History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India

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We analyze the colonial land revenue institutions set up by the British in India, and show that differences in historical property rights institutions lead to sustained differences in economic outcomes. Areas in which proprietary rights in land were historically given to landlords have significantly lower agricultural investments and productivity in the post-independence period than areas in which these rights were given to the cultivators. These areas also have significantly lower investments in health and education. These differences are not driven by omitted variables or endogeneity problems; they probably arise because differences in historical institutions lead to very different policy choices. (*JEL* O11, P16, P51)

There is renewed interest among economists in the question of whether history, through its effect on the pattern of institutional development, has a persistent effect on economic performance. In a recent series of papers, Rafael La Porta et al. (1998, 1999, 2000) have argued that the historical fact of being colonized by the British, rather than any of the other colonial powers, has a strong effect on the legal system of the country and, through that, on economic performance. The role of history in determining the shape of present-day institutions is also at the heart of two recent sets of papers, one by Daron Acemoglu et al. (2001, 2002) and the other by Stanley Engerman and Kenneth Sokoloff (1997, 2000, 2002). Acemoglu et al. show that mortality rates among early European settlers is a strong predictor of whether these countries end up with what economists today call "good" institutions (which protect private property rights) and whether their economies are doing well today. Engerman and Sokoloff argue that the reason why Brazil is where it is today, and the United States is where it is, has a lot to do with the fact that in the early years after European conquest Brazil was deemed to be suitable for growing sugar and the United States was not. Since sugar cultivation demanded the use of slave labor, Brazil ended up with a much larger slave population, and this, they argue, meant that Brazilian society was much more hierarchical than American society, causing a divergence in the types of institutions that evolved in these two countries and eventually a divergence in the rates of growth.

This paper is a part of the same broad research agenda. Where it differs is in focusing on one very specific historical institution—the system for collecting land revenue—in one specific country—India. We compare the present-day economic performance of different districts of India, which were placed under different land revenue systems by British colonial rulers as a result of certain historical accidents. We show that districts in India where the collection of land revenue from the cultivators was assigned to a class of landlords systematically underperform the districts where this type of intermediation was avoided, after controlling for a wide range of geographical differences. The differences show up in agricultural investment and yields, in various measures of public investment in education and health, as well as in health and educational outcomes. For example, the average yield of wheat is 23 percent higher and infant mortality is 40 percent lower in non-landlord districts. The non-landlord effect remains sig-

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nificant even when we restrict our data analysis to a set of 35 districts, chosen so that a landlord district always borders a non-landlord district. Finally, in all the data we have from the earlier period, i.e., from the nineteenth and early twentieth centuries, there is no evidence of landlord districts being at a disadvantage.

An obvious advantage of focusing on one specific institution in one particular country is that it makes it easy to locate the source of the difference, relative to the case where there is a complex of institutions that are all different. Another advantage is that we have access to a very detailed history of how the institutional variation came about, which makes it easier to argue for exogeneity of specific pieces of the variation. In particular, we will argue, based on historical facts, that areas where the land revenue collection was taken over by the British between 1820 and 1856 (but not before or after) are much more likely to have a non-landlord system, for reasons that have nothing to do with factors that directly influence agricultural investment and yields. We will therefore use the fact of being conquered in this period as an instrument for having a non-landlord system. We allow for the possibility that areas that were conquered in this period may have had a different experience simply because, for example, they were conquered later than most other areas, by including controls for the length of British rule. The instrumental variable estimates confirm the OLS results.

A third advantage of this particular experiment is that the land revenue systems introduced by the British departed with the British: there are no direct taxes on agricultural incomes in independent India. Our results therefore tell us that the system for land revenue collection established by the British 150 years ago or more continues to have an effect, long after it was abolished. We therefore have a pure example of institutional overhang, underscoring how hard it is to reform the institutional environment.[1]

The one disadvantage of a very specific experiment like ours is the suspicion that it reflects the peculiarity of the Indian experience. In other words, our results would be more interesting if we could identify the reasons for this extreme persistence. While our data do not allow us to identify exactly the channel through which the historical land revenue system continues to have an effect, there are a number of clues. When the British left, areas where landlords collected the revenue had an elite class that had enjoyed a great deal of economic and political power for over a century; there was no counterpart to this class in the non-landlord areas. This meant that these areas inherited a more unequal land distribution at the time of independence, and a very specific set of social cleavages, absent elsewhere.

Our data suggest, however, that in the post-independence period there is substantial convergence in inequality between the landlord and non-landlord areas, probably because states with landlord-dominated areas tend to enact a greater number of land reforms. This makes it unlikely that the persistence of the landlord effect is mainly through its effect on the contemporaneous land distribution.

On the other hand, it seems that, despite the abolition of the formal structure of landlordism, the class-based antagonism that it created within the communities in these areas persisted well into the post-independence period. The conflictual environment this created is likely to have limited the possibility of collective action in these areas. This collective action–based view is consistent with the fact that the gap between the non-landlord and landlord districts grows particularly fast in the period 1965–1980 when there is extensive public investment in rural areas. We find that states with a higher proportion of landlord districts have much lower levels of public development expenditures and that a substantial part of the gap between landlord and non-landlord districts in health, education, and agricultural technology investments can be explained by this difference in public spending. This suggests that the key to what happened may lie in the relative inability of the landlord districts to claim their fair share of public investment.

The paper is structured as follows: Section I describes the historical background and the land tenure system under British rule. We discuss the reasons why the tenure system varies from district to district, and argue that the choice of tenure system can be reasonably regarded as a source of exogenous variation. Section II outlines different mechanisms through which

[1] This distinguishes this work from the recent empirical literature on the effects of current land reform on current economic outcomes (see Banerjee et al., 2002; Timothy Besley and Robin Burgess, 2000; Justin Y. Lin, 1992, among others).

historical land tenure might affect long-term outcomes. Sections III and IV describe our data and empirical strategy. Our main empirical results are described in Section V. Section VI concludes by discussing potential mechanisms that might explain the persistence of the effect of British land tenure systems.

I. Historical Background

A. *British Political Control*

The British Empire in India lasted for nearly two hundred years. The British first arrived as traders: the English East India Company received a permit in 1613 from the Mughal emperor, Jahangir, to build a factory at Surat. Their empire building began with their victories in the battle of Plassey in 1757 and the battle of Buxar in 1764, as a result of which they obtained political control of the modern states of Bengal and Bihar (formerly Bengal Presidency). The British were formally granted revenue-collection rights in these areas in 1765. After 1818, the British were the major political power in India and by 1860 a large part of the territories of modern India, Pakistan, and Bangladesh were part of the British Empire. There were also a large number of princely states in different parts of the country, all of which were under British political control but had autonomy in administrative matters.

Different parts of the country came under British rule in different periods. While the Bengal Presidency came into British hands in 1765, the rest of eastern India was conquered much later. Some parts of the modern state of Orissa were conquered in 1803 and Assam was conquered between 1824 and 1826. Meanwhile, in south India, the British obtained four districts (the "Northern Circars") as a grant from the Mughal emperor in 1765. These and other areas conquered between 1792 and 1801 came to form the Madras Presidency. Parts of the western state of Gujarat were conquered in 1803 and the rest, along with large parts of Bombay Presidency, were obtained after conquering the Marathas in 1817–1818. Some of these areas formed part of the Central Provinces, to which other parts were added over a long period until 1860. In the north, large parts of the North-West Provinces were obtained from the Nawab of Oudh in 1801–1803, but Oudh itself was not annexed by the British until 1856. The northwestern state of Punjab was annexed after the Sikh wars in 1846 and 1849. Table 1 in the Web Appendix (http://www.e-aer.org/data/sept05_app_banerjee.pdf) provides district-wide details on the date and mode of acquisition by the British.

The rule of the East India Company came to an end after the Mutiny of 1857, when Indian troops revolted against their British officers. The revolt was soon suppressed, but it forced the British government to bring India under its direct control. The British left India in 1947, when the Indian Empire was partitioned into India and Pakistan.[2] Large parts of former Bengal Presidency and Panjab Province are now in Bangladesh and Pakistan, respectively.

B. *Pre-British and British Systems of Land Revenue*

Land revenue, or land tax, was the major source of revenue for all governments of India, including the British. During the period of Mughal rule in the sixteenth and seventeenth centuries, land revenue was collected by nonhereditary, transferable state officials (the *mansabdari* system introduced by Emperor Akbar). After the decline of Mughal power in the early eighteenth century, these officials and others grabbed power where they could and became de facto hereditary landlords and petty chiefs in their local areas. As a result, by the time British rule was firmly established in India (toward the end of the eighteenth century), it was very hard to tell what the "original land revenue systems" of India had been, and different British administrators could come to very different conclusions about it.

Land revenue, or land tax, continued to be the major source of government revenue during British times as well. In 1841, it constituted 60 percent of total British government revenue, although this proportion decreased over time as the British developed additional tax resources. Not surprisingly, land revenue and its collection were the most important issues in policy debates during this period. We use the terms "land revenue systems" or "land tenure systems" to refer

[2] Bangladesh, formerly East Pakistan, became an independent nation in 1975.

