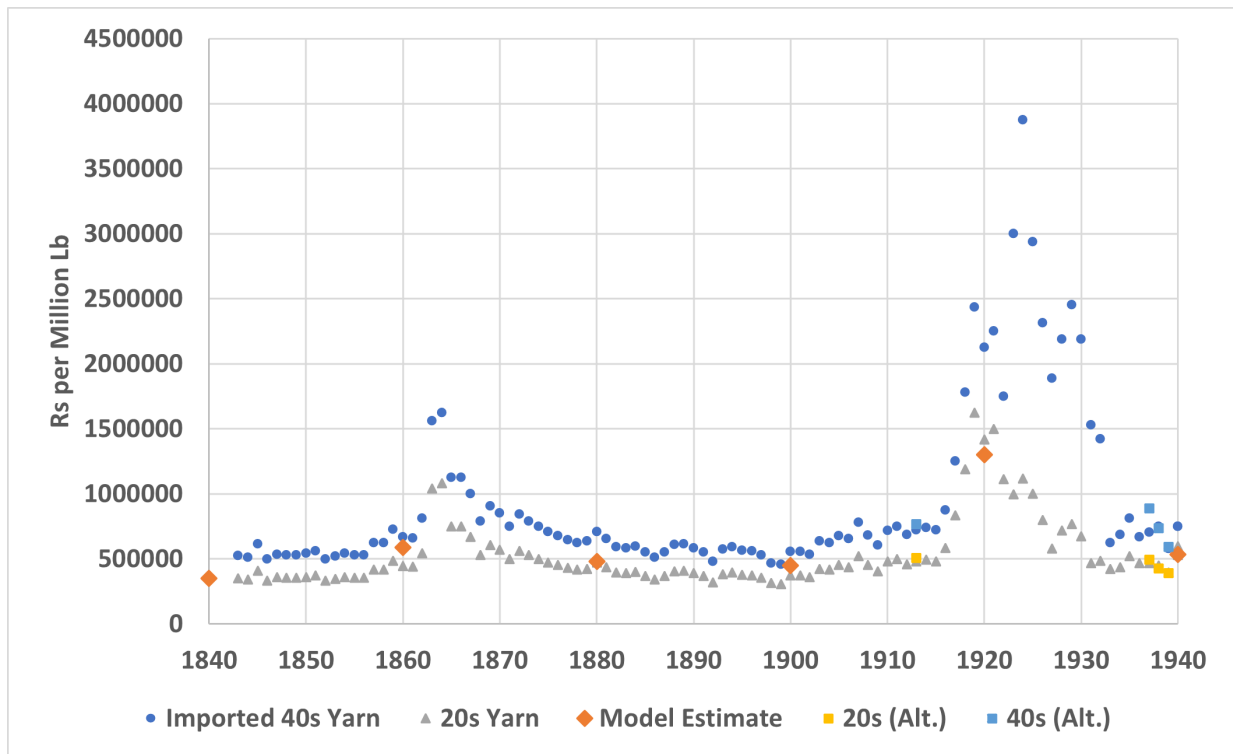
The implied yarn costs are between the two bounds in all years but 1920. The years immediately before 1920 were inflationary, and as I used these earlier years to get price series for grains, cotton etc, we understate yarn prices in 1920. The discrepancies are larger for mill (competing) cloth, particularly in the years 1860 and 1920. In 1860, I suspect this is because the majority of wage observations around that time were based upon the high price (and therefore nominal wage) American Civil War era rather than 1860 itself.⁹⁸ Otherwise, our figures are in the ballpark, but tend towards the higher end represented by imported cloth.

To summarise, despite being simple (so as far general equilibrium models go), the model does a fairly good job at replicating Indian GDP for the first half of the 20th century, as well as matching the prices of cotton yarn and cloth over the period 1840-1940.

⁹⁷1932-33: Page 239, 1934-5: Page 257, 1936-7: Page 257, 1939-40: Page 289.

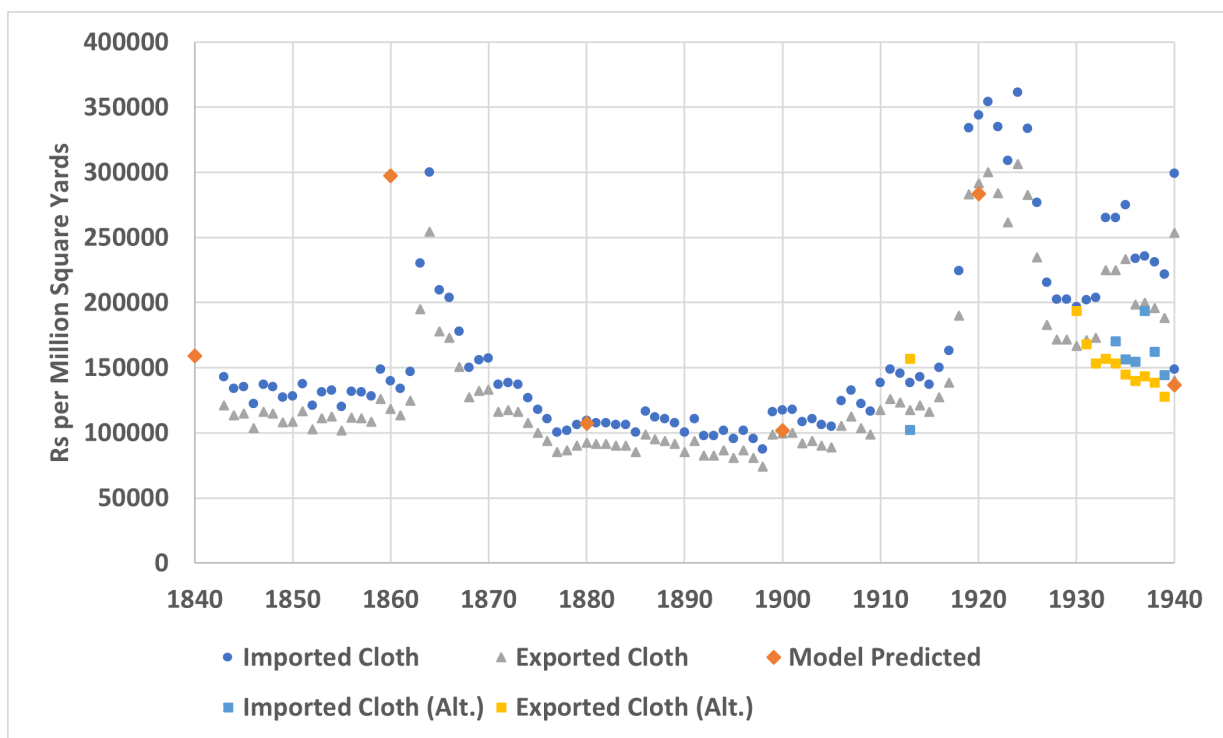
⁹⁸It was not only the price of cotton that rose during the Civil War, the price of food grains appears to have done so too.

Figure 4.16: Yarn Price Verification



Sources: Prices and Wages in India (1902 and 1919), Index Numbers of Indian Prices 1861-1931, Statistical Abstract for British India (Various Years), Review Of The Trade Of India (Various Years).

Figure 4.17: Power Loom Cloth Price Verification



Sources: As in Figure 4.16.

4.D Closed Economy Equilibrium

In the closed economy, production has to equal consumption, and prices are now endogenously determined.

4.D.1 Production Side

Let us revisit the problem of the firm, which has not changed. It maximises:

$$\tilde{E} = P_a Y_a + (P_{st} - P_k \kappa) Y_{st} + \frac{(P_{sf} - P_k \kappa)}{\mu_{sf}} Y_{sf} + (P_{wt} - P_s c) Y_{wt} + \frac{(P_{wf} - P_s c)}{\mu_{wf}} Y_{wf} + P_k Y_k \quad (4.46)$$

Subject to an aggregate labour endowment:

$$L = L_a + L_k + L_{wt} + L_{wf} + L_s \quad (4.47)$$

(and non-negativity constraints)

The wage will equal the Lagrangian multiplier on this constraint. The first order conditions for equilibrium are:

$$P_a = \frac{W}{\gamma_a A_a L_a^{\gamma_a - 1}} \quad (4.48)$$

$$P_k = \frac{W}{\gamma_k A_k L_k^{\gamma_k - 1}} \quad (4.49)$$

$$P_s = P_k \kappa + \frac{W}{\gamma_{st} A_{st} L_{st}^{\gamma_{st} - 1}} \quad (4.50)$$

$$P_s = P_k \kappa + \mu_{sf} \frac{W}{\gamma_{sf} A_{sf} L_{sf}^{\gamma_{sf} - 1}} \quad (4.51)$$

$$P_{wf} = P_s c + \mu_{wf} \frac{W}{A_{wf} \gamma_{wf} L_{wf}^{\gamma_{wf}-1}} \quad (4.52)$$

$$P_{wt} = P_s c + \frac{W}{\gamma_{wt} A_{wt} L_{wt}^{\gamma_{wt}-1}} \quad (4.53)$$

4.D.2 Consumption side

The consumer's nominal income is:

$$E = P_a Y_a + (P_s - P_k \kappa) Y_{st} + (P_s - P_k \kappa) Y_{sf} + (P_{wt} - P_s c) Y_{wt} + (P_{wf} - P_s c) Y_{wf} + P_k Y_k \quad (4.54)$$

Which is related to \tilde{E} by:

$$E = \tilde{E} + \left(\frac{\mu_{wf} - 1}{\mu_{wf}} \right) (P_{wf} - P_s c) Y_{wf} + \left(\frac{\mu_{sf} - 1}{\mu_{sf}} \right) (P_s - P_k \kappa) Y_{sf} \quad (4.55)$$

Given E , the optimal consumption choices are:

$$C_a = \frac{(1 - \delta)}{P_a} E \quad (4.56)$$

$$C_w = \frac{\delta}{P_w} E \quad (4.57)$$

Given E_w , the optimal consumption choices are:

$$C_{wt} = \frac{1}{P_{wt} + \beta P_{wt}} E_w \quad (4.58)$$

$$C_{wf} = \frac{\beta}{P_{wt} + \beta P_{wt}} E_w \quad (4.59)$$

P_w is a price index ($E_w = C_w P_w$) associated with the Leontief function:

$$P_w = P_{wt} + \beta P_{wf} \quad (4.60)$$

4.D.3 Market Clearing

Consider the markets for intermediate inputs, cotton and yarn. The cotton market must clear

$$Y_k/k = C_k/k = Y_{st} + Y_{sf} \quad (4.61)$$

The yarn market must clear:

$$Y_{sf} + Y_{st} = C_s = c(Y_{wt} + Y_{wf}) \quad (4.62)$$

And then for the final goods markets:

$$Y_a = C_a \quad (4.63)$$

$$Y_{wt} = C_{wt} \quad (4.64)$$

$$Y_{wf} = C_{wf} \quad (4.65)$$

4.E Solving the Model

Let the agricultural good be the numeraire ($P_a = 1$). By Walras' law, if the market for every other good clears, so too does that of the agricultural good. I am therefore going to focus on the cloth sectors. To start, guess values of L_{wf}, L_{wt} . Since the demand for yarn and cotton come purely from downstream weaving sectors, we can get employment in those sectors as a function of total output (itself from employment) in weaving. L_a can then be found from subtracting employment in other sectors from the workforce.

