# Land, State Capacity and Colonialism: Evidence from India

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## Abstract

Many authors have argued that colonial institutions influenced contemporary economic outcomes by influencing levels of economic inequality and political conflict. Such accounts neglect an additional important mechanism, differences in state capacity. These two mechanisms of colonial persistence are examined in the context of India, where colonial land tenure arrangements are widely thought to influence contemporary outcomes through class conflict. However, land tenure institutions were also associated with differences in state capacity: In landlord-dominated areas, the colonial state had little or no presence at the village level. An analysis of agricultural outcomes in Indian districts, using a set of original measures of colonial state capacity, shows that while land tenure in isolation is a surprisingly weak predictor of agricultural success, state capacity has a strong and consistent positive association with 20th century economic activity. The findings reinforce the importance of colonial rule in influencing contemporary state capacity, and the importance of state capacity for development.

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# 1  Introduction

Within India, as in the developing world as a whole, there are substantial differences in levels of economic development across regions. One explanation for these differences is underlying differences in the capacity of states. Several influential arguments in the existing literature on development economics have shown that state capacity can be significant in promoting economic growth by inhibiting violent conflict (Fearon and Laitin, 2003; Hendrix, 2010), and providing market-friendly institutions and higher levels of public goods (Evans, 1995; Besley and Persson, 2010, 2009). Conversely, where local level elites are able to ignore or subvert the state's power we should expect even modest development schemes to fail (Migdal, 1988).

One factor that might explain differences in state capacity is the policies of the colonial state. Over the past two decades, a large literature has emerged linking modern outcomes to differing colonial policies, both cross nationally (Banerjee and Iyer, 2005; Acemoglu, Johnson and Robinson, 2002; Sokoloff and Engerman, 2000) and within countries (Dell, 2010; Lee and Schultz, 2012; Iyer, 2010), though these authors have focused on causal mechanisms other than state capacity, such as inequality, class conflict, and institutional quality. While many analysts of the persistent weakness of African states have traced the problem to the colonial period (Herbst, 2014; Mamdani, 1996; Lange and Rueschemeyer, 2005), they have not usually attempted to measure state capacity directly, or explain within-country variation. Similarly, analyses of the Indian state have often focused on the ability of specific classes or social groups to influence its policy (Bardhan, 1999; Chibber, 2003) rather than the ability of the state to implement these policies.

India represents an excellent case to examine the long-term role of state capacity. The subcontinent is large and diverse enough to have considerable variation in contemporary development, but retains many of the advantages of a within-country (and within colonizer) comparison. Also as we shall see, India featured considerable variation in the local-level reach of the colonial state, but has been the focus of an active literature tracing colonial persistence to factors other than state capacity, such as economic inequality and social conflict.

Within India, one particular colonial policy, the land tenure system, has been a focus of scholarly attention. In a widely cited paper, Banerjee and Iyer (2005) showed that areas with land tenure policies that favored large landlords (often referred to as *zamindari* tenure) have worse development outcomes than other areas. This finding has subsequently been both confirmed (Kapur and Kim, 2006; Pandey, 2010) and challenged (Iversen, Palmer-Jones and Sen, 2013). While these analyses are all relatively recent, the negative effects of zamindars and zamindari tenure have been a trope in nationalist historiography and Indian popular culture since the early 20th century (Bagchi, 2010; Slater and Buchanan, 1935). Given that zamindari tenure was abolished immediately after independence, its long-term negative effects must necessarily work through some intervening factor. Banerjee and Iyer argue, primarily by exclusion, that zamindari areas are affected by higher levels of class conflict.