TABLE 1—STATE-WISE DISTRIBUTION OF LANDLORD AND NON-LANDLORD DISTRICTS

State	Mean non-landlord proportion	Classification of revenue systems				Total districts
		Landlord based	Individual based	Village bodies		
				Landlord	Non-landlord	
Andhra Pradesh	0.66	2	8	0	0	10
Bihar	0.00	12	0	0	0	12
Gujarat	1.00	0	7	0	0	7
Haryana	0.85	0	0	0	5	5
Karnataka	1.00	0	15	0	0	15
Madhya Pradesh	0.10	14	1	0	0	15
Maharashtra	0.78	4	14	0	0	18
Orissa	0.32	6	2	0	0	8
Punjab	0.87	0	0	0	6	6
Rajasthan	0.00	1	0	0	0	1
Tamil Nadu	0.75	2	9	0	0	11
Uttar Pradesh	0.42	0	0	12	35	47
West Bengal	0.00	11	0	0	0	11
Total	0.51	52	56	12	46	166

Notes: This table lists only districts that used to be part of British India. Areas where the British did not set up the land revenue system are excluded. Districts of British India currently in Pakistan, Bangladesh, or Burma are excluded. The table also excludes the states of Assam and Kerala, for which agricultural data are not available in the World Bank dataset. The table lists 1960 districts, some of which were split into two or more districts over time. We use unsplit districts in all our analyses.

to the arrangements made by the British administration to collect the land revenue from the cultivators of the land. These systems defined who had the liability to pay the land tax to the British. Up to a first approximation, all cultivable land in British India fell under one of three alternative systems: (a) a landlord-based system (also known as *zamindari* or *malguzari*), (b) an individual cultivator-based system (*raiyatwari*), and (c) a village-based system (*mahalwari*). Table 1 gives the number of districts in each category for the states in our data. The map in Figure 1 illustrates the geographic distribution of these areas.

In the landlord areas, the revenue liability for a village or a group of villages lay with a single landlord. The landlord was free to set the revenue terms for the peasants under his jurisdiction and to dispossess any peasants who did not pay the landlord what they owed him.[3] Whatever remained after paying the British revenue demand was for the landlord to keep. These revenue-collecting rights could be bequeathed, as well as bought and sold (Kumar, 1982). In this sense, the landlord effectively had property rights on the land. Landlord systems were established mainly in Bengal, Bihar, Orissa, the Central Provinces (modern Madhya Pradesh state), and some parts of Madras Presidency (modern Tamil Nadu and Andhra Pradesh states). In some of these areas, the British declared the landlords' revenue commitments to the government to be fixed in perpetuity (the "Permanent Settlement" of 1793). In other areas, a "temporary" settlement was implemented whereby the revenue was fixed for a certain number of years, after which it was subject to revision.

In most areas of Madras and Bombay Presidencies, and in Assam, the *raiyatwari* system was adopted under which the revenue settlement was made directly with the individual *raiyat* or cultivator. In these areas, an extensive cadastral survey of the land was done and a detailed record-of-rights was prepared, which served as the legal title to the land for the cultivator. Unlike the Permanent Settlement areas, the revenue commitment was not fixed; it was usually calculated as the money value of a share of the estimated average annual output. This share typically varied from place to place, was different for different soil types, and was adjusted periodically in response to changes in the productivity of the land.

In the North-West Provinces and Panjab, the

[3] Some measures for protecting the rights of tenants and subproprietors were introduced in later years.

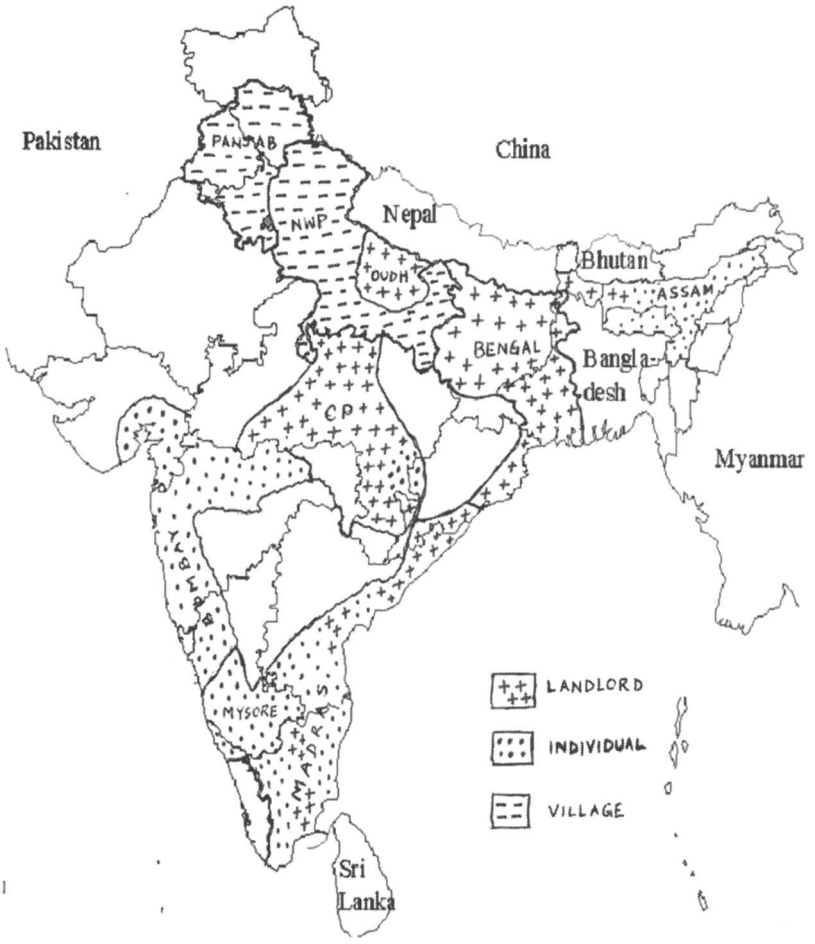

FIGURE 1. MAP OF INDIA

village-based (*mahalwari*) system was adopted in which village bodies which jointly owned the village were responsible for the land revenue. Village bodies could be in charge of varying areas, from part of a village to several villages. The composition of the village body also varied from place to place. In some areas it was a single person or family that made up the village body and hence was very much like the Bengal landlord system (*zamindari*), while in other areas the village body had a large number of members with each person being responsible for a fixed share of the revenue. This share was either determined by ancestry (the *pattidari* system), or based on actual possession of the land (the *bhaiachara* system), the latter being very much like the individual-based *raiyatwari* system. The revenue rates in these areas were determined on fairly ad hoc grounds, based on a diverse set of factors, including: "an examination of rents recorded in the *jamabandis,* the rates which were actually paid by the various classes of tenants and the rates which were considered fair on each class of soil. ... These estimates are based primarily on soils, and secondly on consideration of the caste of the tenant, capabilities of irrigation, command of manure &c, all of which points received attention" (F. W. Porter, 1878, p. 108).[4]

[4] Except in the areas under the Permanent Settlement, the amount of revenue actually paid was often less than the stated revenue liability, due to remissions being granted in

C. *Choice of Land Revenue System*

Why did the British choose different systems in different areas? It is broadly agreed that their major motivation was to ensure a large and steady source of revenue for the government, while maintaining a certain political equilibrium. It is also clear, however, that they often faced a lack of hard information and based their decision on a priori arguments. For instance, Sir Thomas Munro argued for the establishment of an individual cultivator system in Madras on the grounds that it would raise agricultural productivity by improving incentives; that the cultivators would be less subject to arbitrary expropriation than under a landlord; that they would have a measure of insurance (via government revenue remissions in bad times); that the government would be assured of its revenue (since small peasants are less able to resist paying their dues); and that this was the mode of land tenure prevailing in South India from ancient times. The Madras Board of Revenue, in its turn, used more or less the same arguments (in reverse, of course) for favoring landlords. Large landlords would have the capacity to invest more and therefore productivity would be higher; the peasants' long-term relationship with the landlord would result in less expropriation than the short-term one with a government official; a big landlord would provide insurance for small farmers; a steady revenue would be assured because the landlords would be wealthy and could make up an occasional shortfall from their own resources; and this was the mode of tenure prevailing from ancient times (Nilmani Mukherjee, 1962)! While the British often invoked history to justify the choices they made, they frequently misread history. For example, one reason they favored landlords in Bengal is because they found landlords in Bengal when they arrived. As has been pointed out by a number of scholars,[5] however, these landlords were really local chieftains and not the large farmers that the British had thought them to be.

Decisions were therefore often taken on the basis of some general principle, and the ideology of the individual decision maker and contemporary economic doctrines played an important role in combination with the exigencies of the moment. Table 2 of the Web Appendix provides details of how different land revenue systems came to be established in different provinces of British India. Here, we summarize the main channels of influence.

Influence of Individual Administrators.—The ideas and political influence of particular administrators sometimes determined land revenue systems in whole provinces. For instance, in the Madras land tenure debate cited above, the Board of Revenue initially prevailed over Sir Thomas Munro, and all the villages were put under village-level landlords with renewable leases. Munro, traveled to London, however, and managed to convince the Court of Directors of the East India Company of the merits of the individual-based *raiyatwari* system; they then ordered the Madras Board of Revenue to implement this policy all over the province after 1820, on the expiration of the landlord leases. Similarly, the individual system was tried out in Bombay Presidency quite early, mainly because the governor, Lord Elphinstone, was in favor of it and had been a supporter of Munro during the debate in Madras.