To start, yarn produced must equal yarn consumed.

$$L_s = (c(A_{wt}L_{wt}^{\gamma_{wt}} + A_{wf}L_{wf}^{\gamma_{wf}})/A_s)^{1/\gamma_s} \quad (4.66)$$

For the raw cotton market to clear

$$L_k = (A_s k L_s^{\gamma_s} / A_k)^{1/\gamma_k} \quad (4.67)$$

L_a can then be found from subtracting employment in other sectors from the workforce. Let the wage be (from producers' FOCs):

$$W = \gamma_a A_a (L - L_{wt} - L_{wf} - L_s - L_k)^{\gamma_a - 1} \quad (4.68)$$

Then we have P_k in terms of labour allocation:

$$P_k = W / (\gamma_k A_k L_k^{\gamma_k - 1}) \quad (4.69)$$

We then have P_s :

$$P_s = k P_k + \mu_s W / (\gamma_s A_s L_s^{\gamma_s - 1}) \quad (4.70)$$

And therefore also the prices of the cloth goods:

$$P_{wt} = cP_s + W/(\gamma_{wt}A_{wt}L_{wt}^{\gamma_{wt}-1}) \quad (4.71)$$

$$P_{wf} = cP_s + \mu_{wf}W/(\gamma_{wf}A_{wf}L_{wf}^{\gamma_{wf}-1}) \quad (4.72)$$

We can then calculate E , as the sum of the net value of each good produced.

Since we have P_{wt} and P_{wf} , we can calculate P_w , and therefore also C_w (remember that $P_a = 1$). This then allows us to determine E_w . With E_w , and the price of cloth we can determine C_{wt} and C_{wf} . The equilibrium allocation (markets for intermediate inputs have already cleared and Walras' law means we don't have to look at the agricultural one) is such that:

$$Y_{wf} = A_{wf}L_{wf}^{\gamma_{wf}} = C_{wf} \quad (4.73)$$

$$Y_{wt} = A_{wt}L_{wt}^{\gamma_{wt}} = C_{wt} \quad (4.74)$$

I use computational methods to solve this non-linear system of equations for the equilibrium labour allocation, from which everything else follows.

Table 4.28: Labour Productivity in Hand Spinning of Cotton by Count, 1920s

| Count | Yards Spun per Hour | Yards per lb | Yards per 30 Days | Lb per 30 Days | Lb per 250 Days | Adjusted For Preparation | Lb per day (Spinning Only) |
|-------|---------------------|--------------|-------------------|----------------|-----------------|--------------------------|----------------------------|
| 8 | 500 | 6,720 | 120,000 | 17.86 | 148.81 | 74.4 | 0.6 |
| 10 | 500 | 8,400 | 120,000 | 14.29 | 119.05 | 59.52 | 0.48 |
| 15 | 450 | 12,600 | 108,000 | 8.57 | 71.43 | 35.71 | 0.29 |
| 20 | 420 | 16,800 | 100,800 | 6 | 50 | 25 | 0.2 |
| 25 | 400 | 21,000 | 96,000 | 4.57 | 38.1 | 19.05 | 0.15 |
| 30 | 375 | 25,200 | 90,000 | 3.57 | 29.76 | 14.88 | 0.12 |
| 40 | 350 | 33,600 | 84,000 | 2.5 | 20.83 | 10.42 | 0.08 |
| 50 | 320 | 42,000 | 76,800 | 1.83 | 15.24 | 7.62 | 0.06 |
| 60 | 300 | 50,400 | 72,000 | 1.43 | 11.9 | 5.95 | 0.05 |

Source: (Puntambekar & Varadachar, 1926, Page 174). **Notes:** The count of yarn is how many hanks of 840 yards weigh 1 lb. I assume that for each day of spinning, one day of preparation is needed.

4.F Hand Spinning Productivity

This Appendix examines labour productivity in hand spinning, which has been the subject of debate regarding the English Industrial Revolution. In India, by far the main fibre was cotton, and it was usually spun on the common single spindle spinning wheel. For exceptionally fine yarn, the drop spindle was used. No flyer nor treadle was used. In the 20th century, no one was able to come up with a better cottage spinning device than the centuries old *charka*.⁹⁹ Table 4.28 outlines labour productivity in hand spinning of cotton by count for "professional spinners" in the 1920s, presented by two hand spinning propagandists. I assume that preparation of the rovings takes one day for every day of spinning. Robert Allen's preferred figure for the daily output of English spinners is 1 lb per day.¹⁰⁰ In this table, not even those spinning 8s yarns can reach that level. Humphrey and Schneider's, as well as John Styles' preferred upper bound of 0.4 lb per day, also appears fairly high, being exceeded only by counts 10s and below.¹⁰¹ Adjusting for the time needed to prepare, output per spinner would be even lower.

Before the industrial revolution, hand spinners in both India and England only tended one

⁹⁹The Indian Government's favourite new device in the 1950s provided negative value added (Sen, 1957).

¹⁰⁰(Allen, 2009).

¹⁰¹(Humphries & Schneider, 2019).

spindle. The English spinning wheel may have been a bit more robust than the Indian one, but I doubt that it could be much more productive. English spinners may have been better fed, but spinning did not require much manual exertion, and most commentators would place the skill level of Indian cotton spinners as being above English ones. They were able to spin higher counts of yarn by hand, for example, and their yarns were suitable for the warp. Perhaps long stapled New World cotton was easier to spin than short stapled Asian cotton. In the early 19th century, the Commercial Resident of the EIC in Dacca, an important centre of fine spinning and weaving, distributed long stapled Sea Island cotton to local spinners to see if it could be used, "but the spinners were unable to work it into thread, and it was pronounced to be an article unfit for the manufactures of the native looms."¹⁰²

I have collected a range of estimates of hand spinning productivity, adjusted them, if needs be, for (a) the weight of cotton per lb of yarn (assumed to be 0.75 lb of yarn per lb of cotton, from Roy's figures), (b) the time needed to prepare for spinning (assumed 1 day per day of spinning, from Allen's figures). These estimates are presented in Table 4.29.

The figures, except for a few, are for coarse yarns. What can be said about the very fine Dacca yarns, made with a hand spindle rather than a wheel? Here's Taylor:

*"The most indefatigable spinners, supposing that they work every day, cannot manufacture more than 2 sicca weight (300 grains) or 14400 yards of the finest thread per year, which ... gives only 16 rupees or 32 shillings. This, which is more than twelve hundred times the value of the raw material, yields but the small sum of one penny a day."*¹⁰³

This suggests a count of around 330s, and an output in 365 days of only 0.05143 lb. Assuming a spinner spun for only 250 days, her earnings would be 10.4 Rupees, around double the earnings of a normal spinner.¹⁰⁴ The Dacca Spinners of more common fine yarns (40s to 50s) could apparently spin 8.228 lb of yarn a year on average.¹⁰⁵

The average of the estimates is just shy of 40 lb of yarn per year. Removing preparatory time, a

¹⁰²(Taylor, 1851, Page 22).

¹⁰³(Taylor, 1840, Page 312).

¹⁰⁴The count of a yarn is how many hanks of 840 yards weigh 1 lb. 14400 yards is 17.14 hanks, which weigh 2 sicca (tolas), i.e. 23.328 grams or 0.05143 lb. At 250 days, she would spin 0.0352 lb.

¹⁰⁵(Chaudhuri, 1974, Table 1).

Table 4.29: Hand Spinning Productivity

| Tag | Location | Date | Count | Stages | lb per 250 days | Source | Adjusted Output | Include Half Preparation Time |
|-----|---------------|-------|---------------|----------------------------|-----------------|----------------------------|-----------------|-------------------------------|
| 1 | India | 1920s | 15s | Spinning Only | 71.43 | P&V | 71.43 | 35.72 |
| 2 | India | 1920s | 20s | Spinning Only | 50 | P&V | 50 | 25 |
| 3 | India | 1920s | 25s | Spinning Only | 38.1 | P&V | 38.1 | 19.05 |
| 4 | China | | Coarse | | 26.81 | Kuhn SSC | 80.43 | 40.22 |
| 5 | Yangtze Delta | | Coarse | | 78.125 | Huang | 78.13 | 39.06 |
| 6 | Berar | 1860s | Coarse | Ginning, Carding, Spinning | 26.67 | Hastings | 80.01 | 40.01 |
| 7 | South India | 1800 | Coarsest | Spinning Only | 147.1818 | Buchanan | 147.18 | 73.59 |
| 8 | Dinajpur | 1810 | Middling Fine | Ginning, Carding, Spinning | 24.0625 | Buchanan | 72.19 | 36.09 |
| 9 | Bhagalpur | 1810 | Coarse | Ginning, Carding, Spinning | 25.8375 | Buchanan | 77.51 | 38.76 |
| 10 | India | 1930s | | Ginning, Carding, Spinning | 25 | FFC | 75 | 37.5 |
| 11 | Bengal | 1840s | Coarse | Spinning Only | 53.42 | Taylor | 53.42 | 26.71 |
| 12 | Madras | 1920s | 8-12s | Spinning Only | 121.53 | Madras C.I.E | 121.53 | 60.77 |
| 13 | Madras | 1920s | 8s | Spinning Only | 130.21 | Madras C.I.E | 130.21 | 65.11 |
| 14 | Madras | 1920s | 10-12s | Spinning Only | 146.93 | Madras C.I.E | 146.93 | 73.47 |
| 15 | Madras | 1920s | 10-19s | Spinning Only | 62.5 | Madras C.I.E | 62.5 | 31.25 |
| 16 | Madras | 1920s | Coarse | Spinning Only | 42.85 | Madras C.I.E | 42.85 | 21.43 |
| 17 | Madras | 1920s | 10s, 20s | Spinning Only | 71.43 | Madras C.I.E | 71.43 | 35.72 |
| 18 | Madras | 1920s | | Spinning Only | 171.42 | Madras C.I.E | 171.42 | 85.71 |
| 19 | Madras | 1920s | 20s | Spinning Only | 29.76 | Madras C.I.E | 29.76 | 14.88 |
| 20 | Madras | 1920s | 10s | Spinning Only | 62.5 | Madras C.I.E | 62.5 | 31.25 |
| 21 | Madras | 1920s | 12s | Spinning Only | 41.67 | Madras C.I.E | 41.67 | 20.84 |
| 22 | Madras | 1920s | | Spinning Only | 57.85 | Madras C.I.E | 57.85 | 28.93 |
| 23 | Madras | 1920s | <10s | Spinning Only | 64.28 | Madras C.I.E | 64.28 | 32.14 |
| 24 | Madras | 1920s | | Spinning Only | 51.43 | Madras C.I.E | 51.43 | 25.72 |
| 25 | Madras | 1920s | 12s | Spinning Only | 71.25 | Amalsad | 71.25 | 35.63 |
| 26 | Madras | 1920s | 15s | Spinning Only | 53.75 | Amalsad | 53.75 | 26.88 |
| 27 | Madras | 1920s | 20s | Spinning Only | 50 | Amalsad | 50 | 25 |
| 28 | Madras | 1920s | 30s | Spinning Only | 28.57143 | Amalsad | 28.57 | 14.29 |
| 29 | Madras | 1920s | 40s | Spinning Only | 26.19048 | Amalsad | 26.19 | 13.1 |
| 30 | Madras | 1920s | 60s | Spinning Only | 26.19048 | Amalsad | 26.19 | 13.1 |
| 31 | Cuttack | 1880s | | Spinning Only | 40.23 | Banerjei | 40.23 | 20.12 |
| 32 | Belgaum | 1880s | | Spinning Only | 100 | Bombay Gazetteers | 100 | 50 |
| 33 | Assam | 1890s | | Ginning, Carding, Spinning | 64.28 | Monograph | 192.84 | 96.42 |
| 34 | Bengal | 1920s | | Spinning Only | 51.43 | Cottage Industries | 51.43 | 25.72 |
| | | | | | | Average | 74.07 | 37.04 |
| | | | | | 278 | Average, ≤ 20s Only | 80 | 40 |