This causal pathway, and the larger literature on zamindari tenure, largely ignores the role of the colonial state, and several important differences in the ways zamindari and non-zamindari areas were administered. Of these differences, two were especially notable. Firstly, in zamindari areas the British delegated the responsibility for collecting taxes, along with certain other minor administrative and judicial responsibilities, to the zamindars and their agents. This meant that, unlike in other parts of India, the state in these areas had no institutional presence at the village level, and no direct administrative contact with the bulk of the population. Secondly, in zamindari areas the colonial state faced constraints in setting tax rates due to formalized promises given at the time the land-tenure regime was established and the need to maintain the political support of the zamindars. For these reasons, throughout the colonial period the local and provincial state in non-zamindari areas was substantially better funded than in zamindari areas. These two differences meant that the colonial state had a much higher capacity in non-zamindari areas than in other areas, with a better ability to extract money and a greater knowledge of and influence on the lives of ordinary citizens.

This paper shows that while there are noticeable differences in contemporary economic development between zamindari and non-zamindari parts of India, these differences are traceable to differences in state capacity rather than other aspects of land tenure, and that colonial state capacity serves as a mediating factor between land tenure

and contemporary outcomes. To do so, it reexamines Banerjee and Iyer's data, adding original measures of colonial taxation and state size—some of the best local-level measures of state capacity yet available. The state capacity measures have a robust positive relationship with the agricultural yields and inputs in late 20th century India, Banerjee and Iyer's key dependent variable, and with contemporary measures of state and district level state capacity. Also, accounting for state capacity reduces the estimated effect of land tenure to insignificance.

The paper makes two major contributions. Firstly, it helps link the large literature on the effects of colonialism with the equally large literature on the importance of state capacity, showing that colonial regimes, like modern ones, had an uneven ability, even within a single country, to understand and shape local conditions. In doing so, it provides an alternative mechanism for long-term colonial influence, supplementing the focus in existing accounts on mechanisms such as social inequality and institutional quality. Secondly, it shows that state capacities, once established, can be difficult to alter over time, even when many aspects of the states themselves have changed. This historically grounded account adds to existing theories of the origins of state capacity in comparative politics, which often emphasize factors such as geography and wealth (Herbst, 2014; Fearon and Laitin, 2003), natural resources (Humphreys, 2005), elite self-interest (Besley and Persson, 2010; Suryanarayan, 2014; Migdal, 1988; Geddes, 1994), or war (Besley and Persson, 2010).

These findings do not, of course, show that state capacity in India is solely a product of colonial influences. Since independence, there have been important changes in the party system, bureaucracy, economy, and patterns of identity politics that might well have shaped the capacity of the Indian state and economic outcomes. Similarly, they cannot access the relative importance of land tenure in shaping colonial state capacity (though there is evidence it had at least some independent influence). They do imply, however, that some portion of the differences in state capacity we see today has deep historical roots, and that these differences influenced subsequent economic development.

Section Two briefly outlines the existing literature on state capacity, and why we might expect it to be influential. Section Three describes the history of land tenure institutions in India, and existing theories about their long term effects. Section Four

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outlines the differences in state capacity within the colonial regime, and why we might expect these institutions to be significant. Section Five describes the data to be used, and Section Six describes the results of a set of statistical tests on the effects of state capacity and land tenure. Section Seven concludes with a discussion of the implications of the findings for the literature.

# 2  State Capacity and Development

## 2.1  Why State Capacity Matters

State capacity is a concept with a bewildering variety of definitions and subdefinitions, and low state capacity often becomes a catch-all diagnosis for a wide variety of political dysfunctions. To the extent that one can identify a core definition, state capacity is *the ability of the state to control the behavior of its citizens.* In order to obtain this power, states must construct institutions that have knowledge of and power over ordinary people at a fairly low level—that "penetrate" society and transcend the social and political isolation of rural villages in developing countries (Migdal, 1988). Lange (2009) refers to this type of local level-influence as "infrastructural power."

Once achieved, state capacity can be used to achieve a wide variety of policy goals, of which the most basic are the collection of taxes and the maintenance of the state's monopoly of coercion. Both of these goals are considered valuable by a wide spectrum of governments, and were the core functions of the first modern states (Levi, 1989). However, states can also use their power to build broadly beneficial public goods such as roads, schools and wells, or compel cooperation with other national projects such as public health campaigns, population control mandates, or censuses (Scott, 1998).