Another instance of individual influence occurred in the North-West Provinces. Landlord systems with short-term leases were implemented there initially, and there was considerable debate as to whether or not there should be a Permanent Settlement along the lines of that prevailing in Bengal. In 1819, however, Holt Mackenzie, the Secretary of the Board of Revenue, wrote a famous Minute, which claimed that historically every village had had a proprietary village body and felt that no settlement that did not give proper recognition to such customary rights should be declared in perpetuity. This became the basis for Regulation VII of 1822, which laid the basis for village-level settlements (B. R. Misra, 1942). The previous actions, however, could not always be undone and in several places the previously appointed large landlords (*talukdars*) retained their positions.[6]

times of bad harvests and other hardships. Our focus here is not on the actual revenue paid or the revenue rates, which prevailed at various points of time, but on the allocation of revenue and control rights in land.

[5] See Tirthankar Roy (2000) and Ratnalekha Ray (1979).

[6] For instance, the Aligarh settlement officer writes, "So far indeed had the action of our first officials sanctioned the

Political Events.—The most notable example of this occurred in Oudh province. This region was annexed by the British in 1856 and merged with the North-West Provinces to form the United Provinces (state of Uttar Pradesh today). Since the North-West Provinces had a village-based revenue system, it was proposed to extend the same to Oudh, and a cadastral survey that would form the basis of this settlement was under way when the mutiny broke out in 1857. After it was successfully subdued, the British felt that having the large landlords (*talukdars*) on their side would be politically advantageous. Thus, there was a reversal of policy and several landlords whose land had been taken away under the village-based settlement had the land given back to them, and in 1859 they were declared to have a permanent, hereditary, and transferable proprietary right. Districts that used to be a part of Oudh thus came to have a larger area under landlord control than the other districts of Uttar Pradesh.

Date of Conquest.—There are at least three reasons why areas that came under British revenue administration at later dates were in general more likely to have non-landlord systems. First, areas conquered later had some non-landlord precedents to follow and these made it easier to make the case for the non-landlord system. For instance, Berar was put under an individual-based system because neighboring Bombay had been; and similarly Panjab adopted the village-based system already in place in the North-West Provinces. In fact, once Munro's victory over the Board of Revenue in Madras was sealed by a widespread conversion of landlord areas into *raiyatwari* areas, and Holt Mackenzie had succeeded in making the case for village bodies, there were to be no new landlord areas until the reversal in Oudh. Second, landlord-based systems required much less administrative machinery to be set up by the British, and so areas conquered in the early periods of British rule were likely to have landlord-based systems. Once a landlord-based system was established, however, it was costly to change the system (this was most obviously true where there was a Permanent Settlement) and hence the landlord system survived. Finally, the increasing popularity of dealing directly with the peasant mirrored shifts in the views of economists and others in Britain. In the 1790s, under the shadow of the French Revolution across the Channel, the British elites were inclined to side with the landlords. In the 1820s, with peasant power long defeated and half forgotten, they were more inclined to be sympathetic to the utilitarians and others who were arguing for dealing directly with peasants.[7,8]

Presence of a Landlord Class before the British Took Over.—This was probably one of the factors leading to the landlord system being favored, at least in Bengal. As the historian Tapan Ray Chaudhuri says, "... in terms of rights and obligations, there was a clear line of continuity in the *zamindari* system of Bengal between the pre- and the post-Permanent Settlement era" (Dharma Kumar, 1982). This was not, however, always the case. For instance, it was decided to have a landlord-based system in the Central Provinces, even though there was no existing landlord class.[9]

D. *Post-Independence Developments in Land Policy*

Under the constitution of independent India, states were granted the power to enact land reforms. Several states passed legislation in the early 1950s, formally abolishing landlords and other intermediaries between the government and the cultivator. Other laws have also been passed by different states at different times regarding tenancy reform, ceiling on land holdings, and land consolidation measures. Besley and Burgess (2000) provide a good review of

usurpations of the Talukdars, that among other cases they granted to Raja Bhagwant Singh a lease for life of the whole of the pargana Mursan for Rs.80,000 leaving the old communities entirely at his mercy ..." (W. H. Smith, 1882).

[7] James Mill actually worked for the East India Company, and George Wingate, who helped set up the individual-cultivator system in Bombay, was heavily influenced by him.

[8] For a discussion of the role of ideology and economic doctrines in the formation of the land revenue systems, see Ranajit Guha (1963) and Eric Stokes (1959, 1978a).

[9] B. H. Baden-Powell (1892) states: "In the Central Provinces we find an almost wholly artificial tenure, created by our revenue-system and by the policy of the Government of the day."

these laws and their impact on state-level poverty rates.

II. Why Should the Historical Land System Matter?

Why would we expect productivity and investment (including public investment in infrastructure) to differ between areas having a greater or lesser extent of landlord control? Why would these differences persist and not be wiped out as soon as the landlord class is formally abolished? In this section, we list some potential answers to these questions, postponing to Section VI any discussion of the empirical plausibility of these answers.

A. *Differences in the Distribution of Wealth*

Under landlord-based systems, the landlords were given a more or less free hand to set the terms for the tenants[10] and, as a result, they were in a position to appropriate most of the gains in productivity. Moreover, landlord areas were also the only areas subject to the Permanent Settlement of 1793 (which fixed the landlord's dues permanently in nominal terms), and even where the settlement was not permanent, the political power of the landlord class made it less likely that their rates would be raised when their surplus grew. As the nineteenth century was a period of significant productivity growth and inflation, the landlord class grew rich over this period and inequality went up. By contrast, in the individual cultivator areas, rents were raised frequently by the British in an attempt to extract as much as possible from the tenant. There was, as a result, comparatively little differentiation within the rural population of these areas until, in the latter years of the nineteenth century, the focus of the British moved away from extracting as much as they could from the peasants. At this point, there was indeed increasing differentiation within the peasant class, but overall one would expect less inequality in the non-landlord areas.

In fact, this is what the limited historical data we have suggest. The provinces with a higher non-landlord proportion have lower Gini measures of land inequality in 1885 (Figure 2A). Further, the differences in inequality persist until the end of the colonial period. In 1948, the districts of Uttar Pradesh that had a higher landlord proportion had a much higher proportion of land revenue being paid by very large landlords and a correspondingly higher measure of inequality (Figure 2B).

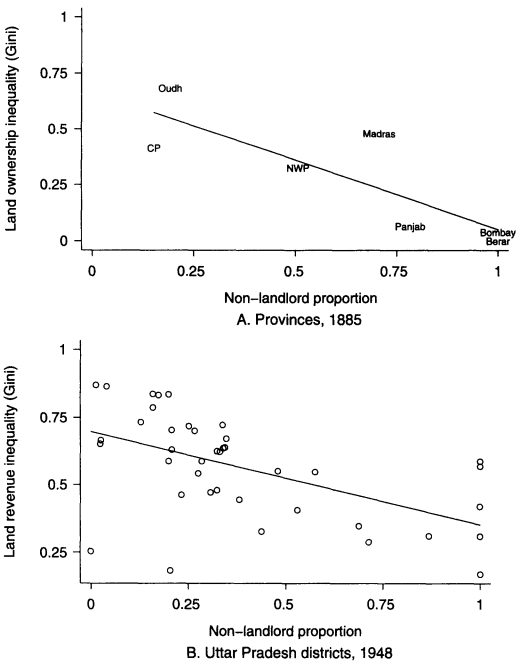

FIGURE 2. LAND TENURE AND LAND INEQUALITY

The distribution of wealth is important for three reasons: first, because it determines the size of the group within the peasantry that has enough land and other wealth to be able to make the many somewhat lumpy and/or risky investments necessary to raise productivity;[11] second, because it affects the balance between those who cultivate mainly their own land and those who cultivate other people's land (as is well-known, cultivating other people's land generates incentive problems, which reduces investment and productivity); finally, because it made it likely that the political interests of the rural masses would diverge substantially from that of the elite. In particular, it made it very

[10] Under the *Haftam* regulation of 1799 and the *Panjam* regulation of 1812.

[11] See Banerjee and Andrew F. Newman (1993) and Oded Galor and Joseph Zeira (1993) for theoretical models of the link between income distribution and long-run development.

tempting for the peasants to support political programs that advocate expropriating the assets of the rich. To the extent that the differences in the land distribution still persist, this would be one mechanism through which historical differences in the land tenure system could continue to affect productivity today.

B. *Differences in the Political Environment*

The right to set the land revenue rates and to penalize those who did not pay gave the landlords a substantial degree of political power over the rest of the population in their domain. One possible consequence of this may be that peasant property was relatively insecure in the landlord areas. Investments that made the land more productive were discouraged because of the risk of expropriation by the landlord. In contrast, in the *raiyatwari* areas, the proprietary rights of peasants were based on an explicit, typically written, contract with the colonial state, which the colonial state was broadly committed to honor. This may have resulted in better incentives for the peasants in the non-landlord areas in the colonial period.