Note: See the end of this Appendix for detailed sources.

pure spinner could spin around 0.32 lb of coarse yarn a day. Allen's figure for English spinners of cotton was 1 lb a day.¹⁰⁶ Table 4.28 puts 0.6 lb of 8s yarn being spun per day by professional spinners. This was for 8 hours, and with a long workday of 13.333 hours, 1 lb would be possible. But for less coarse yarns, and once we include preparation time, 1 lb seems unlikely. John Styles puts the average count of cotton yarn spun in Lancashire in the late 1760s at over 15s, up from 9-10s in the 1720s and such an increase would tend to lower productivity.¹⁰⁷ Allen provides figures that put preparatory time in a 1:1 ratio with spinning, so this component was not insignificant.¹⁰⁸

The debate about the 1 pound a day figure is reminiscent of the interwar debates about the feasibility of hand spinning as a paying concern. Given prices of yarn and raw cotton, incomes depended on productivity. D. M. Amalsad, textile expert to the Madras government was rather opposed to the contention that 8 oz. (0.5 lb) of 20s yarn could be spun a day, as some of the hand spinning proponents claimed. Here is what he had to say:

*"The length of yarn spun per operative depends upon the number of back-ward stretches of the left hand for drawing out the thread which is a characteristic feature of hand spinning with the aid of the Charka. Allowing for the variations in the length of the hand and the amount of individual energy, the number of times this stretching action is repeated in an hour is 8 per minute in the case of 20s counts. It is difficult to believe that this could be accelerated to 14 per minute which would be necessary to obtain 840 yards per hour. In the modern continuous ring spinning frame the spindle runs at speeds as high as 9,000 revolutions per minute and it has not been found possible to exceed an average production of 7.2 oz. [0.45 lb] of 20s per spindle in a day of 10 hours. The power-driven ring spindle is a continuous spinner, while in hand spinning it is only the backward stretch that produces yarns while the return motion winds them on the spindle. The claim that hand spinning can produce 8 oz. [0.5 lb] of 20s counts per day of 10 hours is therefore exaggerated."*¹⁰⁹

The English wheel, as Amalsad notes, was basically a type of *charka*. Fancy things unheard of in

¹⁰⁶(Allen, 2009).

¹⁰⁷(Styles, 2020, Page 206).

¹⁰⁸(Allen, 2020, Table 1). Sumit Guha's figures for India are 1:2, but this includes the time taken to gin cotton. (Guha, 1989, Appendix A) In this document, I have used Allen's estimate.

¹⁰⁹(Amalsad, 1924, Page 16).

Indian spinning, like flyers and treadles were not in use for English hand cotton spinning either. So in the light of Asian evidence, Humphries, Schneider and Styles' upper bound of 0.4 lb per day seems more reasonable than Allen's 1 lb a day.¹¹⁰

¹¹⁰(Humphries & Schneider, 2019), (Humphries & Schneider, 2020), (Schneider, 2023).

Table 4.29 Sources:

- China, Dieter Kuhn, Science and Civilisation in China.¹¹¹
- Yangtze Delta, Huang.¹¹²
- Berar, Fraser Hastings.¹¹³
- Bihar, Buchanan Hamilton.¹¹⁴
- FFC.¹¹⁵
- Dacca, Taylor.¹¹⁶
- P&V, see Table 4.28.
- Belgaum, adjusted from 5 hours a day to 8.¹¹⁷
- Madras C.I.E: Report of the Madras Cottage Industries Enquiry.¹¹⁸
- Amalsad (experimental evidence).¹¹⁹
- Banerjei.¹²⁰
- Assam Monograph.¹²¹
- Cottage Industries.¹²²

There were a few estimates that appeared spuriously low in the Madras C.I.E figures at 11.9 and 4.82 lb per 250 days. These I left out.

¹¹¹(Kuhn, 1974, Book 9, Page 225, Taiwan Ed.).

¹¹²(Huang, 1990, Page 84).

¹¹³(Fraser & al Daulah, 1865, Page 355).

¹¹⁴(Buchanan-Hamilton, 1810-11, Page 608).

¹¹⁵Pages 301-2 (GoI, 1942, Pages 301-2).

¹¹⁶(Taylor, 1851, Page 73).

¹¹⁷(GoI, 1877 - 1904, Belgaum, Page 338).

¹¹⁸(Rao, 1929, Appendix B).

¹¹⁹(Amalsad, 1924, Page 63, Statements G and H).

¹²⁰(Banerjei, 1893, Page 169).

¹²¹(Samman, 1897, Page 29).

¹²²(Mazumder, 1927, Page 60).

4.G Hand Weaving Productivity

How many square yards of cloth were produced per loom per year is a difficult question owing to the diversity of types of cloth. Let me give some examples of the wide range found in the sources. The finest Dacca muslins took the weavers 12 months to make single piece of 20 square yards.¹²³ This was for a cloth worth around 160 Rupees, while "A whole piece of Narainpore *jehazy* muslin, costing two rupees, can be made in the course of eight days"¹²⁴, or 625 square yards per working year of 250 days. Coarser cloths could be produced faster. The average of Francis Buchanan's estimates for coarse cloth output per loom (from South Bihar) in 1811-2 was 773 square yards per year.¹²⁵ M. A. Latif's estimated average output per loom, for the types of cloth produced by Bangladeshi hand looms in the late 20th century, adjusting the pick rate to that of the throwing shuttle, is 779.4 square yards per year.¹²⁶ There is, however, once again large variation between types of cloth, and some of the figures are above 1,000 square yards a year. The Punjab Cotton Monograph suggested that a weaver could produce, on average, 11 yards of very coarse cloth 0.75 yards wide a day, so, assuming a third of his time was spent setting up the loom, 1,375 square yards a year.¹²⁷

The FFC came across this question, and eventually decided to use 4 square yards per working day of 9 hours for throw shuttle looms and 7 square yards for flying shuttle looms. At 250 days of 8 hours each, we get 888.9 and 1555.6 square yards per loom per year respectively.¹²⁸ These figures are lower than those reported in the appendices of the FFC report.¹²⁹ Using the characteristics of the cloths reported and Latif's figures for downtime (for fly shuttle looms) and picks per minute on throw and fly shuttle, I calculated the implied output per year in square yards per loom. These were at the higher end of things, and while the throw shuttle results were consistent with the FFC's estimates, the fly shuttle results were higher. To the extent that the cloth had much in the way of colour or pattern, then speed would be slower, and many hand loom cloths did have these characteristics. Robert Allen's figures for "printers' cloth" woven in

¹²³(Taylor, 1851, Page 55).

¹²⁴(Taylor, 1851, Page 39).

¹²⁵Calculated from (Buchanan, 1936, vol 2 Page 774, Table No 42).

¹²⁶(Latif, 1997, Pages 66-7 and 197).

¹²⁷(Francis, 1884, Pages 4-5).

¹²⁸(GoI, 1942, Pages 57-58).

¹²⁹(GoI, 1942, Appendix XXIII, Page 294).

Table 4.30: Hand Weaving: Assumed Output Per Loom

| Year | Ywt/Lwt | Output per Loom | Workers per Loom | c | Lb of Yarn per Loom per Year | Implied Hand Spinners per Loom |
|------|---------|-----------------|------------------|-------|------------------------------|--------------------------------|
| 1820 | 402.55 | 805.1 | 2 | 0.154 | 123.99 | 3.35 |
| 1840 | 402.55 | 805.1 | 2 | 0.154 | 123.99 | 3.35 |
| 1860 | 402.55 | 805.1 | 2 | 0.192 | 154.58 | 4.18 |
| 1880 | 402.55 | 805.1 | 2 | 0.192 | 154.58 | 4.18 |
| 1900 | 402.55 | 805.1 | 2 | 0.192 | 154.58 | 4.18 |
| 1920 | 528.35 | 1056.69 | 2 | 0.192 | 202.88 | 5.48 |
| 1940 | 926.19 | 1667.14 | 1.8 | 0.217 | 361.77 | 9.78 |

Source: See text. **Notes:** *c* is lb of cotton per square yard of cloth. Hand Spinners per loom are based upon 37 lb of yarn spun per spinner per year.

England with a flying shuttle was 2381.9 square yards, or 2035 square yards a year adjusting for differences in the length of the working year and hours.¹³⁰ Latif's average figure for flying shuttle production in Bangladesh is much the same.

It is important not to overestimate weaving productivity, since this will tend to make any decline in weaving employment, smaller than it was, and so we could be accused of making "deindustrialization" less important than it actually was. As a result it would be better to have figures towards lower end of the estimates. My assumed figures are presented in Table 4.30. I'll explain how I arrived at them.

I began with the (unadjusted) estimate of cloth production by hand looms in 1940, 1945 million square yards, which I divided by 2.1 million hand loom workers to get *Y/L* for that year. The FFC figures give 1.8 workers per loom (in FTEs), which gave me output per loom. I then assumed that in 1900 and earlier, output per loom was 4/6.5 of an adjusted 1940 figure (the average of the three years preceding 1938), which gives us estimated loomage.¹³¹ This reflects the adoption of the flying shuttle after 1900. The 1920 figure was assumed to be the average of the 1940 and 1900 figures. I then assumed that there were 2 workers per loom in 1820-1920, and so we then

¹³⁰(Allen, 2018, Page 387).