A variety of factors are thought to explain variation in state capacity. These include the geography of the state (since mountainous, poorly populated or peripheral areas may be more difficult or expensive to penetrate) (Herbst, 2014) and wealth (since state institutions and technologies of social control may be expensive to develop)(Fearon and Laitin, 2003). Elites may not desire a high capacity state that can extract resources from them, and may thus seek to retard their development (Besley and Persson, 2010;

Suryanarayan, 2014). At the local level, elites can see the state as a competitor to their own authority, and attempt to subvert its local representatives to serve their own ends, creating a set of intermediaries between the state and society (Migdal, 1988; Geddes, 1994). Large social projects such as foreign wars or revolutions may create a fiscal need for states to invest in capacity building (Besley and Persson, 2009) Conversely, in societies where such fiscal and political imperatives do not exist (such as in resource-rich states) capacity building may be seen as expensive and unnecessary (Humphreys, 2005).

Whatever its causes, state capacity is widely believed to be positively associated with economic and political development. Merely through their role in reducing civil conflict and reducing crime, high capacity states can reduce economic waste and create incentives for investment. A state with high capacity in the core areas of fiscal extraction and coercion can also supply market-supporting institutions such as courts and patents and providing market enhancing goods such as schools, roads and public health (Besley and Persson, 2010). In the absence of strong states, private individuals may use coercion to appropriate rents to themselves, while markets operate inefficiently in the absence of guarantees of contract enforcement.

In the Indian context, there is considerable direct evidence that the types of goods and services provided by high capacity states have a direct positive effect on rural economic development and well-being. To quote only a few examples, rural roads are associated with higher levels of employment (Asher and Novosad, 2014), lower levels of teach absenteeism are associated with test higher scores (Duflo and Hanna, 2005), and small-scale public works projects with rural wages (Azam, 2011).

A closely related strand of the literature has examined the *autonomy* of the state relative to powerful social actors, in particular wealthy elite groups (Mann, 1984). These relationships are highly predictive of the ability of states to promote economic development (Kohli, 2004; Evans, 1995). This tradition has been especially prominent in the large literature on the Indian state. Several influential analyses have argued that the Indian state is embedded in a network of class conflicts and social power relations that determine its behavior, and thus India's development trajectory and policy choices (Bardhan, 1999; Chibber, 2003; Kohli, 1990). While these accounts have often focused on the power of the wealthy or the "bourgeoisie," other scholars have identified specific

classes and caste groups with disproportionate influence (Lee, 2016). These accounts either explicitly dismiss the importance of state capacity (Chibber, 2003), or discuss capacity only in the sense of the political system's ability to manage conflict and incorporate rising social groups (Kohli, 1990).

However, state capacity and state autonomy are far from incompatible concepts. The influence of powerful groups might influence the direction of state policy (toward redistribution, liberalization etc.), but the ability to achieve these goals may be constrained by the state's underlying institutional capabilities. This would fit with accounts of how broad state programs are subverted, or see their meaning subtly altered, at the local level, both in India (Gupta, 1998) and elsewhere (Scott, 1998; Migdal, 1988).

## 2.2   State Capacity and Colonialism

Colonialism was the time in which most states in the developing world were created, but we have little direct evidence on whether colonial states varied in their capabilities, or whether these differences have persisted. From a theoretical perspective, colonial states present an interesting case for the development of state capacity, since colonial officials were relatively insulated from the native elites often thought to be the principle enemies of state capacity development. Perhaps for this reason, the best existing study of state capacity in colonial India (Suryanarayan, 2014) focuses on the small amount of autonomy held by elites in local government in the last decades of colonialism. Similarly, theories of the colonial state have tended to focus on the colonial regime's goals ("extractive" or "non-extractive"), rather than their abilities (Acemoglu, Johnson and Robinson, 2002).