The exercise of this type of more or less arbitrary power by the landlord over the property and not, infrequently, the body of the peasant, created a political ethos of class-based resentment in these areas, which persisted well into the post-independence period.[12] Those familiar with post-independence India will recognize, for example, that the areas most associated with Maoist peasant uprisings (known as "Naxalite" movements)—clearly the most extreme form of the politics of class conflict in India—are West Bengal, Bihar, and the Srikakulam district of Andhra Pradesh, all landlord areas. Paul R. Brass (1994, pp. 326–27) argues explicitly that these peasant movements had their roots in the history of exploitation and oppression of peasants by landlords. Moreover, these class-based conflicts go back to the colonial period. Kathleen Gough (1974) studies 77 peasant struggles from the end of the Mughal era until today and suggests that at least a third of these originated in Bengal, the oldest and best established of the landlord areas. Along the same lines, Partha Chatterjee (1984) has argued, based on the pattern of voting on the Tenancy Act Amendment in the Bengal Legislative Council in 1928, that the representatives of the peasants voted largely in a block against the landlords, and vice versa.

Given this history, it is no surprise that the elites and the masses in these areas rarely shared the trust that is essential for being able to act together in the collective interest.[13] It is quite plausible that, in the post-independence period, the political energies of the masses were directed more toward expropriating from the rich (via land reforms, for example) than toward trying to get more public goods (schools, tap water, electricity) from the state, while the political energies of the rich were aimed at trying to ensure that the poor did not get their way.[14] Moreover, it was not uncommon for the rural elites in the landlord areas to be quite disassociated from the actual business of agriculture, since they typically were more likely to be rent collectors than farmers, and even the rent collection rights were often leased out. This would tend to weaken the political pressure on the state to deliver public goods that were important to farmers. Moreover, they were often physically absent, preferring to live in the city and simply collect their rents, and as a result had only rather limited stakes in improving the living conditions in rural areas.

C. *Differences in the Relationship with the Colonial State*

Since it was easier for the colonial government to raise rents in non-landlord areas, it meant that the state could capture some of the productivity gains from these areas, and hence had more reason to invest in irrigation, railways, schools, and other infrastructure in these areas during the colonial period.[15] In this context, we

[12] See Sugato Bose (1993) for an account of the rise of class-based agrarian politics in colonial Bengal (a landlord area) and its subsequent influence on the politics of independent West Bengal.

[13] See Alberto Alesina and Dani Rodrik (1994) and Torsten Persson and Guido Tabellini (1994) for models where collective action fails in the presence of groups with misaligned interests.

[14] For instance, the rich could undercut democratic processes and resist public policies that would empower the poor, very much along the lines taken by the Latin American elites (see Engerman and Sokoloff, 2002).

[15] Amiya K. Bagchi (1976) also makes this point.

should note that almost all canals constructed by the British were in non-landlord areas. If, indeed, these areas had better public goods when the British left, it is plausible that they could continue to have some advantage even now.

III. Data

We use a combination of historical and recent data for our analysis. All data are at the district level, a district in India being an administrative unit within a state. In 1991, India had 415 districts in 17 major states, a district on average having an area of 7,500 square kilometers and a population of 1.5 million.

We chose to use district-level rather than state-level data for three major reasons. First, modern Indian state boundaries are completely different from older British province boundaries due to the linguistic reorganization of states in 1956. Although district boundaries have also changed a little over time, it is still possible unambiguously to match current districts to older districts—the main source of change is that some of the older districts have been split into two or more districts over time. Second, because of the integration of several princely states in 1947, nearly all the states in our data are composed of both British-ruled districts and districts that were ruled by Indian kings in the colonial period. Since we have historical data on land tenure only for British districts, it is hard to compute a good state-level measure of historical institutions. Third, using district-level data gives us a larger sample size. The drawback is that we are limited in the kind of data that we can get. For instance, we do not have measures of GDP or average income per capita at the district level. We will thus be using other correlates or proxies of economic prosperity for which we have data at the district level: agricultural investment outcomes (the proportion of irrigated gross cropped area, quantity of fertilizer used per hectare of gross cropped area, and the proportion of area sown with high-yielding varieties (HYV) of rice, wheat, and other cereals); agricultural productivity (crop yields); and the stock of health and education infrastructure (schools and health centers).

The district-level data on agricultural investments and productivity come from the India Agriculture and Climate Data Set assembled by the World Bank and cover the period 1956–1987. This dataset has information on 271 districts in 13 major states.[16] All data are at the 1961 district level, aggregating over subsequent splits in districts. We also have data for health and education infrastructure from the 1981 Census. We matched each modern district to an older British district using old and new maps, and retained only the districts where the land tenure system was established by the British, because we do not have detailed information on the land systems in districts that were under native princes or tribal chiefs.[17] For each district of British India,[18] we then proceed to compute a measure of non-landlord control in the colonial period as follows: for many areas (the states of Andhra Pradesh, Madhya Pradesh, Panjab, Tamil Nadu, and Uttar Pradesh), we have district-level information on the proportion of villages, estates, or land area, not under the revenue liability of landlords; for other areas where we do not have the exact proportion (Bihar, Karnataka, Maharashtra, Orissa, West Bengal), we assign the non-landlord measure as being either zero or one, depending on the dominant land revenue system. In all cases, the measure of non-landlord control is computed based on data from the 1870s or 1880s. The details of the data sources and the construction of this variable are in Table 3 of the Web Appendix.

IV. Empirical Approach

We will compare agricultural investments and productivity between landlord and non-landlord areas by running regressions of the form

[16] The states included in the dataset are Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. Assam, Himachal Pradesh, Jammu and Kashmir, and Kerala are the large states not covered.

[17] This usually corresponds to the areas under direct British administrative control, with one exception. In the princely state of Mysore (part of modern Karnataka state), the British took over the administration in 1831 and ruled for 50 years, before reinstating the royal family in 1881. During this time, the British instituted an individual-based land revenue system, which the ruler was obliged to continue after his reinstatement.

[18] We dropped districts currently in Pakistan and Bangladesh.

$$(1) \quad y_{it} = constant + \alpha_t + \beta \mathrm{NL}_i + X_{it}\gamma + \varepsilon_{it}$$

where y_{it} is our outcome variable of interest (investment, productivity, etc.) in district i and year t, α_t is a year-fixed effect, NL_i is the historical measure of the non-landlord control in district i, and X_{it} are other control variables. Our coefficient of interest is β, which captures the average difference between a non-landlord district and a landlord district in the post-independence period.

In all our regressions, we control for such geographic variables as latitude, altitude, soil type, mean annual rainfall, and a dummy for whether the district is on the coast or not. In addition, we also control for the length of time under British rule (or, equivalently, the date of British conquest), which may have independent effects, because early British rule was particularly rapacious or because the best (or the worst) districts fell to the British first. Note that we do not include district fixed effects in this regression, since NL_i is fixed for district i over time (it is the historical land arrangement). We do adjust our standard errors for within-district correlation, however, since our data consist of repeated observations for each district over time. We also do not use state fixed effects in our base specification because the within-state variation in non-landlord proportion is much less than the cross-state variation.[19] More importantly, the modern states were formed at a later date than our non-landlord proportion and we would like to see how far historical factors can account for the widely varied performance of Indian states in the post-independence period.

As mentioned in the introduction, we will try to deal with concerns about exogeneity, first by looking only at the difference between neighboring districts, and second by adopting an instrumental variables approach. After establishing the robustness of the differences in investment and productivity between landlord and non-landlord areas, we estimate some additional specifications. First we reestimate the yield equations after controlling for various measures of investment in agriculture (fertilizer use, irrigation, etc.) to check whether there is a non-landlord effect over and above the effect on investment. Then we allow the non-landlord coefficient to vary over time to see whether we can demonstrate how the gap between landlord and non-landlord areas has evolved over time.

[19] In our later regressions with state fixed effects, we are in effect dropping the states of Bihar, Gujarat, Karnataka, Rajasthan, and West Bengal.

V. The Impact on Agricultural Outcomes

A. *Differences in Geography and Other Differences*

There are significant geographical differences between landlord areas and non-landlord areas (Table 2). Landlord areas have somewhat lower altitudes, higher rainfall, and fewer areas with black soil as compared to non-landlord areas. In particular, we note that landlord areas have a greater depth of topsoil, which together with the greater rainfall and lower altitudes seems to indicate that these areas might be inherently more fertile and productive. Landlord areas have a slightly higher total population and a significantly higher population density than non-landlord areas. This is consistent with the fact they seem to be more fertile areas. They have a greater proportion of minorities, such as castes that were discriminated against historically and are formally listed as "Scheduled Castes" in the Indian Constitution, and more people living in rural areas. Further, landlord areas have a greater proportion of the workforce engaged in farming, and devote more area to food crops like rice and wheat and less to cash crops like cotton, oilseeds, tobacco, and sugarcane. This could be due simply to different climatic conditions or could reflect an endogenous shift toward commercial agriculture in non-landlord areas.