¹³¹Using the unadjusted 1940 figure gave estimates that were high in comparison with the other evidence. I used 4/6.5 to account for the productivity differential between throw and fly shuttle looms.

have output per worker, and employment in weaving.¹³² Since I assume that productivity per hand loom in the 19th century was similar to that in the early 20th, I do not account for the fact that only certain types of cloth were wiped out by the power loom. Chances are that these were the simple types of cloth that had higher productivity per hand loom than those that survived, and so my employment decline is probably higher than what it actually was.

The implied ratio between looms and hand spinners is consistent with the literature.¹³³ Our output per loom estimates before 1900 are in line with the lower end of the estimates discussed above, so we have not under-estimated employment. In the 1880s, the Nellore district manual, which contained an detailed discussion of weaving in the whole of Madras Presidency, estimated that a loom consumed 112 lb of cotton yarn on average. This figure included non-cotton and some part time looms, so let us increase this by 25 per cent: 140 lb of yarn a year.¹³⁴ The Madras Board of Revenue asked "experienced weavers" to make an independent estimate and they suggested 162 lb of yarn per year.¹³⁵ My figure, 154 lb, is very close to the average of these estimates.

¹³²The Y/L figures derived from the calibration process before 1880 differ slightly due to the model set up.

¹³³E.g. (Guha, 1989).

¹³⁴(Boswell, 1873, Page 291).

¹³⁵(Boswell, 1873, Page 292).

4.H A Comparison with Twomey (1983)

Michael Twomey's 1983 paper is currently the go-to on the topic of textile employment. A comparison between my results and his is presented in Figures 4.18 and 4.19. Adjusting for a difference in our assumptions about employment per loom (he has 1.5, I usually have 2), our results for both spinning and weaving are rather similar. There are a few exceptions. My spinning employment figure in 1880 is almost double his, but this was in the middle of a major decline and mine has caught up within a few years. Roy's figures in Table 4.1 have zero hand spun yarn in 1900 and 1920, and so I have no spinners, while Twomey has some in 1913 (his figure is close to my 1940 estimate). Our results are similar despite different ways of getting there. My method and baseline figures for output (based upon Roy's estimates) were hopefully explained sufficiently above. Twomey starts with figures for imported and mill production of cloth and yarn after 1880. He then added an assumed time series for hand spun yarn. This is higher than Roy's estimates, but his output per FTE is higher than my output per full time woman, hence the difference in spinning employment in 1880. He then regresses consumption of (homogenous) cloth on its price (deflated by the CPI) and an estimate of Indian income for the post-1880 years. With the estimated parameters of this function, he predicts consumption backwards in time. With assumed employment per lb of yarn/square yard of cloth, this gives him employment estimates. Twomey's resulting estimates of consumption (and therefore production, as imports were small before 1850) are far larger than Roy's.¹³⁶ Deindustrialization therefore appears larger in terms of output, but because his labour productivity estimates are higher, the employment decline is not much different from our figures.

Twomey's regression technique assumes that all types of cloth are perfect, or at least close, substitutes.¹³⁷ If hand loom cloth after 1880 was not a perfect substitute for mill cloth, then Twomey probably over-predicts production of cloth in total before 1880. Our estimate for the elasticity of substitution between traditional and factory (competing) cloth is less than one, indicating imperfect substitutability. Indeed, an elasticity of substitution of zero seems to fit

¹³⁶Broadberry, Gupta and Custodis' independent cloth consumption estimates are more in line with those of Roy than Twomey's (Broadberry *et al.*, 2015).

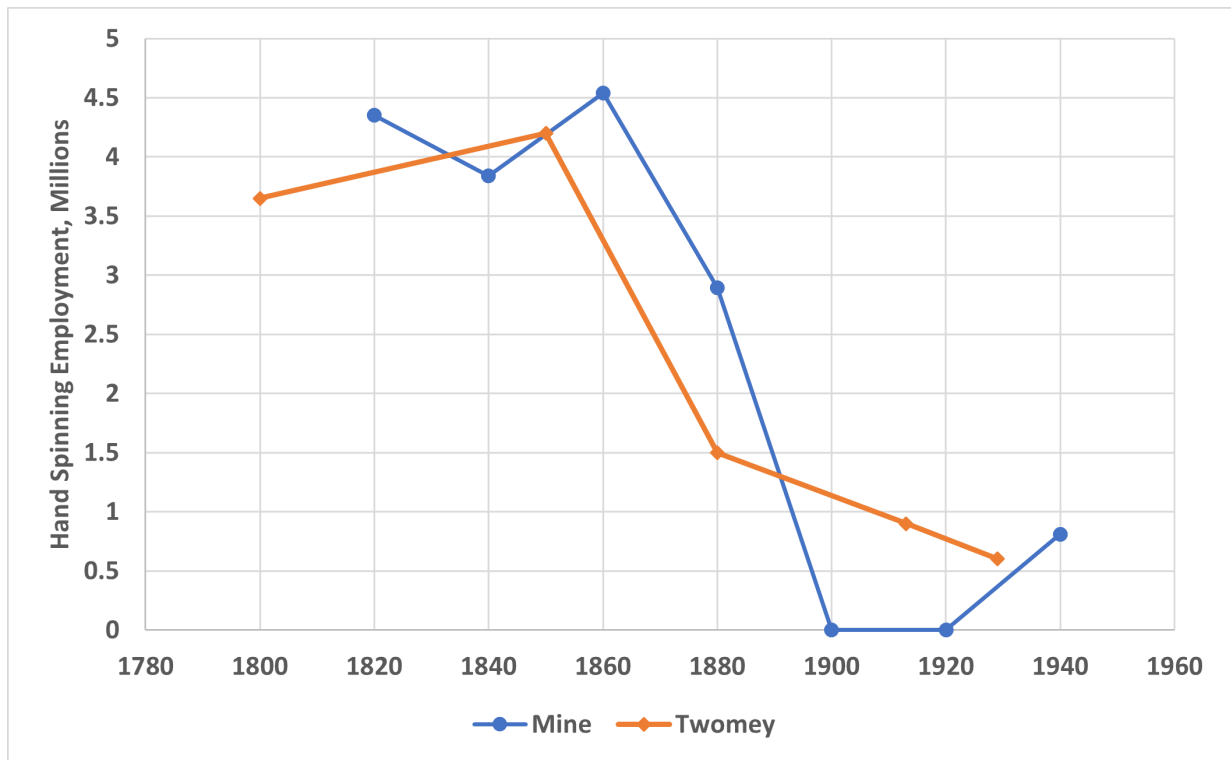
¹³⁷"This involves assuming imported and handicraft textiles are comparable on a volume basis (weight or length)" (Twomey, 1983, Page 51).

Figure 4.18: Weaving Employment



Source: See text and (Twomey, 1983). **Note:** The adjusted series accounts for our different assumptions about employment per loom.

Figure 4.19: Hand Spinning Employment



Source: See text and (Twomey, 1983).

the data. What this means is that imports (and domestic mill production) did not displace hand loom production by much, as implied by the two being perfect substitutes, and instead tended to add to aggregate consumption. Twomey built on Meghnad Desai's earlier econometric attempt to examine the demand for cotton textiles in 19th century India. Desai acknowledges the severe limitation of assuming perfect substitutability, and suggests a way forward, which just so happens to correspond to the way in which Roy derived his output estimates and therefore the basis upon which our employment figures were calculated.¹³⁸

¹³⁸(Desai, 1971, Pages 359-60).

4.I Yarn Consumption in Bengal: Sources

There are a number of ways to estimate yarn consumption. For example:

$$Yarn\ Consumption = c(Cloth\ Production) \quad (4.75)$$

Where c is the ratio between lb of yarn and square yards of cloth.

My main method, however, is from cotton production and trade:

$$Yarn\ Consumption = k(Cotton\ Availability) + Net\ Yarn\ Imports \quad (4.76)$$

Where:

$$Cotton\ Availability = Cotton\ Production + Net\ Cotton\ Imports \quad (4.77)$$

and k is the ratio between raw cotton in lb and yarn output in lb.

Note that in all cases, except for A. Z. M. Iftikhar-ul-Awwal's figures after 1911, my estimate has been multiplied by 0.75 to convert from Greater Bengal to Bengal Proper.

An example of the former type: Robert Allen puts the figure for the weight of cotton cloth produced at 85 million lbs a year in the 1750s for Bengal.¹³⁹ Allen assumes 0.4 lb per yard of cloth, which is more than twice Roy's figure for the 1820s (0.154). Figures provided by hand spinning propagandists in the 1920s have 0.323 lb per square yard for the lowest count they consider, 8s. Their figures suggest that 0.4 square yards per lb would be for extremely coarse cloth. Roy's lb per square yard matches theirs between 30s and 40s, which seems to me to be too high, but I will stick with it for consistency.¹⁴⁰ Allen calculates his lb figure from approximately 212.225 million square yards a year, so we can adjust this using our figure, implying 32.68 million lb of yarn spun. This was then multiplied by 0.75 to convert the figure to Bengal Proper (i.e. excluding Bihar).

An example of the latter type: John Duncan, Resident at Benares division, through which

¹³⁹(Allen, 2009).

¹⁴⁰See the table on (Puntambekar & Varadachar, 1926, Page 174).

most cotton for Bengal passed through, estimated the import of cotton in 1789 to be 22 million lb.¹⁴¹ Taylor wrote of an import of 12 million lb via the Eastern hills into East Bengal for spinning into coarse yarns (that had not been exposed to successful import or mill competition yet) in the middle of the 19th century.¹⁴² Assume that this import was also present in the 18th century. Cotton was usually taken down from the hills in an unginned state, owing to the lower cost of labour in Bengal proper, so the actual quantity of clean cotton was smaller. On the other hand, this type of cotton, called Comilla, is known for its high ginning percentage (the ratio between the weight of clean cotton to the cotton with the seed), around 0.45 compared to 0.3 for other types. A late 19th century report put the share of unginned cotton as three quarters of exports, so I'll use these figures.¹⁴³ This would give us around 7 million lb from the East. Exports at this time via Calcutta were small. Home cotton production is meant to have provided at most one eighth of consumption.¹⁴⁴ This gives us 33.2 million lb of cotton available. At a 0.675 ratio of cotton to yarn (0.75 lb of yarn per lb of cotton, and 0.9 of cotton used for yarn), we get 22.41 million lb of yarn spun. 1788-9 was a very poor year for the cotton harvest, (cotton prices were unusually high), so this is a lower than average figure.¹⁴⁵ A figure from the customs authorities puts the average import into Bengal (including Benares and Bihar, and presumably also Orissa) in the years before 1802 at 43.2 million lb.¹⁴⁶ This, eastern imports, and local production gets us up to 57.42 million lb of raw cotton, so 38.76 million lb of yarn spun, or 29 million lb for Bengal proper, assuming a 0.75 ratio.