In the African politics literature, it has become standard to note the negative influence of colonialism on state capacity (Herbst, 2014; Mamdani, 1996; Lange and Rueschemeyer, 2005), though these accounts often do not measure the concept directly. Moreover, theories tracing state weakness to colonialism (or the lack of conflict associated with colonialism) cannot explain variations in capacity within colonial states.

The main exception to this pattern has been the discussion of indirect rule. All colonial regimes delegated substantial authority to native collaborators. When this delegation was extensive and formalized, it is known as indirect rule (Iyer, 2010; Lange,

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2009; Gerring et al., 2011). In the Indian context, the most prominent indirectly ruled areas were the princely states, where Indian rulers maintained autonomous quasi-state institutions. It might be supposed that this devolution might lead to lower state capacity, since it created an additional layer of authority between citizens and the central state, and one not recruited or held accountable by normal bureaucratic procedures. Alternatively it is possible that indirect rule might in fact increase state capacity if the rulers were better able than colonizers to control the population, due to cultural knowledge, social incentives or political legitimacy superior to those possessed by the colonial state. The limited work on this topic has found mixed effects: higher levels of service provision and better development outcomes than directly ruled areas (Iyer, 2010; Lee and Schultz, 2012), higher levels of conflict (Mukherjee, 2013), different types of conflict (Verghese, 2016) and higher levels of authoritarianism and underdevelopment (Lange, 2009). For this reason, the causes and consequences of indirect rule remain an interesting topic for study.[1]

## 2.3 Persistence

Even if state capacity does positively influence development, it does not explain why this effect persists over time. Since many colonial policies leading to differences in state capacity were abolished at independence, one might expect state capacity to gradually converge across types of regions.

While it is difficult to pinpoint the exact pathway by which the effect of colonial state capacity has persisted, there are several potential mechanisms. Firstly, it is possible that state expansion was frustrated by *Elite Resistance* The expansion of the state into rural areas creates many problems for local elites, providing an alternative source of protection and patronage for the poor. "Big men" like Joel Migdal's large Egyptian farmers, may attempt to frustrate the growth of local state institutions (Migdal, 1988). Such efforts are much easier if a state and its officials are relative newcomers with little knowledge of the population, and the local elites have traditionally exercised political authority. Where the state is well entrenched already, a bureaucrat bent on expanding her authority may

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[1]See the appendix for an empirical examination of the effect of princely states in India.

have a solid institutional base from which to work, and face a less consolidated and legitimized local elite.

Another possibility is that attempts to build stronger states were frustrated by *Status Quo Bias* within the Political System and Bureaucracy. The creation of state capabilities is expensive and difficult relative to the maintenance of existing ones—it involves the construction of new buildings, the recruitment of a mass of new personnel, and the reorganization of existing government departments. Given the short time horizons of some politicians and bureaucrats, they may be unwilling to pay these costs, even if they would be beneficial for the state over the long term. If such startup costs exist, politicians who would be willing to maintain existing state capacities at a certain level might be unwilling to raise low capacities to that level.

Finally, it might be difficult to expand state capacity in areas with a hostile set of *Cultural Expectations*. After a long period of high state capacity, individuals might expect high levels of state services and protest when they are not delivered. They might also develop social expectations of cooperation with the state, for instance in the collection of taxes (Levi, 1989). Conversely, states that have long been dysfunctional receive little cooperation from their citizens, who make few demands for improvement and rely instead on personal or ethnic links to gain services. Culture or culturally flavored arguments have long been used to explain differences in economic and political development between northern and southern Italy, another nation with important regional divisions (Putnam, Leonardi and Nanetti, 1994).

# 3 Land Tenure in Colonial India

## 3.1 Historical Background

Both colonial India and the indigenous states that preceded it ruled agrarian societies, and both types of governments depended for their survival on their ability to tax peasants, primarily through the simple property tax known as the land revenue. In 1858, land revenue comprised 50% of the government's revenues, as against 4.3% for excise and income taxes (Raychaudhuri, Habib and Kumar, 1983, 916). The collection of this tax

was considered the primary function of government, and the right to collect it was confused with political authority more generally. In most of India, British district officials were termed "collectors" and "assistant collectors," referring to this role.