We have very limited historical data on yields. Looking at data for rice yields in ten districts of Madras Presidency, and rice and wheat yields for 17 districts of Uttar Pradesh during the colonial period, we see in Figure 3 that yields were in fact *lower* in non-landlord areas during this period.[20] Given the size of the sample, we cannot hope to control for geographical differences between the districts. These yield differences may therefore reflect differences in geography. The only point we are

[20] The yield data for Uttar Pradesh come from the same settlement reports of the 1870s and 1880s that we use to calculate our non-landlord proportion. Very few of the reports contain data on yields, resulting in a very small sample. We also have data for ten Tamil Nadu districts from Haruka Yanagisawa (1996).

TABLE 2—DIFFERENCES IN GEOGRAPHY AND DEMOGRAPHICS

		Mean	Standard deviation	Difference[a]	Standard error of difference
Geography					
Latitude		22.19	5.60	−4.35***	(0.961)
Altitude		366.41	148.14	93.64***	(25.98)
Mean annual rainfall (mm)		1263.09	471.64	373.99***	(80.83)
Coastal dummy		0.1497	0.3579	0.084	(0.065)
Top 2 soil types	Black soil	0.2096	0.4082	0.244***	(0.072)
	Alluvial soil	0.1677	0.3747	−0.135**	(0.067)
	Red soil	0.5689	0.4967	0.075	(0.090)
Top-soil depth	<25 cm	0.0181	0.1336	0.016	(0.024)
	25–50 cm	0.1145	0.3193	−0.076	(0.058)
	50–100 cm	0.2289	0.4214	0.193	(0.075)
	100–300 cm	0.0904	0.2876	0.135***	(0.051)
	>300 cm	0.5482	0.4991	−0.268***	(0.088)
Area share of various crops: 1956–1987					
Area share of rice		0.366	0.298	−0.194***	(0.054)
Area share of wheat		0.149	0.157	−0.058**	(0.026)
Area share of other cereals		0.205	0.172	0.128***	(0.031)
Area share of oilseeds		0.067	0.088	0.065***	(0.013)
Area share of cotton		0.041	0.096	0.066***	(0.018)
Area share of tobacco		0.003	0.015	0.005**	(0.002)
Area share of sugarcane		0.031	0.053	0.005	(0.008)
Cash crops-to-cereals ratio		0.149	0.257	0.152***	(0.048)
Demographics: 1961, 1971, 1981, 1991					
Log (Population)		14.26	0.634	−0.088	(0.109)
Population density		36.44	85.92	−11.22**	(4.02)
Proportion of scheduled castes		0.1598	0.0733	−0.034**	(0.014)
Proportion of scheduled tribes		0.0980	0.1630	−0.010	(0.031)
Proportion rural		0.8102	0.1237	−0.066***	(0.023)
Proportion of working population in farming		0.7119	0.1352	−0.050*	(0.027)

Notes: Standard errors in parentheses, corrected for district-level clustering. * Significant at 10-percent level; ** significant at 5-percent level; *** significant at 1-percent level. For the area under different crops and demographics, the difference is calculated after controlling for year fixed effects.

[a] Difference represents the average difference between non-landlord and landlord districts, computed as the regression coefficient on the non-landlord proportion.

making here is that the landlord districts did not start with a disadvantage.

B. *Differences in Agricultural Investments and Productivity*

We mainly investigate investment and productivity differences in the 1956–1985 period. Table 3 documents large and significant differences in measures of agricultural investments and productivity between landlord and non-landlord areas in the post-independence period. Each entry in this table represents the regression coefficient from a regression of the dependent variable on the non-landlord proportion, controlling for year fixed effects, geographical variables (latitude, altitude, mean annual rainfall, and soil types), length of British rule, and within-district clustering of errors. We show the detailed regression specification for one of the dependent variables (log agricultural yield) in Table 4 in the Web Appendix, listing the coefficients on all our control variables. Our base specification in column (1) shows that non-landlord districts have a 24-percent-higher proportion of irrigated area and 43-percent-higher levels of fertilizer use. They have a 27-percent-higher proportion of rice area and 18 percent more wheat area under high-yielding varieties.

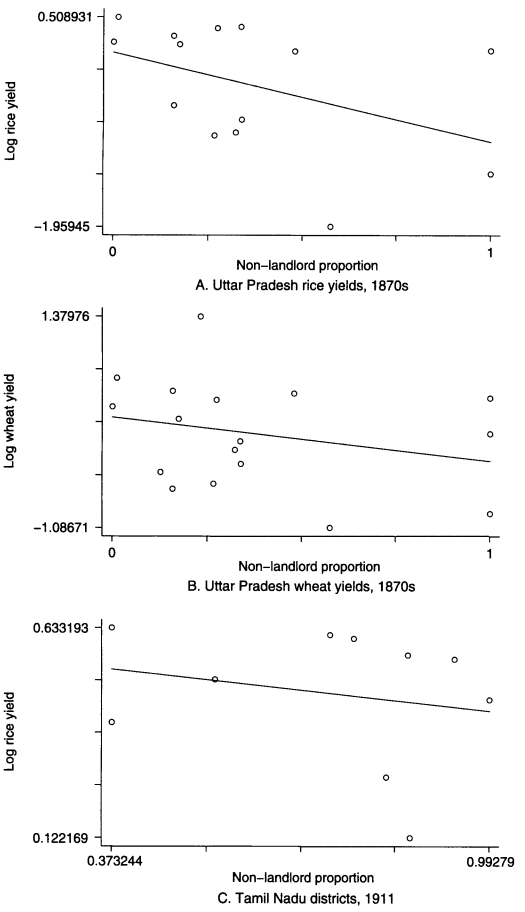

FIGURE 3. AGRICULTURAL YIELDS IN COLONIAL PERIOD

Overall agricultural yields are 16 percent higher, rice yields are 17 percent higher, and wheat yields are 23 percent higher. Further, column 2 shows that these differences are slightly bigger if we exclude the states of West Bengal and Bihar, the two states that have the highest proportion of landlord districts and the first to be conquered by the British. (We wanted to be sure that something idiosyncratic about these states was not driving our results.)

It is worth noting that these differences are driven neither by substitution away from agriculture in landlord districts nor by a greater shift toward crops other than rice or wheat. As we see in Table 2, landlord areas have a higher proportion of their working population engaged in farming, and they also devote a lower proportion of area to growing cash crops.

C. *Results Using Binary Measures of Non-Landlord Control*

Our results are robust to using a binary landlord/non-landlord classification rather than the continuous measure. We construct this classification as follows: a district is classified as "landlord" if it was under a landlord-based system, if it was under a landlord-based system and only partly converted to a different system (several districts of Madras), or if it was in Oudh, which we have argued had a higher proportion of landlords due to the reversal of policy after 1856. All other individual-based or village-based systems are classified as "non-landlord." Column 3 shows that our results are relatively robust to using a binary classification. A few coefficients are no longer significant here, probably because we are deliberately mismeasuring our regressor—some of the "non-landlord" districts in our binary classification nevertheless have large areas under landlords.[21] We also compute results using a more restricted sample: since we might not be fully sure of the classification of village-based districts, we exclude them and do a comparison of only landlord districts with individual-based districts. Some of the coefficients in this specification are larger than our base specification (column 4). This is probably because when we leave out the village-based districts, we are comparing almost wholly landlord areas with the other extreme, the individual-cultivator areas.

D. *Results Using Neighboring Districts*

Obviously, our interpretation of these results has to be tempered by the possibility that the non-landlord gap might reflect omitted variables. One strategy to control for possible omitted variables is to consider an extremely restricted sample: we consider only those districts that happen to be geographical neighbors (i.e., share a common border), but that

[21] In this classification, the "landlord" districts have at most 40 percent of land under non-landlord control, while some of our so-called "non-landlord" districts in fact have less than 20 percent of their land under non-landlord control. We have also tried an alternative specification where the binary variable takes the value one if the non-landlord proportion is greater than 0.5, and zero otherwise. Our results are robust to this specification as well (results not shown).

TABLE 3—DIFFERENCES IN AGRICULTURAL INVESTMENTS AND YIELDS
(*Mean non-landlord proportion = 0.5051 (s.d. = 0.4274)*)

Dependent variable	Mean of dependent variable	Coefficient on non-landlord proportion: OLS Full sample (1)	Coefficient on non-landlord proportion: OLS Excluding Bengal and Bihar (2)	Coefficient on non-landlord dummy: OLS Full sample (3)	Coefficient on non-landlord dummy: OLS Excluding village-based districts (4)
Agricultural investments					
Proportion of gross cropped area irrigated	0.276	0.065*	0.066*	0.077***	0.005
		(0.034)	(0.035)	(0.027)	(0.032)
Fertilizer use (kg/ha)	24.64	10.708***	10.992***	9.988***	10.695***
		(3.345)	(3.406)	(2.301)	(3.040)
Proportion of rice area under HYV	0.298	0.079*	0.094**	0.016	0.074*
		(0.044)	(0.043)	(0.032)	(0.038)
Proportion of wheat area under HYV	0.518	0.092**	0.119***	0.031	0.107**
		(0.046)	(0.045)	(0.036)	(0.052)
Proportion of other cereals area under HYV	0.196	0.057*	0.084***	−0.035	0.109***
		(0.031)	(0.024)	(0.025)	(0.041)
Agricultural productivity					
log (yield of 15 major crops)		0.157**	0.152**	0.173***	0.089
		(0.071)	(0.074)	(0.053)	(0.085)
log (rice yield)		0.171**	0.195**	0.099	0.173**
		(0.081)	(0.081)	(0.062)	(0.079)
log (wheat yield)		0.229***	0.228***	0.188***	0.143
		(0.067)	(0.070)	(0.054)	(0.098)
No. of districts		166	143	166	109
Year fixed effects		YES	YES	YES	YES
Geographic controls		YES	YES	YES	YES
Date of British land revenue control		YES	YES	YES	YES

Notes: Standard errors in parentheses, corrected for district-level clustering. * Significant at 10-percent level; ** significant at 5-percent level; *** significant at 1-percent level. Each cell represents the coefficient from a regression of the dependent variable on the measure of non-landlord control. Data are from 1956 to 1987. Data for area under high-yielding varieties (HYV) is after 1965. Geographic controls are altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The non-landlord dummy is assigned as follows: the dummy equals one for all individual-based districts and all village-based districts except those in Oudh. For landlord-based districts and the village-based districts of Oudh, the dummy is zero.

happened to have different historical land systems. (These districts and the historical reasons for their land system differences are listed in Table 5 of the Web Appendix.) We expect that there would be fewer differences in omitted variables, if any, in this sample of geographic neighbors than in our overall sample, and we verify that there are no significant differences in our observed geographic and demographic variables between these districts (results available upon request).