Details for all years:

- 1750: Worked out above. Robert Allen's 82 million lb estimate adjusted downwards to around 33 million lb by changing the square yards to lb of yarn from 0.4 to 0.154.¹⁴⁷
- 1765: Tirthankar Roy's 250 million square yards figure adjusted to cotton yarn consumption by 0.154.¹⁴⁸

¹⁴¹Calculated from (EIC, 1836, Book 1, Pages 366-7).

¹⁴²(Taylor, 1851, Page 64).

¹⁴³(GoI, 1896).

¹⁴⁴(Medlicott, 1862, Page 44).

¹⁴⁵(EIC, 1836, Page 359).

¹⁴⁶(EIC, 1836, Pages 21-2).

¹⁴⁷(Allen, 2009).

¹⁴⁸(Roy, 2010).

Table 4.31: Bengal Hand loom Yarn Consumption, Guide to Sources

| Years | Whose Estimate? | Method | Cotton Source Documents | Smoothed? |
|------------------------------------|-------------------|-------------------|-------------------------|-----------|
| 1750 | Allen | Cloth to Yarn | | |
| 1765 | Roy | Cloth to Yarn | | |
| 1789 | Mine | Cotton to Yarn | Duncan, Taylor | |
| 1791 | Ray | Cotton to Yarn | | |
| 1800 | Mine | Cotton to Yarn | Customs, Taylor | |
| 1816-1818 | Mine | Cotton to Yarn | Phipps, Mann | |
| 1819-1832 | Mine | Cotton to Yarn | Martin, Mann | |
| 1834-1843 | Mine | Cotton to Yarn | Thomason, Mann | Yes |
| 1845-1847 | Mine | Cotton to Yarn | Forbes Royle | |
| 1847 | Ray | Cotton to Yarn | | |
| 1861-72 | Mine | Cotton to Yarn | NWP Government, Prender | Yes |
| 1878 | Mine | Cotton to Yarn | Government | |
| 1882, 1887, 1892, 1902, 1907 | Misra | Yarn Availability | | |
| 1883-1891 | Mine | Cotton to Yarn | Bengal Cotton Report | |
| 1889 | Mine | Cotton to Yarn | Watt | |
| 1900-1938 | Iftikhar-ul-Awwal | Yarn Availability | | |

- 1789: Mine, see the example above.
- 1791: Indrajit Ray's raw cotton figure (565,000 maunds, equivalent to 46.4882 mill lb) adjusted to yarn by 0.675.¹⁴⁹
- 1800: Mine, see the example above.
- 1816 and 18: Cotton passing through Mirzapore from Phipp's Guide to the Commerce of Bengal.¹⁵⁰ I added 7 million lb for domestic production and 7.05 for Eastern Imports. I then deducted the cotton export figures provided by Mann.¹⁵¹
- 1819-1832: Receipts at the Mirzapore customs house were reported by Martin.¹⁵² Mirzapore was the main cotton mart, and I assume that this entire sum consisted of cotton (these numbers are consistent with the entire receipts from cotton from the source in the next item), and that the duty on cotton was 0.5 rupees per maund (see the next bullet point). I then added domestic and eastern production and deducted exports (again from Mann)

¹⁴⁹(Ray, 2009, Table 16).

¹⁵⁰(Phipps, 1823, Page 258).

¹⁵¹(Mann, 1860, Table 7).

¹⁵²(Martin, 1839, Page 360).

as before. According to Taylor, imports of yarn from England only began in 1821, by 1827 were at 3 million lb, and by 1832 had reached 6.624 million lb.¹⁵³ From Mann's figures for 1827-1859, these appear to be for all of India rather than just Bengal.¹⁵⁴ I therefore multiply the all India import figures by the average ratio between it and my Bengal net import figures for 1849-1858, approximately 0.544, and then multiply this import figure by 0.8 to account for some of the yarn passing further inland.

- 1834-1843: Mine. These are estimated from the cotton duty receipts from the customs houses in the North West Provinces (modern day Uttar Pradesh). See the letter from James Thomason (a senior civil servant) to Lord Ellenborough (the Governor-General), no. 2,218 of 1844, in a collection of papers presented to the House of Lords.¹⁵⁵ Bengal grew only a small share of its cotton consumption and the majority of the cotton passed through the North Western Provinces. At this time there were customs houses levying duties on trade between the British provinces and the neighbouring states. These states were the main cotton regions at this time. Excessive duties levied by local rulers and landowners in the Deccan caused cotton to be taken to Bengal rather than Bombay (which was closer as the crow flies). Crucially, Bundelkhand, at this time the main cotton growing region in Bengal Presidency (British territory), was outside of the customs frontier since it was easier to limit this to one bank of the Ganges. Goods crossing the frontier were subject to minor duties, and so we have records of the cotton passing through.

The assumed rate of duty per maund was 0.5 rupees as Thomason's letter states that it was this figure from 1840 to 1843. Some of this cotton would be consumed by the looms of the Northwestern provinces, so I have deducted a 0.4 share of the total.¹⁵⁶ This gives us the aggregate quantity of cotton passing south of Mirzapore, the cotton mart at the border between Greater Bengal and UP. From this figure, exports from Calcutta to all destinations were deducted, as stated in Mann's *Cotton Trade of Great Britain*.¹⁵⁷ This multiplied by

¹⁵³(Taylor, 1840, Page 365).

¹⁵⁴(Mann, 1860, Table 19, Page 118).

¹⁵⁵(House of Lords, 1853, Page 158).

¹⁵⁶How reasonable is this figure? The FCC's estimated weight of cotton yarn consumption for UP is equal to the Bengal and Bihar figures in 1940, implying a share of 0.5, but Benares is included in the UP figure, and Bihar apparently saw the largest decline after 1850. (GoI, 1942, Appendix 284).

¹⁵⁷(Mann, 1860, Table 7).

0.675 gives us yarn from this source.

I then added 7 million lb of raw cotton assumed to be produced in Bengal and Bihar (i.e. 4.725 million lb of yarn), approximately the 18th century figure, and cotton equivalent to 4.75 million lb of yarn for imports from Assam/the Chittagong hills (as stated by Taylor).

European Yarn imports are remaining. The official reports on the external commerce of Bengal have yarn net imports of 13.4 million lb in 1849-50, and 11.4 million lb in 1850-51.¹⁵⁸ Some of this would pass beyond Bengal by land (re-exports by sea have already been deducted) and we do not have figures for earlier years. I therefore multiplied the all-India yarn import figures from Mann by 0.544 (the average ratio between these and Bengal net imports 1849-1858 from the external commerce reports), and then again by 0.8 for yarn passing further inland to get the Bengal consumption.

The resulting estimates were smoothed by taking the average of the immediate year and that before and after, otherwise the series jumped around a lot.

- 1845-1847, Mine. Mirzapore cotton imports from J. Forbes Royle.¹⁵⁹ Same as above, otherwise.
- 1847: Not included on the figure. Indrajit Ray's estimate for the middle of the 19th century, average of his lower and upper figures 408-491,000 maunds of raw cotton times 0.675, equivalent to 29.12 million lb.¹⁶⁰ This estimate has some overlap in sources with my 1845-47 figures, but is lower. There are two reasons for this: First, I include cotton imported from the hills to the East, as reported by Taylor around this period. Second, Ray appears to have substantially underestimated the weight of cotton yarn imports: he reports a cotton weight equivalent of 18,000 maunds, around 1.48 million lb. This appears to be far too low, especially given our figures above. Mann reports all-India cotton yarn imports from the UK at an average of 18.624 million lb for the years 1845-47 (those Ray makes his estimate for).¹⁶¹ Assuming that Bengal got only 0.4 of the total, that would be around 90,500 maunds - 72,000 more than Ray has. This would bring his range up to

¹⁵⁸(GoI, 1849, Statements 1,2,3) IOR/V/17/124, (GoI, 1851, Statements 1,2,3) IOR/V/17/125.

¹⁵⁹(Royle, 1851, Page 42).

¹⁶⁰(Ray, 2009, Table 16).

¹⁶¹(Mann, 1860, Page 118, Table 19).

490-563,000 maunds, with the latter figure only 2,000 maunds (around 0.35 per cent) below his 18th century peak cotton consumption figure!

- 1861-72: Estimates for the out-turn of cotton 1861-72 in the NWP (The "North West Provinces", later the United Provinces, and currently Uttar Pradesh) were taken from "Selections from the Records of Government".¹⁶² Only part of the cotton was from the NWP however. In 1861 and 1862, I added 10 million lb from the States/neighbouring provinces. In 1863 and 1864 I doubled this to 20 million lb as prices spiked during the American Civil War. In 1865 and after I assumed that the other regions supply cotton equal to two-thirds of that from NWP. The reason behind this is that the princely state of Gwailor had a cotton acreage around half of that of UP in the early 20th century. Yields are unlikely to have differed by that much. Bumping this up to 2/3rds accounts for the other states/imports from the Punjab.

I then add Bengal and Eastern Production to this, assuming that they are unchanged from the 1840s, so around 14 million lb. This assumes no production response to the higher price after 1862, but I keep these figures constant so that I don't overstate cotton availability. I then deduct exports of cotton from Calcutta. From the total available cotton in Eastern India, I assume that Greater Bengal took 60 per cent of it: 40 per cent gets deducted for consumption in the NWP. I then multiply the remaining figure by 0.675 to account for wastage and non-cloth uses of cotton. I then add net yarn exports to Calcutta, multiplied by 0.8 (to account for some of it going to other provinces inland). The resulting figures were smoothed as otherwise availability was negative in some years - it is clear that there was a major decline in cotton yarn consumption in the 1860s.

- 1878: Mine, mill yarn (imported plus local production) retained in Bengal, Bihar and Orissa, multiplied by 1.2 to account for Hand Spinning.¹⁶³ Roy's India wide statistic for 1880 would suggest multiplying mill yarn by 2. However, Bengali hand spinners had fewer transport costs to protect them from machine goods.
- 1882, 1887, 1892, 1897, 1902, 1907: From an article by Bhubanes Misra.¹⁶⁴

¹⁶²(GoI, 1868 - 1873, Vol II, No. IV, Page 420) and (GoI, 1868 - 1873, Vol VI, No. II, Page 284).

¹⁶³(GoI, 1879, Pages 188-191).

¹⁶⁴(Misra, 1987, Table 5, Page 12).