In a few parts of India, the pre-colonial rulers had collected land revenue directly from individual cultivators (known as *ryots*), a process that required a sizable bureaucracy to keep records of landholdings and enforce payment. Given the difficulty of maintaining such a bureaucracy, most pre-colonial states outsourced some or all of their revenue collection to third parties, commonly known as zamindars. The zamindar was assigned the rights to collect land revenue within a fixed territory, which could be as small as a single village or as large as a whole district. He undertook to remit a fixed sum to the government, and earned his profit by collecting more than the government's demand (Baden-Powell, 1892).

The origins of the zamindars varied widely. Some were ordinary cultivators or groups of cultivators who undertook to collect taxes from their neighbors. Others were decedents of traditional rulers, who had become zamindars when their petty fiefdoms were incorporated into larger empires. Still others were servants and soldiers of the precolonial rulers, for whom a zamindari was a reward, and urban bankers and merchants, for whom a zamindari was a business investment. The question of zamindari status was further complicated by the fact that larger zamindars often granted their rights to other intermediaries, and that pre-colonial rulers often granted the rights to collect revenue *from* the zamindars to certain of their more powerful subordinates in lieu of salary. After the decline of the Mughal Empire in the mid-18th century, many zamindars built up armed forces which they used to expand their territory, and refused to pay revenue unless forced (Bayly, 1988).

When the British began to conquer large amounts of territory in the mid 18th century, they thus faced a confusing mass of ryots, zamindars, and others, each claiming some type of rights in land. How the British dealt with these claims, and organized revenue collection, varied considerably from time to time and from place to place, with different systems being adopted even within the same district based on official perceptions of political need and traditional practice. One can, however, distinguish four broad approaches.

In Bengal, Bihar and Orissa, the British introduced a policy known as *permanent settlement.* This policy had two prongs. The first of these was a strengthening of the zamindars, who were declared to have private property rights in land similar to English freehold, in addition to their traditional role in collecting the land revenue. The second was that the land revenue demanded from them was fixed permanently. The goal of the permanent settlement had been to create a territorial aristocracy with an incentive to invest in land improvement, but the consequences of the policy were quite different. Since the zamindars now possessed legal rights over their tenants far more extensive than anything they had had previously, and had access to a court system capable of enforcing these rights, they were able to raise rents to high levels, while netting gains from the decline of their liabilities due to inflation. To make matters worse, the high level at which the settlement had been set initially caused many local zamindars to be replaced by urban outsiders who purchased them as an investment (Marshall, 1987). The permanent settlement thus became unpopular among both Indians and British officials, who first resisted extending it to other provinces, and then began agitating (unsuccessfully) for its abolition (Bengal, 1938).[2]

In other areas of India, such as many areas of the United Provinces, the British also granted land revenue rights to the zamindars or at least those who could prove to the settlement officer's satisfaction that they held their land by a genuine grant. However, these zamindars were not granted permanent tax quotas, instead having their tax liability reassessed at long intervals (usually thirty years) by a specially appointed settlement officer. I refer to these areas as *temporarily settled zamindari.*

In the south and west of India, the British often acted to remove the zamindars and other intermediate revenue payers, who were given small pensions and deprived of any role in the taxation process. Instead, under a system called *ryotwari* the revenue was collected from individual cultivators, with a periodically reassessed tax liability (generally a share of the average estimated output) corresponding to each individual field, whose ownership was carefully recorded.

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[2]Zamindari tenure might be seen as being analogous to indirect rule, despite the zamindars' relatively low level of autonomy. However, while zamindars did collect taxes, they had only a limited role in providing public services, and had none of the fictive sovereignty that surrounded indirect rule institutions in other parts of the world.