Even when we restrict our sample to this small set of 35 geographically neighboring districts, we still see large and significant differences between landlord and non-landlord districts in agricultural investments and outcomes (Table 4, panel A, column 1). In particular, total yields are 15 percent higher and wheat yields 25 percent higher in non-landlord areas than in landlord areas. These estimates are very close to the estimates in our base specification. The differences in fertilizer use and HYV adoption for wheat are also fairly close to the magnitudes obtained in our base specification. These results serve to confirm that our original results were not caused primarily by some unobserved district characteristics.

E. *Results Using Instrumental Variables*

As discussed above, our results might also be biased if the British decision regarding which land tenure system to adopt depended on other characteristics of the area in systematic ways. We would like to highlight a few facts in this

TABLE 4—ROBUSTNESS OF OLS RESULTS

Panel A: Robustness checks

	Coefficient on non-landlord proportion	
Dependent variable	OLS Neighbors only (1)	IV Full sample (2)
Agricultural investments		
Proportion of gross cropped area irrigated	0.101**	0.216
	(0.041)	(0.137)
Fertilizer use (kg/ha)	10.589**	26.198**
	(4.979)	(13.244)
Proportion of rice area under HYV	−0.015	0.411**
	(0.083)	(0.163)
Proportion of wheat area under HYV	0.078**	0.584***
	(0.034)	(0.163)
Proportion of other cereals area under HYV	−0.025	0.526***
	(0.024)	(0.129)
Agricultural productivity		
log (yield of 15 major crops)	0.145**	0.409
	(0.061)	(0.261)
log (rice yield)	0.126	0.554*
	(0.098)	(0.285)
log (wheat yield)	0.253***	0.706***
	(0.084)	(0.214)
No. of districts	35	166
Year fixed effects	YES	YES
Geographic controls	YES	YES
Date of British land revenue control	YES	YES

Panel B: First-stage regressions for IV
Dependent variable: Non-landlord proportion

Coefficient on	(1)	(2)	(3)
Instrument (=1 if date of British revenue control is between 1820 and 1856)	0.331***	0.430***	0.419***
	(0.086)	(0.092)	(0.087)
R-squared	0.40	0.43	0.63
No. of observations	166	166	166
Geographic controls	YES	YES	YES
Date of British land revenue control	YES	YES	YES
Date of British land revenue control squared	NO	YES	NO
State fixed effects	NO	NO	YES

Notes: Standard errors in parentheses, corrected for district-level clustering. * Significant at 10-percent level; ** significant at 5-percent level; *** significant at 1-percent level. Each cell in Panel A represents the coefficient from a regression of the dependent variable on the non-landlord proportion. Data are from 1956–1987. Data for area under high-yielding varieties (HYV) is after 1965. Geographic controls are altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. Instrument is a dummy that equals one if the date of British revenue control is after 1820 and before 1856.

regard. First, we do not expect the choice of land tenure system to be very highly correlated with local district characteristics, since the choice of land tenure system was made for large contiguous areas at the same time and was often based on very little information regarding local conditions. Second, as explained in Section I C, places that were conquered earlier tended to have landlord-based systems. If British annexation policy was selectively directed toward the more productive places,[22] then landlord-controlled areas are likely to be inherently more productive. Third, *zamindari* areas were usually highly fertile areas which created enough rent to support a landlord-tenant-laborer hierarchy (Roy, 2000). In some areas, where landlord

[22] See Iyer (2005) for some evidence in support of this hypothesis.

defaults were excessive, these were later changed to different forms of settlement. Therefore, areas that ended up with non-landlord systems are more likely to be inherently less productive, or at least were less productive in colonial times. Another way to deal with this potential problem of omitted variables is to use an instrumental variables strategy. This has the additional advantage of helping us deal with the problem of measurement error in our non-landlord proportion variable, caused by district boundary changes and the fact that the historical record tends to be impressionistic (in any case, reflects the impression of one observer at one point of time).

Our instrumental variables strategy is based on the observation, mentioned in Section I, that areas that came under British revenue administration after 1820 have predominantly non-landlord systems, except for the policy reversal which occurred in Oudh (taken over in 1856) after the revolt of 1857. We believe that the source of this variation is in part due to the success of Munro and Mackenzie in establishing non-landlord systems in Madras and the North-West Provinces (starting around 1820), which created the all-important precedents that were followed in the districts conquered after 1820, as well as a broader shift in ideology in England. Therefore, the fact that areas conquered between 1820 and 1856 got non-landlord systems does not depend on the characteristics of the district, and a dummy for the date of conquest being between 1820 and 1856 is a valid instrument for the non-landlord proportion, especially after we control for the date of British conquest to take into account any direct effects of a longer period of British rule.[23]

Figure 4 demonstrates the basis for our instrumental variable strategy. In this figure, we plot the kernel regression of the non-landlord proportion and the mean log agricultural yield against the date of conquest. It is clear that there is a good fit in the shape of the two graphs and that both curves are highly nonlinear. Therefore, the co-movement in the two graphs is not driven by the fact that both are trending up or down, making it less likely that the relation between the two reflects the direct effect of the date of conquest. The figure also demonstrates that the non-landlord proportion is significantly higher for areas conquered between 1820 and 1856 compared to areas conquered earlier or later. This is exactly what we would have expected given the discussion above.[24] Panel B in Table 4 shows the first-stage coefficients of our IV strategy; we should note that the first-stage relationship remains significant even when we include a quadratic control for the length of British rule, as well as when we include state fixed effects.

Our IV results confirm that non-landlord systems indeed have a large and significant impact on current outcomes (Table 4, panel A, column 2). In fact, all the IV coefficients are larger than their OLS counterparts, although the difference between the two estimates is not statistically significant.[25] The standard errors for the IV estimates are also larger than the OLS standard errors, but the non-landlord effect remains statistically significant in the case of HYV adoption, as well as in fertilizer usage and wheat yields. Rice yields are significantly greater at the 10-percent level. Specifications involving a quadratic control for the length of British rule typically give coefficients that are smaller in magnitude, but generally of the same level of significance (results not shown).

The fact that the IV results are larger than the OLS results suggests that the OLS results are biased downward. This is the direction of bias we would have expected, given our discussion above, especially the fact that landlord areas, which were not productive enough to sustain a landlord class, tended to become non-landlord. It is also the direction of bias suggested by the presence of classical measurement error. Since our non-landlord variable is limited to being between 0 and

[23] By "date of conquest," we mean the date when the district came under British land revenue administration. The two dates are usually the same, with two exceptions. The first is the kingdom of Mysore, which was under British administration for the period when the land revenue systems were put in place, but was never part of the British Empire. The second is the kingdom of Nagpur, which was formally annexed in 1854, but had been under British revenue control in 1818.

[24] The other "hump" (or mode) on the left is mainly due to the districts of Madras Presidency, which were conquered fairly early, but which switched over to a non-landlord system after 1820.

[25] A Hausman test does not reject the null hypothesis that the OLS and IV coefficients are equal.