- 1883-1891: Mine, figures calculated from the Bengal Cotton Report of 1892, adding 3.88 million lb for hand spun production from the 1878 Bengal Administration Report.¹⁶⁵
- 1889: From George Watt's Dictionary of Economic Products. The quantity is the net imports of European and Indian yarn in terms of rupees divided by their respective prices. I then added 75,000 maunds (around 6.2 million lb) to account for unregistered production from the Calcutta mills as Watt's figure excludes Calcutta from Bengal and only looks at the registered trade. An 1885 compilation put the production of yarn (cotton consumption converted to lb adjusted by 0.75) in mills near at 19 million lb, so this is not a high figure.¹⁶⁶ I then added 10 per cent to the total for hand spun yarn.¹⁶⁷
- 1900-1938: A. Z. M. Iftikhar-ul-Awwal's figures from the trade statistics. No hand spinning is included, but this was likely to only be a couple of million lb at most by this period, and would not matter much. Before 1912 the figures refer to Bengal, Bihar and Orissa, and so I have adjusted them downwards. After that date they refer to Bengal proper only.¹⁶⁸

There are two, lower, alternative estimates for the 1930s. First, one table from the FFC reports a provincial government figure of only 29.64 million lb of cotton yarn consumed by hand looms in Bengal.¹⁶⁹ Second, a provincial Industrial Department Bulletin from 1940, by G. N. Ghose, gives a variety of figures, which are inconsistent and vary wildly. Estimated annual yardage is only 144.699 million yards.¹⁷⁰ At 4 lb per square yard, this will only be 36.17 million lb of yarn. But, another of his estimated annual yarn consumption figures is only 27.704 million lb.¹⁷¹ By consulting the trade and factory production statistics, Ghose then separately estimates 43.7 to 49.11 million lb of yarn for hand looms in 1935-6 to 1937-9, yet his 1938-9 figure is only 14.29 million lb.¹⁷² Ghose concludes that these figures support one another by bringing up three figures not in the table he mentions, which I could not source, and does not point out the apparent drop in 1938-9, while mentioning a

¹⁶⁵(GoI, 1892).

¹⁶⁶(GoI, 1886, Page 66).

¹⁶⁷(Watt *et al.*, 1889, Vol VI, Page 162)

¹⁶⁸(Iftikhar-ul Awwal, 1982, Table 7.14).

¹⁶⁹(GoI, 1942, Page 105).

¹⁷⁰(Ghose, 1940, Page 6).

¹⁷¹(Ghose, 1940, Page 17).

¹⁷²(Ghose, 1940, Page 14).

tariff board estimate of 48.6 million lb for 1936.¹⁷³

Ghose appears to have overestimated the weight of cloth produced by factory sector weaving in Bengal (and therefore yarn consumption by this sector which he deducts from the total to get hand loom consumption), and this accounts for the bulk of the difference between his estimates and Iftikhar-ul-Awwal's when both rely on the trade reports.¹⁷⁴ For this reason (and those above), I prefer Iftikhar-ul-Awwal's estimates. Such a low consumption of yarn as per Ghose's favoured figures seems highly doubtful given our other estimates for earlier years and the widespread adoption of the flying shuttle in Bengal in the early 20th century, which significantly raised yarn consumption per loom. At best, Ghose's figure could cover the situation during the Second World War, when yarn was hard to get on the open market for hand looms, much like during the First. But this was an exceptional period.

¹⁷³(Ghose, 1940, Page 18).

¹⁷⁴I base this statement off figures provided by an industrial bulletin examining the factory cotton textile industry in the province (Gupta, 1937, Table VIII).

4.J Yarn Consumption in Madras: Sources

For Madras there is an additional method of estimating yarn consumption:

$$Yarn\ Consumption = Number\ of\ Looms * Yarn\ Consumption\ per\ Loom \quad (4.78)$$

We have estimated *Yarn Consumption per Loom* from our values for c (yarn to cloth ratio), and our weaving productivity estimates in Appendix 4.G.

Note that where there was an overlap between these estimates before 1850, I averaged them (although they were not that far apart).

- 1820, 1840, 1860: Loom counts from Wielenga, *Weaving Histories*.¹⁷⁵ Yarn consumption was estimated by the number of hand looms multiplied by our consumption per loom figures from the calibration section. I adjusted these upwards by 20 per cent to account for missing districts, using the district wise figures from the Nellore Manual.¹⁷⁶ I then adjusted the 1820-1860 figures upwards by 20 per cent to account for tax evasion. I then adjusted the number of looms to cotton only by 0.8, and I then adjusted by 0.9 or 0.85 to account for idle looms. These figures were based on the FFC statistics.
- 1819-1844: Specker reports loom counts for a number of districts, with some gaps.¹⁷⁷ I increased the number of looms in early years in a number of cases where there was a discrete jump upwards, as some looms were now added to the registers for the first time. I interpolated the gaps for each district using a number of assumptions. For the years before the first loom count, I used the highest figure within the first two years. Where there was a gap between two reported figures, I linearly interpolated them. Where there was a large gap after the final reported figure, I linearly interpolated it between that year and the 1860s figures. Where there was a small gap (two years or less) I kept the loom count constant. The figures were then multiplied by 1.2 to account for missing districts (Kurnool, Salem, and Madura), then 1.2 again for tax evasion, and then 0.8 and 0.9 for

¹⁷⁵(Dietrich Wielenga, 2020, Appendix Table 2.2).

¹⁷⁶(Boswell, 1873, Page 294)

¹⁷⁷(Specker, 1989, Table 1).

cotton looms only and idle looms. These were then multiplied by 123.985 lb per loom as above. These assumptions tend to bias the results towards a fall.

- 1828-1850: I calculated the implied loomage from the *Moturpha* returns, assuming that the share of loom payments in the total (and payment per loom) was the same as in 1860.¹⁷⁸
- 1851-68: I calculated the cotton grown in but not exported from Madras from estimated figures supplied by the Nellore District Manual, adjusted this to yarn by 0.675, and added net imports of yarn to this.¹⁷⁹ This required assumptions regarding cotton yields. Before the American Civil War I took this to be Roy's estimate of 81 lb per acre, then 75 in 1860, and 70 thereafter, except for 1862, 1863, and 1868 where I assumed it was 55. This tends to bias the yarn consumption trend downwards.
- 1869-1874: Specker reports the acreage under cotton (with overlap for earlier years with the Nellore DM), and cotton exports. I assumed an average yield of 60 lb an acre for these years (further biasing yarn consumption downwards), then exports were deducted and the total multiplied by 0.675. Yarn imports (provided by Raghavaiyengar as above) were added to this.
- 1901-1909: 1911 Madras Census Report.¹⁸⁰
- 1907, 1909, 1920: 1921 Madras Census Report.¹⁸¹
- 1889: From George Watt's Dictionary of Economic Products.¹⁸² Imported yarn times 1.2 to account for local mills and hand spun production.
- 1900, 1921, 1928, 1931, 1938, 1941: From the FFC Report, some of these figures were also reported by Wielenga as above. The 1900 and 1938 estimates have been excluded for being outliers.¹⁸³

¹⁷⁸ *Moturpha* figures for 1835-1850 from (Srinivasa Raghavaiyengar, 1893, Pages cxxviii-cxxx), 1828-1835 from (Select Committee on East India Produce, 1840, Page 625).

¹⁷⁹ (Boswell, 1873, Pages 291-6).

¹⁸⁰ (Chatterton, 1912, Vol I, Page 229).

¹⁸¹ (Boag, 1922, Page 195).

¹⁸² (Watt *et al.*, 1889, Vol VI, Page 162).

¹⁸³ (GoI, 1942, Pages 28 and 284).

4.K Yarn Consumption in the Punjab: Sources

- 1861: The Bengal Cotton Hand book (1862) contains official estimates of Punjab cotton cultivation, outturn, and exports.¹⁸⁴ I have increased the outturn by 1.25 because the official acreage is likely to have been understated at this point. In particular, it is just over half of that recorded a decade later. From this figure, I deducted reported gross exports, but added 4 million lb, based upon later figures for imports. The resulting figure was multiplied by 0.675 as usual to get yarn consumption. I assume no yarn imports.
- 1870: 1870-71 Cotton Report. Estimated outturn minus net exports, I assume no yarn imports. The resulting figure was multiplied by 0.675 as usual to get yarn consumption.¹⁸⁵
- 1879: 1879-80 Cotton Report (Yarn imports from 1880-81 report Page 5). Estimated outturn minus net exports. The resulting figure was multiplied by 0.675, then yarn imports were added as usual to get yarn consumption.¹⁸⁶
- 1880: 1880-81 Cotton Report. Estimated outturn minus net exports. The resulting figure was multiplied by 0.675, then yarn imports (From the 1884 Punjab Cotton Monograph, see below) were added as usual to get yarn consumption.¹⁸⁷
- 1881: 1881-82 Cotton Report. Estimated outturn minus net exports. The resulting figure was multiplied by 0.675, then yarn imports were added as usual to get yarn consumption.¹⁸⁸
- 1882: 1882-83 Cotton Report. Estimated outturn minus net exports. The resulting figure was multiplied by 0.675, then yarn imports were added as usual to get yarn consumption.¹⁸⁹
- 1883: Punjab Cotton Monograph (1884). Estimated outturn minus net exports. The resulting figure was multiplied by 0.675, then yarn imports were added as usual to get yarn consumption.¹⁹⁰
- 1921: FFC.¹⁹¹ Looms from the FFC, adjusted to full time all cotton looms by 0.688 (cacu-

¹⁸⁴(Medlicott, 1862, Page 239).

¹⁸⁵(GoI, 1871, Pages 2-3).

¹⁸⁶(GoI, 1880, Pages 1-3).

¹⁸⁷(GoI, 1881, Pages 1-3).

¹⁸⁸(GoI, 1882, Pages 1, 8, 9).

¹⁸⁹(GoI, 1883, Pages 1, 9, 10).

¹⁹⁰(Francis, 1884, Pages 2-4).

¹⁹¹(GoI, 1942, Page 27).

lated from the share of part time and the share of non-cotton looms).¹⁹² Going from looms to cotton yarn consumption is the hard part. My usual figures are not reliable because hand loom weaving in the Punjab was unlike that in most of the rest of the country; Punjabi cloth was coarser and heavier. Using the reported loomage for the years 1880-1882 (see above) and my estimated yarn consumption for those years suggests a yarn consumption of 261 to 387 lb per year. This lower figure seems to be due to a high reported loom count in 1880 (around 180,000 vs 140,000 for the next two years). The FFC reports the provincial estimate for the yardage of cloth produced in the Punjab in 1940 at 228 million square yards.¹⁹³ Both Roy and the FFC use the ratio of 4 square yards to 1 lb of yarn in 1940, but Punjabi cloth was likely to have been heavier owing to its coarseness. The FFC reports 3 square yards per lb for cloth made out of hand spun yarn, which survived on a large scale in the Punjab.¹⁹⁴ I therefore use 3.5 square yards per lb. Taking the total square yardage figure and dividing by the number of full time cotton looms, then further dividing by 3.5 gives me 333.15 lb of yarn consumed per year per loom, which is in accordance with the earlier figures (Punjabi weavers did not adopt the flying shuttle to any great extent in this period). The 1921 figure is then calculated from the reported loomage and the average lb per loom per year.