In the northwest of modern India, the British often vested land rights in a group of villagers, a system known as the *mahalwari*, *bhaiachara* or *patidari*. This group could include all the cultivators or a subset of them, often the descendants of the village founders. The villagers received a tax demand from the states and divided it among themselves, with the taxpayers being jointly liable for the whole amount. Confusingly, these village proprietors were sometimes know as zamindars, since they paid land revenue to the state.

The choice among these systems was conditioned by two major factors. The first of these was the situation on the ground. Since colonial officials preferred to leave existing or "legitimate" institutions in place, areas with many large zamindars in the eighteenth century tended to have many large zamindars in the nineteenth. This tended to mean that the East of the subcontinent, which had been ruled by large Mughal successor states, had a much higher concentration of large zamindars than areas ruled by the Maratha or Sikh empires.

The second major factor was the time at which the area was conquered, since the most important decisions about the land tenure regime were made at the time of conquest. In areas conquered at later dates, the position of the colonial state was generally more secure (and thus disposed to deal generously with landed elites whom they might previously have seen as threatening (Lee, 2017)). In later decades, the ideological climate in England had shifted, under the influence of utilitarianism, to be more sympathetic to the individual rights and economic efficiency arguments advanced by the advocates of ryotwari, and less sympathetic to the feudal nostalgia central to the legitimacy of the permanent settlement.

Zamindari tenure was gradually weakened in the late colonial period by reforms that granted improved rights (and, often, fixed rents) to tenants. After independence, every Indian state abolished all intermediaries between the cultivator and the state, and tax collection became a bureaucratic responsibility, thus depriving zamindars of their former fiscal and administrative role (Rasul, 1948). While some zamindars lost social influence (Metcalf, 1967), many others were able to retain a large portion of land and power. While these reforms thus fell short of instituting social equality in the countryside (especially since the tenants who benefited most were usually wealthier than the mass of landless

laborers and sharecroppers), they did eliminate formal links between the zamindars and the state, and reduced inequalities in land distribution. One visible consequence of these changes was that in the 1990s zamindari areas actually had *higher* concentrations of small holdings than other parts of India, and similar proportions of very large holdings ((Banerjee and Iyer, 2005, 1209).

## 3.2   The Effects of Land Tenure

Tax collectors have never been particularly popular, and the status of the zamindars as agents of a foreign power made them doubly suspect. By the early 20th century, the abolition of zamindari tenure was a central goal of the nationalist movement, zamindars were widely regarded as social parasites, and the evil zamindar was a stock figure of Indian cinema. Several authors went further, and argued that the general poverty of northern and eastern India was a product of the permanent settlement (Slater and Buchanan, 1935).

However, awareness of the negative effects of the permanent settlement among social scientists can be traced to Banerjee and Iyer's 2005 paper, hereafter BI. They found that "landlord areas" (in which they included both permanent and temporarily settled zamindari) have lower agricultural yields and lower levels of adaptation of productivity-improving agricultural inputs than non-landlord areas (in which they include both ryotwari and village-based systems). They traced this divergence to differences in the political environment between districts, and the potentially higher level of class conflict in these areas, which in turn led to lower levels of state inputs:

> 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. 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... (BI 1198).

As additional evidence for the class conflict mechanism, BI show that landlord areas have lower levels of public goods and higher levels of crime than other areas. In emphasizing the class conflict mechanism, BI discount the role of land inequality (since, post-land reform, differences in inequality between zamindari and non-zamindari regions are actually quite modest), direct institutional legacies (since zamindari tenure was discarded soon after independence) and colonial physical and economic legacies (since the major differences in output do not emerge until the 1960s).

The BI finding has since been examined in detail by other authors. Kapur and Kim (2006), using very similar data, confirmed the finding, which they attributed to agency costs and insecure property rights in zamindari areas, particularly after the introduction of tenancy protections in the early 20th century. Pandey (2010), using an original survey dataset of border districts, also confirmed the finding, which she traced to the greater political and economic power of high caste groups in zamindari areas. Iversen, Palmer-Jones and Sen (2013) challenged BI's finding, which they find is sensitive to the coding of village-based systems. Verghese and Teitelbaum (2014), Sarbahi (2016) and Mukherjee (2013) have engaged in a contentious debate on the influence of zamindari tenure on armed conflict.