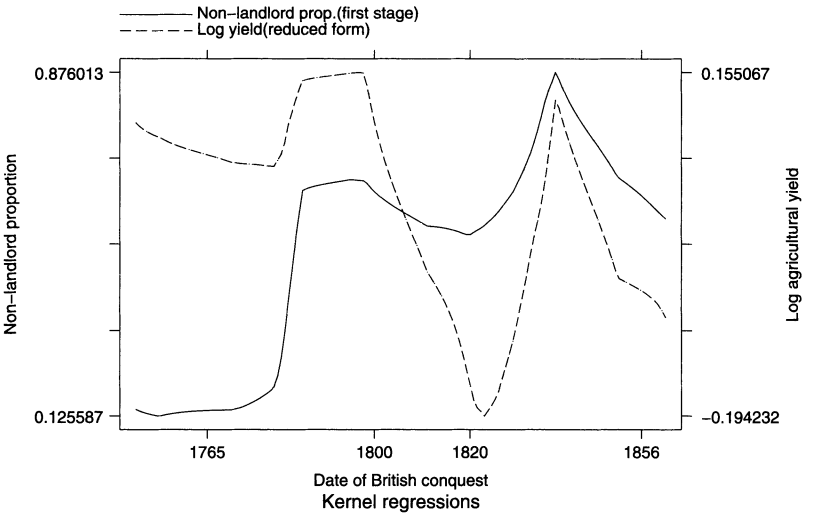

FIGURE 4. INSTRUMENTAL VARIABLES STRATEGY

1, however, we have nonclassical measurement error. Even then, for the special case of a binary regressor and no covariates, (nonclassical) measurement error will still bias the OLS coefficient downward, but will also bias the IV coefficient upward (Kane et al., 1999). For this special case, we verify that measurement error is not the only source of the difference between the OLS and IV estimates.[26]

Our IV results, together with the results on neighboring districts and the historical data, lead us to conclude that our OLS results are not biased upward due to omitted district characteristics. Because of the possibility of upward bias in the IV estimates, however, we will continue to treat the OLS results as benchmark estimates of the difference between landlord and non-landlord districts.

[26] We run the regressions with the binary regressor (defined in Section V C) and no covariates. If there were only measurement error, the OLS would be biased downward, the IV would be biased upward but have the same sign as the OLS coefficient, and the ratio of the two would be the same for all the outcome variables. We find that, of the eight outcome variables, the IV coefficient is larger than the OLS for five, the IV is smaller in magnitude than the OLS for one, and for the remaining two outcomes, the OLS coefficient is negative while the IV is positive. This suggests that measurement error is not the only problem.

F. *Does Land Tenure Have an Independent Effect on Productivity?*

We have established large and robust differences between landlord and non-landlord districts in terms of agricultural investments and productivity, with the non-landlord districts showing better performance in all of these measures. In Table 5, we argue that the differences in productivity are due largely to differences in investments. We do this by regressing productivity measures on the proportion of non-landlord control, as well as on the measures of investment. All the measures of investment (irrigation, fertilizer use, and adoption of HYV) are positive and strongly significant, as we would expect. The addition of these measures reduces the coefficient on the non-landlord proportion by 78 percent for total yields, 59 percent for rice yields, and 52 percent for wheat yields. The non-landlord variable is also no longer statistically significant.

G. *When Do the Differences Arise?*

As shown before, non-landlord districts were not more productive than landlord-based districts in the colonial period. Figure 5 indicates that the differences in investments (irrigation, fertilizer) and yields widen in the mid-1960s. Table 6 (panel A) formally estab-

TABLE 5—ARE YIELDS EXPLAINED BY INVESTMENTS?

	Dependent variables		
	Log total yield OLS (1)	Log rice yield OLS (2)	Log wheat yield OLS (3)
Proportion non-landlord	0.035	0.070	0.109
	(0.053)	(0.063)	(0.063)
Proportion of gross cropped area irrigated	0.693**	0.439**	0.435**
	(0.112)	(0.096)	(0.117)
Fertilizer use (kg/ha)	0.007**	0.004**	0.001
	(0.001)	(0.001)	(0.001)
Percent area under HYV	4.274**	0.580**	0.618**
	(1.122)	(0.063)	(0.070)
Adjusted R-squared	0.60	0.52	0.56
No. of districts	166	166	166
Year fixed effects	YES	YES	YES
Geographic controls	YES	YES	YES
Date of British land revenue control	YES	YES	YES

Notes: Standard errors in parentheses, corrected for district-level clustering. * Significant at 10-percent level; ** significant at 5-percent level; *** significant at 1-percent level. Data are from 1956–1987. Data for area under high-yielding varieties (HYV) is after 1965. Geographic controls are altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions.

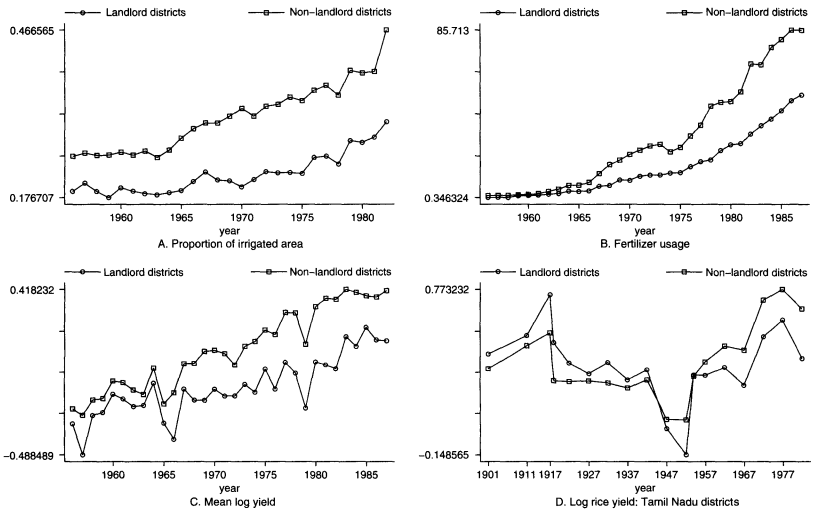

FIGURE 5. INVESTMENT AND PRODUCTIVITY TIME SERIES

lishes that the gap between landlord and non-landlord areas is larger after 1965 than in the 1956–1965 period. We also have data on rice yields for a limited sample of ten districts of Tamil Nadu from the colonial period onward. Figure 5D indicates that the non-landlord areas overtake the landlord areas during the mid-1960s. Table 6 (panel B) also checks this formally by computing the gap in the pre-1965 and post-1965 period.

VI. Why do the Landlord Districts Fall Behind?

The period after 1965 saw the state in India becoming much more active in rural areas, through the Intensive Rural Development Programs, the efforts to disseminate new high-yielding varieties of crops (resulting in the "Green Revolution"), and the building of public infrastructure (including fertilizer delivery systems) in rural areas under the 1971

TABLE 6—WHEN DO THE DIFFERENCES APPEAR?

Panel A: Full sample

Dependent variable	Coefficient on non-landlord proportion: 1956–1965 (1)	Coefficient on non-landlord proportion: After 1965 (2)	Difference (3)
Agricultural investments			
Proportion of gross cropped area irrigated	0.046	0.079**	0.033**
	(0.033)	(0.036)	(0.016)
Fertilizer use (kg/ha)	1.026**	15.581***	14.55***
	(0.425)	(4.763)	(4.44)
Agricultural productivity			
log (yield of 15 major crops)	0.066	0.201***	0.135***
	(0.065)	(0.076)	(0.033)
log (rice yield)	0.108	0.196**	0.088**
	(0.069)	(0.089)	(0.044)
log (wheat yield)	0.146**	0.268***	0.122*
	(0.058)	(0.079)	(0.063)
No. of districts	166	166	166
Year fixed effects	YES	YES	YES
Geographic controls	YES	YES	YES
Date of British land revenue control	YES	YES	YES

Panel B: Rice yields for Tamil Nadu districts

Sample: 10 districts of Tamil Nadu. Data are for 1870, 1901, 1911, 1917, 1919, and five-yearly intervals from 1922 to 1982.

Dependent variable	Coefficient on non-landlord proportion: Before 1965	After 1965	Difference
Log rice yield	−0.099	0.415	0.514**
	(0.172)	(0.366)	(0.217)
No. of districts	10	10	10
Year fixed effects	YES	YES	YES

Notes: Standard errors in parentheses, corrected for district-level clustering. * Significant at 10-percent level; ** significant at 5-percent level; *** significant at 1-percent level. Data are from 1956–1987. Geographic controls are altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. Estimates in column (3) are computed from a regression of the dependent variable on the interaction of the non-landlord proportion and a dummy for year >1965, after controlling for the main effects of these variables, as well as geographic controls.

Garibi Hatao (poverty alleviation) program. As we have seen, the landlord areas were slower in the adoption of high-yielding varieties. They also seem to have benefited less from the growth in public investment in irrigation, though our numbers do not distinguish between public and private irrigation facilities. Why were landlord areas unable to take advantage of the new opportunities that presented themselves after the mid-1960s? We discussed some potential answers in Section II, and we assess their empirical relevance here.

Of the three alternative classes of explanations discussed earlier, the explanation based on differential investment by the colonial state is probably the least compelling, given that the major differences between the landlord and non-landlord areas arose after 1965 (Table 6). In principle, one could still argue that the advantage they got from these early public investments continues to help them in the post-independence period.[27] The fact that

[27] Tirthankar Roy (2002) makes the argument that the areas that gained from the Green Revolution were those that showed improvements during the colonial period as well.

the main source of the non-landlord advantage does not come from the *mahalwari* districts of northern India,[28] which were the main beneficiaries of the canal construction during the colonial period, makes it harder to believe that this is the source of the entire difference.