- 1940: FFC.¹⁹⁵ Looms from the FFC, adjusted to full time all cotton looms by 0.688. Cotton yarn consumption from loomage multiplied by lb per loom as in 1921.

¹⁹²(GoI, 1942, Pages 29-30).

¹⁹³(GoI, 1942, Page 60).

¹⁹⁴(GoI, 1942, Page 61).

¹⁹⁵(GoI, 1942, Page 27).

4.L Hand Spinner and Weaver Earnings: Sources

Spinners (Earnings every 20 years from 1820):

- 1820: Francis Buchanan. Part time observations doubled to get full time earnings.¹⁹⁶
- 1840: Taylor, Dacca.¹⁹⁷
- 1860: Fraser Hastings, Berar.¹⁹⁸
- 1880: Bombay Gazetteers, Belgaum.¹⁹⁹
- 1900: Notes on the Industries of the United Provinces.²⁰⁰
- 1920: The Hand-Spinning of Cotton (Bihar Department of Industries Bulletin).²⁰¹

Note that Buchanan in South India (1800) reports an earnings figure for a coarse spinner which is equivalent to what he reports for the finest spinners in Bihar, and Taylor's very fine spinners in Dacca.²⁰² I have excluded this, as he has likely misreported.

Weavers (Earnings Averaged By Decade):

- 1800: Buchanan South India.²⁰³ No of Observations: 10.
- 1810: Buchanan East India. 30 observations were taken directly from Buchanan's reported earnings.²⁰⁴ 16 were calculated from a table showing productivity and input and output prices.²⁰⁵ No of Observations: 46.
- 1840: Taylor, Topography and Statistics, Dacca.²⁰⁶ No of Observations: 1.
- 1850: Taylor, Descriptive and Historical Account.²⁰⁷ No of Observations: 2.

¹⁹⁶(Buchanan-Hamilton, 1833, Page 244), (Buchanan-Hamilton & Jackson, 1928, Pages 444 and 537), (Buchanan, 1936, Pages 647), (Buchanan-Hamilton, n.d., Book V, Pages 43-44), (Hamilton & Banerji-shastrī, 1939, Pages 608).

¹⁹⁷(Taylor, 1851, Page 73).

¹⁹⁸(Fraser & al Daulah, 1865, Page 355).

¹⁹⁹(GoI, 1877 - 1904, Belgaum, Page 338).

²⁰⁰(Chatterjee, 1908, Page 3).

²⁰¹(Rao, 1923, Page 2).

²⁰²(Buchanan, 1807, Vol III, Page 317).

²⁰³(Buchanan, 1807, Vol I, Pages 212, 217, 218, 216)

²⁰⁴(Buchanan-Hamilton, 1833, Pages 296-8), (Buchanan-Hamilton & Jackson, 1928, Pages 539-44), (Buchanan, 1936, Pages 650-7), (Buchanan-Hamilton, n.d., Book V, Pages 47-8), (Hamilton & Banerji-shastrī, 1939, Pages 614-7).

²⁰⁵(Buchanan, 1936, Pages 774)

²⁰⁶(Taylor, 1840, Page 311).

²⁰⁷(Taylor, 1851, Page 77).

- 1870: Bombay Gazetteers: Kutch Page 127, Baroda Page 155, Khandesh Page 229, Thana Pages 380, 386, 387, 389.²⁰⁸ No of Observations: 10.
- 1880: Bombay Gazetteers: Nasik Pages 162 and 168, Ahmadnagar Page 349, Poona Pages 190 and 197 (one extremely high outlier removed), Satara Page 222, Sholapur Pages 270-2, Dharwar Page 376, Bijapur Pages 370-3 and the Punjab Cotton Monograph.²⁰⁹ No of Observations: 32.
- 1890: Monograph Cotton Fabrics Bombay.²¹⁰ No of Observations: 14.
- 1900: Ghosh, Hand Loom weaving.²¹¹ No of Observations: 1.
- 1920: Madras Cottage Industry Survey and The Economics of Handloom by N. G. Ranga (1930, but observations refer to 1925-6).²¹² No of Observations: 124.
- 1930: Hyderabad Report on Weaving and Dyeing.²¹³ No of Observations: 214.
- 1940: FFC and the Bengal Cotton Weaving Survey.²¹⁴ No of Observations: 139.

Rice Prices: The sources for the rice prices used to convert nominal earnings to grain earnings depend on the time and location. For Bombay, before 1880 the prices came from the Bombay Gazetteers, and thereafter grain markets were integrated, so I used prices from elsewhere. For Madras, rice prices (1800-1937) came from a combination of (a) the district manuals and (b) the appendix to the Report of the (Madras) Land Revenue Enquiry Committee.²¹⁵ For Bengal (1793-1937) they either came from Buchanan's reports or my paddy price series (adjusted to rice equivalents) for Bengal, as in Chapter 2 of this thesis.

Implied Earnings:

Given output prices, input prices and, productivity we can calculate implied earnings for both spinners and weavers.

²⁰⁸(GoI, 1877 - 1904).

²⁰⁹(Francis, 1884, Page 5).

²¹⁰(Enthoven, 1896, Pages 12, 16, 19, 22, 23).

²¹¹(Ghosh, 1906, Page 113).

²¹²(Rao, 1929), (Ranga, 1930, Pages 63-80, 90-104).

²¹³(Sabhait, 1933, Appendix).

²¹⁴(GoI, 1942, Pages 82-3), (Ghose, 1940, Page 53).

²¹⁵(Marjoribanks, 1937).

$$\text{Implied Earnings} = (\text{Output Price} - \text{Unit Input Price}) * \text{Productivity} \quad (4.79)$$

Spinners: The output of spinning is yarn. The trade statistics report the import price of 40s yarn from 1843 onwards. This was far finer than average for hand spinners. I therefore reduced its price by dividing by 1.5, which was approximately the average ratio between 40s and 20s yarn when the trade statistics later start to report both. The input into spinning is raw cotton. The trade statistics report the price of export-grade cotton from 1843 onwards, which was finer than the average used by hand spinners. To deal with this problem, I calculated the implied share of raw cotton in the price of cotton yarn from the calibration process. This gave me value added shares in spinning for a set of baseline years. I then calculated an index of the relative price of yarn to cotton from each baseline year until the next using the trade statistic figures. I then multiplied the baseline value added share by this index for each year (until the next baseline) to get a rough estimate of the value added share for the non-baseline years. This is not a perfect measure, but it should suffice for this purpose and it gives me value added per lb of yarn spun. I then multiplied this by my representative productivity estimate (37 lb per woman per year), to get value added per spinner. I then multiplied this by 0.85, to account for the lower quality of hand spun yarn relative to mill yarn, which would be reflected in its price. This was then divided by rice prices to get implied earnings in terms of rice.

Weavers: The input into weaving is yarn. I use the implied 20s yarn price (40s figure from the trade statistics divided by 1.5 where not given). I use Roy's yarn (lb) to cloth (square yard) ratios (*c*). I use the import price of cloth from the trade statistics divided by 1.18 (which was roughly the average ratio between imported cloth from Britain and exported cloth from Bombay). This gives me value added in Rs per square yard. I then multiply this by my representative estimate of square yards per weaver per year. This then gives me value added per weaver producing factory competing cloth per year. This was then divided by rice prices to get implied earnings in terms of rice.

4.M Calibration Data Sources

The data consists of output, consumption, and prices in each sector, plus labour productivity in spinning and weaving and a few technological parameters. Almost everything is in terms of millions of a unit. So the nominal wages refers to rupees per million workers, square yards implies millions of square yards, and so on.

4.M.1 Conversion ratios and Population

Conversion Ratios: κ , c

These are taken from Tirthankar Roy's *Crafts and Capitalism* chapter 2. $\kappa = 1/(0.75 * 0.9)$, as 1 lb of cotton made 0.75 lb of yarn, and 0.9 of the cotton crop was used for cotton textiles. c is lb per square yard.

Population, L

Roy provides population figures. I assume that the workforce equalled 0.35 of the population. As he notes, the population figures he uses are rather higher than most estimates for the early 19th century (since they are based on extrapolated 1881-1921 population growth rates, which was a period of famine and severe disease shocks, notably the 1919 Influenza).

4.M.2 Prices and Wages

The Price of Foodgrains, P_a

This is an average of the price of wheat, rice, and millet, for the baseline year and the five preceeding and following years (except for 1940). For 1820-1860 the average of the prices from the Gazetteers of Surat and Khandesh districts in Bombay Presidency were used. These were important cotton producing regions, and they were close to the manufacturing cities of Bombay and Ahmedabad. Surat: District Gazetteer Page 208, Khandesh: District Gazetteer Page 203.

For 1880, the Gazetteer sources above were used in conjunction with the 1902 edition of *Prices and Wages in India*.²¹⁶

²¹⁶(GoI, 1902, Pages 168-69).

1900: From Prices and Wages in India, 1902 and 1919.²¹⁷

1920: Statistical Abstract for British India, 1922-3 to 1932-3.²¹⁸

1940: Retail And Wholesale Prices In The Hyderabad State From 1341 to 1350 Fasli [Years].²¹⁹

Hyderabad was an important cotton producing princely state, close to Khandesh district. Prices adjusted from Hyderabad rupees to British Indian Rupees, and are consistent with harvest prices from the Agricultural Statistics, 1937-38.²²⁰

The Price of Cotton: P_k

The trade statistics usually report the export price of Broach cotton. This was of a longer staple than virtually all of the rest of the Indian crop. Its price was therefore higher than average, and higher than that consumed by Indian producers. Before the late 19th century, there was a significant difference between the export price of cotton and the price in the producing regions due to high transportation costs. I take the average of the export and the cotton producing region price as the price of cotton, P_k , in order to account for both export opportunities and local costs before 1880.

Export prices

1820: Bengal export price from G. A. Prinsep, "Remarks on the External Commerce of Bengal".²²¹

1840: 1837 values From John Crawford, "A Sketch of the Commercial Resources ...".²²²

1860-1900: Prices and Wages in India, 1902, January Bombay Prices.²²³

1920: Prices and Wages in India 1919, January Bombay Prices.²²⁴

1940: Review of Indian Trade, 1939.²²⁵ Calculated from value and quantity of net exports.

Cotton Producing Region Prices

²¹⁷(GoI, 1902, Pages 168-69), (GoI, 1919, Pages 8-11).