All these authors, like BI themselves, treat land tenure as an economic institution, albeit one with important social and political effects. The effects of zamindari tenure, in this view, stem from its effect on the relationship between tenants and cultivators. However, they have ignored the other two sides of the triangle, for land tenure also had important political implications, affecting the relationship between the state and the landlords, and the state and the tenants.

# 4  State Capacity in Colonial India

## 4.1  Administration

The Indian colonial state performed a set of functions that were, by modern standards, extremely limited. At the local level, there were two basic ones: the collection of the land revenue and the enforcement of justice. In the early colonial period, these responsibilities

were generally united in one man, with the district collector superintending the tax regime and serving as district judge. The revenue responsibilities of the collector were complex. He supervised a small army of clerks, who maintained records of all the land in the district, the taxation rates for each piece of land, and their payment status. He judged disputes over landownership and tax responsibilities, seized and sold the land of persistent non-payers, and remitted the taxes in areas he judged to be badly affected by weather or natural disaster.

These responsibilities were obviously affected by the land tenure system in use in the district. In districts with ryotwari tenure, the collector had to have information about the size, productive capacity and ownership of every individual field. This not only required a relatively large bureaucratic apparatus at district headquarters, but the maintenance of an even more local set of officials, the village accountants. These officials, called (according to the local language) patwaris, kulkarnis, talatis or karnams, were each responsible for a village or small group of villages, in which they were required to reside. They were required to keep records (extensively duplicated) of the crops grown in every field, and any mortgages and changes in ownership status (Rothermund, 1971). On their frequent tours through the district, the collector and his subordinates reviewed these records and checked them against both physical reality and the opinions of villagers.

In areas with zamindari tenure, by contrast, tax responsibilities were consolidated in a few landlords, who took responsibility for the payments of individual cultivators. There was thus no particular reason for the government to maintain officials at the village level, or to collect information about land cultivation. In the temporarily settled areas, the need to periodically set new tax rates at least meant that detailed surveys had to be conducted every few decades, with the first cycle commencing in Western UP in the 1830s and Eastern UP (an area with a great concentration of large zamindars) in the 1870s.[3] Not only did these surveys allow the government to estimate the productive capacity of the land, but, by recording the rights of tenants, they created a direct relationship between the ordinary cultivator and the government. In the North Western Provinces and Punjab, where temporary and village-based systems were common, these surveys evolved into a permanently updated record of tenant rights, though the spread

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[3]See for instance Lyall (1874).

of subordinate village officials was never as thick as in ryotwari areas.

In permanently settled areas, even this episodic state presence was unnecessary, since the tax rate was permanently fixed. By the late 19th century, the tax rates were so low in real terms that they did not even need to be adjusted for weather and natural disasters. While the government did conduct cadastral surveys in the mid 19th century, they merely recorded village boundaries rather than individual fields and tenancy arrangements, as they did in the rest of India (Dodwell, 1932). Similarly, while village accountants and other officials did exist, they were employees of the zamindars rather than the state, and recorded obligations to the zamindar. Only in 1885 did the Bengal Tenancy Act gradually lead to the institution of field-by-field surveys and a records of tenancy rights, though (unlike in the rest of India) these records were never continuously updated (Dodwell, 1932, 250).

Under the Mughals, the zamindar had the obligation to enforce justice, and had maintained his own police force and courts. These obligations continued into the colonial period, and until 1793 the zamindars retained full police authority in Bengal. Even after these obligations were removed, landlords remained the most important force in law enforcement, since they appointed and paid the village watchmen (chaukidars). Despite attempts at reform, it was generally admitted that the chaukidars remained "the servants of the zamindars," and zamindars were often able to use them as a tool against recalcitrant tenants and avoid prosecution for crimes of their own (Government of India, 1905). The tradition of decentralized enforcement was so strong that the formation of an organized police force in Bengal and UP (in the 1860s) came a generation later than in Ryotwari Bombay (1843).