We noted in Section II that the landlord-controlled areas had higher levels of land inequality in the colonial period. It therefore comes as no surprise that the major landlord-dominated states enacted an average of 6.5 land reform measures in the period between 1957 and 1992, while non-landlord states had an average of 3.5.[29] Besley and Burgess (2000) report that states that enacted a larger number of land reforms had a somewhat greater decline in the Gini coefficient of land inequality. This does not mean that there has been complete convergence in the land distribution in the two areas. As late as 1990, 64 percent of all land holdings in landlord areas were classified as "marginal" (less than one hectare), which is about eight percentage points higher than the corresponding figure in non-landlord areas.[30] Further, 48 percent of all holdings are small to medium sized (one to ten hectares) in individual-based areas, but only 35 percent in landlord areas. There is no significant difference in the proportion of extremely large holdings, which is probably due to the impact of land ceiling laws passed after independence.

These differences in the land distribution, however, cannot explain our results. For instance, if we were to ascribe the entire difference of 16 percent in agricultural yields to the fact that there are more marginal holdings in landlord areas, on the grounds that these holdings are less productive because they underinvest, we would have to accept that the small holdings are only about 12 percent as productive as larger holdings, which seems implausibly low.[31] This also contradicts the evidence from developing countries, which suggests that small farms are, if anything, more productive than large farms (Binswanger and Rosenzweig, 1986). Further, our results do not change when we control directly for the Gini coefficient of land holdings in 1971 or the number of land reforms passed by the state. If we use consumption inequality as a better measure of wealth inequality, we find that landlord areas show significantly larger declines in consumption inequality between 1972 and 1987 than non-landlord areas (Table 6 in the Web Appendix). In fact, by 1987 the landlord districts show significantly lower consumption inequality.[32]

We therefore feel that the biggest piece of the story is probably the differences in the political environment. If the effect of the political environment operated mainly through the insecurity of peasant property in the landlord areas, however, we would have observed convergence rather than divergence after independence, since peasant property clearly became less insecure once the landlords lost their formal authority. This suggests that the important difference in the political environment probably has to do with the nature of collective action in the two areas. We find that in addition to placing a greater emphasis on land reform measures, states with a higher proportion of landlord areas spent less on development expenditure. Between 1960 and 1965, the landlord states spent 13 rupees per capita on development expenditure, compared to 19 rupees in the non-landlord states. This spending gap is higher in the post-

[28] Table 3, column 4, shows that leaving them out makes the non-landlord coefficient larger for some of the outcomes.

[29] Data on state-level land reforms comes from Besley and Burgess (2000). We classify Bihar, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, and West Bengal as "landlord" states, and Andhra Pradesh, Assam, Gujarat, Karnataka, Kerala, Maharashtra, Punjab, and Tamil Nadu as "non-landlord" states.

[30] The difference of eight percentage points is obtained by regressing the proportion of marginal (less than one hectare) holdings on the non-landlord proportion, after controlling for geographic variables.

[31] Suppose small farms are δ times as productive as large farms, z is the share of small farms and total productivity is simply the sum of large farm and small farm productivity. Then the percentage productivity difference between non-landlord and landlord areas equals $\{[(1-\delta)\Delta z]/[1-(1-\delta)z_{landlord}]\}$. Using productivity difference = 0.16, Δz = 0.08 and $z_{landlord} = 0.64$, we obtain $\delta \approx 0.12$.

[32] These measures are computed using household survey data from the National Sample Surveys (NSS). We should keep in mind that these data are not at the district level but at the NSS region level, usually consisting of three to ten districts. Our standard errors for these regressions are clustered at the NSS region level to take care of this aspect of our data.

1965 period, just when new technologies were appearing in the agricultural sector: landlord states spent 29 rupees per capita, while the non-landlord states spent a much higher 49 rupees per capita (Table 7 in the Appendix). This is not simply because of lack of resources: development expenditure as a proportion of state domestic product is also lower in the landlord states, and the difference in per capita spending persists even after controlling for state domestic product per capita (Appendix Table 7, column 3). Given that the difference in the number of land reforms is also mainly from the post-1965 period, one way to characterize the difference in the nature of public action is to say that landlord-dominated states were busy carrying out land reform exactly when the non-landlord states started focusing on development.

This difference in public spending turns out to be important in explaining our results. When we add development expenditure per capita as an explanatory variable in our base regressions, we find that it sharply reduces the magnitude of the non-landlord coefficient for the measures of HYV adoption (Table 7, column 2). The idea of state policy priorities as the major channel of influence is consistent with what we find when we estimate the investment and yield equations after including a fixed effect for each state. This reduces the estimated coefficient on the non-landlord share substantially (by 50 percent or so), though the signs are unaltered and several remain significant (Table 7, column 3).[33] The differences in state policies are also reflected in the substantial difference between landlord and non-landlord areas in the provision of educational and health facilities: landlord areas had 21 percent fewer villages (15 percentage points) equipped with primary schools, while the gap in middle school and high school availability are 61 percent and 63 percent, respectively. Given these differences in investments, it is not surprising that literacy rates are 5 percentage points higher in non-landlord areas, while infant mortality rates are 40 percent lower; both these differences are statistically significant (Table 7, panel D).[34] A large part of these differences can be attributed to the difference in state development expenditure (column 2).

Why are the political priorities so different in these two areas? As already suggested in Section II, the masses in the landlord areas, with their memories of an oppressive and often absentee landlord class, may perceive their interests as being opposed to that of the local elite, while those in the non-landlord areas may be more interested in working with that elite. The existence of a highly conflictual environment is consistent with our results on crime rates (Appendix, Table 8). Landlord districts have significantly higher levels of violent crime (such as murder, rape, kidnap, armed robbery, and riots), but not of economic crimes like cheating or counterfeiting.

The perception of a large divergence of interests between the masses and the elite in landlord areas may not, however, be necessarily correct. The final empirical exercise in this paper compares poverty reduction in the landlord and non-landlord areas. While the head count ratio falls in both areas between 1972 and 1987 (the mean reduction is about 11 percentage points), the decline in poverty according to our OLS estimates is about seven percentage points higher in non-landlord areas (Appendix, Table 6). The difference in poverty reduction is five percentage points for the sample of neighboring districts and is robust to the inclusion of a state fixed effect. The IV estimate, however, is completely insignificant and has the opposite sign. In sum, there is no evidence that the masses fare better in the landlord areas, and there is some evidence that they do worse. If we were prepared to attribute the change in poverty to the differences in political priorities and the resulting differences in policies, these results would suggest that the masses could perhaps have done a little better, or at least no worse, by focusing on what they had in common with the elites.

[33] We need to be a little cautious when interpreting these results. Adding state fixed effects effectively drops the states that have no within-state variation in non-landlord proportion. These states (Bihar, Gujarat, Karnataka, Rajasthan, and West Bengal) account for about one-fourth of our sample, so putting in state fixed effects results in a lack of power in our estimation.

[34] IV estimates of these differences are larger in magnitude than the OLS estimates for literacy, infant mortality, and primary school provision (results not shown).

TABLE 7—IMPACT OF STATE POLICY

Dependent variables	Mean of dependent variable	Coefficient on non-landlord proportion: OLS Base specification (1)	OLS Control for state dev exp per capita (2)	OLS State FE (3)
Panel A: Agricultural investments				
Proportion of gross cropped area irrigated	0.276	0.065*	0.074**	0.028
		(0.034)	(0.035)	(0.036)
Fertilizer use (kg/ha)	24.64	10.708***	10.805***	4.297
		(3.345)	(3.717)	(3.308)
Proportion of rice area under HYV	0.298	0.079*	0.007	0.000
		(0.044)	(0.040)	(0.042)
Proportion of wheat area under HYV	0.518	0.092**	0.061	0.028
		(0.046)	(0.047)	(0.039)
Proportion of other cereals area under HYV	0.196	0.057*	0.025	0.043*
		(0.031)	(0.030)	(0.026)
Panel B: Agricultural productivity				
log (yield of 15 major crops)		0.157**	0.174**	0.059
		(0.071)	(0.076)	(0.072)
log (rice yield)		0.171**	0.083	0.016
		(0.081)	(0.082)	(0.078)
log (wheat yield)		0.229***	0.243***	0.150***
		(0.067)	(0.072)	(0.045)
Panel C: Education and health investments, 1981				
Proportion of villages having:				
Primary school	0.745	0.154***	0.062*	0.102***
		(0.036)	(0.037)	(0.039)
Middle school	0.204	0.125***	0.093***	0.064***
		(0.023)	(0.021)	(0.018)
High school	0.082	0.052***	0.019	0.030**
		(0.018)	(0.014)	(0.013)
Primary health center	0.023	0.011***	0.002	0.012***
		(0.004)	(0.004)	(0.004)
Primary health subcenter	0.031	0.033***	0.011	0.006
		(0.011)	(0.009)	(0.006)
Panel D: Education and health outcomes				
Literacy rate (1961, 1971, 1981, 1991)	0.2945	0.0524**	0.0290*	0.0241
		(0.0190)	(0.0171)	(0.0176)
Infant mortality rate (1991)	82.17	−32.71***	−25.43***	−15.81***
		(5.38)	(5.28)	(5.40)
State fixed effects		NO	NO	YES
Year fixed effects		YES	YES	YES
Geographic controls		YES	YES	YES
Date of British land revenue control		YES	YES	YES

Notes: Standard errors in parentheses, corrected for district-level clustering. * Significant at 10-percent level; ** significant at 5-percent level; *** significant at 1-percent level. Geographic controls are altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions.

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