²¹⁸(GoI, 1921 - 1947, Vol 11, Pages 221-5)

²¹⁹(Husain, 1942, Pages 62-68).

²²⁰(GoI, 1938a, Vol 1, Pages 296-7, Table VIII).

²²¹(Prinsep, 1971, Page 162, Appendix O).

²²²(Crawford, 1971).

²²³(GoI, 1902, Table 41).

²²⁴(GoI, 1919, Table 7).

²²⁵(GoI, 1939, Pages 143-4).

Cotton production was concentrated in Western and Central India. I therefore take prices from Surat and Khandesh districts, in Bombay Presidency, for the years 1820-1880, i.e. from the same source as foodgrains prices, and average them.

Surat: District Gazetteer Page 208. Khandesh: District Gazetteer Page 203.

Nominal Wages, W

Wages here are for unskilled male labourers. For 1820-1880 I take the average nominal wage for years closest to the relevant year, from a dataset I compiled from the Bombay Presidency District Gazetteers. I excluded in kind wages. Most of these districts were cotton producing ones, but a few, notably those in the Konkan, were not. After 1880, I assumed that wages in terms of jowar (millet) were constant, given the stagnation of Indian per capita income, and the nominal wage is therefore the average jowar wage for 1820-1880 times the jowar price. You can call this a Malthusian assumption if you like; it is borne out by other data available on request.

4.M.3 Output and Consumption

Y_w, Y_s, C_w : From Roy, Crafts and Capitalism.

C_s inferred from C_w and c .

These figures give us X_w, X_s .

C_k inferred from C_s and κ .

X_k from a range of sources:

1820: Sum of Bengal and Bombay exports from G. A. Prinsep.²²⁶

1840: 1837 values From John Crawford, "a sketch of the commercial resources..."²²⁷

1860-1920: Statistical Abstract for British India, for the relevant years.²²⁸

1940: Review of Indian Trade 1939.²²⁹

This gives us Y_k

²²⁶(Prinsep, 1971, Pages 138 and 162).

²²⁷(Crawford, 1971).

²²⁸(GoI, 1920).

²²⁹(GoI, 1939, Pages 143-4).

X_a estimated as outlined above.

4.M.4 Industrial Employment

Given output of these sectors, we need labour productivity estimates to estimate employment, or employment estimates to estimate labour productivity. For the traditional weaving sector and hand-spun yarn I use the former method, see the appendices above, while for factory spinning and weaving I use the latter.

Actual figures for (L_{wf}, L_{sf}) are a little more difficult. "Average No. of Hands Employed Daily" figures for the years 1879-1929 are provided by Arno Pearse.²³⁰ This provides 1880-1920 employment figures. For 1940 employment I used the figures from the "Report on an enquiry into conditions of labour in the cotton mill industry in India".²³¹ Most statistics do not provide employment in modern spinning and weaving separately.²³² To deal with this, I looked at a detailed breakdown of employment by process in modern cotton textile factories in Bombay Presidency in 1937 from the Textile Labour Inquiry.²³³ These I either allocated to spinning, weaving or misc. I then allocated misc to spinning and weaving in proportion to their shares in their sum. I then calculated the number of looms examined, and worked out the employment in weaving departments per loom. I then multiplied this figure by the number of looms in each of the benchmark years. This approximately gives me employment in modern weaving. I then subtracted this from the total daily employment figures which gives us an approximate figure for employment in modern spinning. Night shifts were introduced in many mills between 1920 and 1940, and complicate things for this final year, as the usual employment figures cover day shifts only. I found figures for night shift employment for Bombay Presidency (which had a majority of textile mill workers) in this year, from another report on labour, which I multiply by 1.15 to get the all-India figure.²³⁴ This adds about another hundred thousand mill workers for 1940, perhaps an understatement. It is worth noting that night shift employment expanded considerably during the war, but I presume that 1940 means the situation during peacetime.

²³⁰(Pearse, 1930, Page 22).

²³¹(Deshpande, 1946, Page 1).

²³²As remarked by the 1927 Tariff Board report.

²³³(GoI, 1938b, Vol II, Page 12).

²³⁴(Deshpande, 1946, Pages 8,20,30).

4.M.5 Markups

Labour shares in manufacturing costs were taken from the 1927 Tariff Board Cotton Textile Enquiry Report, as an average of the Bombay and Up-Country shares.²³⁵

I set Urban/Rural wage ratios according to figure 5 in "Labour Power and Stagnant Industrial Labor Productivity in Late Colonial India" by Susan Wolcott.²³⁶

²³⁵(GoI, 1927a, Pages 119-20).

²³⁶(Wolcott, 2013).

Chapter 5

Conclusion

5.1 Conclusion

The introduction to this thesis introduced the prime puzzle, with which everything else must be read at the back of your mind: India's failure to see sustained per capita economic growth. The rest of the introduction briefly covered the reasons economists and historians may offer for such poor performance, and why I find these unconvincing. The body of the thesis went into detail about three key subjects in the Economic History of India: Chapter One, living standards at the start of the colonial era, Chapter Two, agriculture and institutions, and, Chapter Three, trade and industry. I will summarize each in turn and its broader implications.

Chapter One took on revisionist claims that South India had high living standards at the start of the colonial era. I re-examined the empirical basis for this and found it to be faulty. More accurate accounting leads to the conclusion that Southern Indian living standards were low in absolute terms in 1800, just as they were in 1900, or even 2000. I find that welfare ratios from individual wage observations from Mysore, the region used by the revisionists, suggest low living standards, and that supposedly high aggregate living standards result from an implausible occupational and wealth distribution. I supplement this by showing comparably low labour earning welfare ratios from the other areas Buchanan visited in South India, which were around subsistence. Further evidence from slave prices and male heights supports the low living standard view.

Thus India's poverty is long standing and derived from some period before colonialism. Starting from a low base should, in theory, result in fast catch up per capita growth. This did not happen. Since how far back, then, has India been poor? Some studies referenced in Chapter One find a major decline in per capita incomes during the 18th century. But this begs the question as to why. Mughal decline could not have been the reason because Mughal institutions were of a low quality in the first place.¹ Warfare could not have been the reason as incomes did not rise during the 150 years of colonial peace. There was little technological change over the Mughal period in stark contrast to the Colonial one. The Malthusian model could account for a decline through some combination of increased fertility or reduced mortality at given income levels, but I'm not aware of either occurring. In sum, further research on Indian living standards before 1800 is necessary, and here there is a large opportunity for Indian scholars who can dig up new

¹E.g. (Habib, 2014). Habib exaggerates, but not by much.

data.

Chapters Two and Three turn to address common arguments for stagnation. Chapter Two looks at the big, supposedly bad, landlords, the *zamindars*, of Bengal who have a poor reputation in the historical literature, and Economists have used them to demonstrate their institutionalist theories. This chapter argues that they were not as powerful as commonly thought, and that the colonial era witnessed their substantive defeat - so they could not have been the problem. The key reason for this was that tenancy customs in Bengal consisted of multiple layers of perpetual leases, known as tenant right. In theory this left the superior landlords with little control over land. An examination of the legal history shows that the colonial state protected tenant right. My data on rents suggests a trivial average nominal rental enhancement for tenants with permanent rights between 1793 and 1939. Since inflation was significant in this period, real rents collapsed and a major chunk of arable income (and therefore power) was redistributed from the elite to the middle classes. By historical accident, and since colonialism meant that the landed elite did not hold political power, the subordinate right in land became of superior value. I argue that tenancy legislation was a response to the increased value of these customary rights rather than landlord oppression - greater value required greater formal protection. Climate was more important for poor performance during the Green Revolution than the legacy of the *zamindars*. In this chapter, I go against the received wisdom - I am a revisionist myself rather than attacking them here - and argue that traditional institutions have been fundamentally misunderstood. There is a clear avenue for further research: to what extent does this story apply to other parts of India? I make a very brief attempt in one of the appendices to the chapter.

Entertainingly, I prove one of the Nationalist heroes, R. C. Dutt, correct on the one thing historians have usually disagreed with him about - and it was the only thing he got right in his entire career as a public intellectual (his other main contribution was claiming that lump sum taxes on wealthy landowners caused famines!). Perhaps land reform propagandists had an incentive to exaggerate the problems of the past to gain support for their policy views, and state affiliated historians had the incentive to make the past look worse in order to legitimise the current government. More work should be done on the persistent yield gap between the Indian subcontinent and East Asia, despite many institutional similarities such as small fragmented

farms and historical tenancy (including tenant right). East Asia has managed to beat South Asia on both the agricultural and industrial fronts. The former may be due to climate, but surely the latter cannot have been.

Chapter Three looks at industry at a time when India was relatively more industrialised, in the modern sense, than East Asia - in sharp contrast to Post-WW2 history. Despite this precocious industrial revolution, most historians have focused on calling the period one of "deindustrialization"! "Deindustrialization" is a classic topic in Indian Economic History, if not *the* classic. The usual suspect is imported cotton cloth from the United Kingdom during the 19th century following the Industrial Revolution. However, this period also saw the rise of the Indian factory industry, using modern machinery that saved labour. At the start of the Second World War, the Indian industry had replaced most imports, yet textile employment remained low, suggesting that technology was more important than trade in the long run. The majority of the hand loom weavers in fact survived, and their earnings did not decline, because of product differentiation. There was, however, a second, largely forgotten deindustrialization in the early 20th century due to technology driven labour productivity advances in the hand loom sector and an inelastic demand for its types of cloth. My simulations suggest that technology explains almost all of the decline in employment, not only historically but also relative to a no trade counterfactual: deindustrialization was a necessary corollary of Indian industrialization. Trade mattered much more for factory sector weaving output, but not so much for factory spinning or hand loom weaving. Given that so much was achieved, industrially speaking, the real puzzle is why it amounted to so little in comparison to the Indian population. Standard theories about imperialism and industry ought to be discarded in the face of the evidence against them. India could very easily have expanded output and investment - the technology was there and foreign capital was cheap.

To wrap things up, the arguments and evidence in this thesis strongly suggest that traditional stories about some major topics in the economic history of India have generally been focusing on the wrong issues. The question is why such inaccuracies have persisted for so long. Supply side issues regarding the availability of data certainly have been extremely important, but, as always, demand probably played a role. Production-relevant false beliefs held by producers rapidly get weeded out in competitive markets, since they lead to negative profits, but there is no such

constraint in the "marketplace of ideas". The parallel with the market for goods is a bad one, except when those ideas are production relevant (e.g. in civil engineering) since many false beliefs impose no cost on their holder. In the ideological marketplace conformity and preferences over beliefs - people like to believe that some things are true - are much more likely to matter.² The non-expert usually accepts what they are told, and that's that. I hope I have convinced the reader, through the use of arguments and evidence, that the usual tales require some revision, and to have provided more accurate ones in their place.

²E.g. (Caplan, 2011, Chapter 5).

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