In the 18th century, zamindars had held autonomous courts, which they used to maximize their own profits, and at times to protect criminals who were willing to pay (Jain, 2006). The autonomy of these courts was abolished in the 1793 reforms, but the munsif courts (and later honorary magistracies) that replaced them in Bengal further entrenched the power of the zamindars, since landownership was a requirement for becoming a munsif, and the position was not paid.

In the ryotwari areas, the government was forced to turn to other expedients for rural law enforcement. One of these was a professional uniformed police, which Bombay was

the first province to adopt, only a decade after England itself. The colonial state also relied upon village officials, often drawing upon precolonial precedents. The police patil (in Bombay), the village headman (in Madras) and the somewhat similar lambradar (in Punjab) were all responsible for ensuring that taxes were collected, and crimes reported, with severe penalties for the concealment of crime. They also met touring government officers and became general state representatives at the village level. The appointment of these officials was a mixture of heredity and official influence, with village elections sometimes also playing a role. While these officials (unlike the accountants) were generally drawn from powerful landholding families, the colonial government was able to remove them, and select more or less competent members of particular families, powers it did not possess over the zamindars. Unlike zamindars, the patils did not generally possess property rights in the taxes they collected, which they simply forwarded to the district treasury.

The existence of a large network of village officials in the ryotwari areas encouraged the government to use them for other purposes. Police patils in Bombay, for instance, maintained a register of births and deaths, looked after unclaimed property, reported on epidemics and helped conduct the census (Government of Bombay, 1976). More subtly, the existence of multiple state agents at the local level acted as a check upon the local elites and other state agents (Elphinstone, 2011), reducing the chance that a large landowner would be able to conceal his misdeeds from the district authorities.

## 4.2 Taxation

Another key difference between the zamindari and non-zamindari districts was in the ability of the government to raise taxes. Under the permanent settlement, the British government had solemnly renounced the ability to ever raise land revenue rates on the zamindars. Given that agricultural productivity was generally increasing, and the value of the rupee was generally decreasing in real terms, the government found the base of its main tax steadily reduced relative to the overall size the agrarian economy. Taxation was further limited by the fact that until 1870 the prevailing judicial interpretation of the permanent settlement precluded all additional taxes on property, including the local

rates that funded road and sewer construction in the rest of India.

There are several potential reasons why the colonial state allowed the zamindars to earn steadily increasing rents. While the fear of breaking a formal promise of perpetual property rights weighed heavily on official minds, a more plausible mechanism is the political clout of the zamindars. The zamindars were one of the few classes of Indians who consistently supported the colonial regime (Reeves, 1963), and many officials saw them as a prop against "instability" in rural areas (though there was no evidence that zamindari areas were in general more stable). Many zamindars could also claim that they held their estates as a reward for loyalty to the raj during the conquest period or the 1857 rebellion. Finally, the wealthy and powerful zamindars were simply a more visible and effective pressure group than the ryots. As a result, zamindars were able to retain their special status to the end of the colonial regime. Even in temporarily settled areas, the tax assessments made at end of the colonial regime tended to be lower relative to overall productivity than those of the early 19th century and of comparable ryotwari areas.

## 4.3 Discussion

These political differences meant that state capacity was much lower in zamindari areas. The state's ability to raise revenue was much lower, since the state collected lower levels of taxes, and the penetration of state institutions was much lower, since the state in zamindari areas had little or no direct presence in the villages, and little or no direct contact with individual Indians. These differences should in turn be associated with the state's ability to protect property rights and provide growth-enhancing public goods. If these differences have persisted over time, we should expect development outcomes to be worse in these regions than in other parts of India. While the importance of these differences would be minimal under traditional production mechanisms, they would be of increased importance after a technological advance such as the Green Revolution.[4]

A more direct causal pathway is also possible. If the colonial state had fewer officials and collected fewer taxes in zamindari areas than in other areas, it is unsurprising that

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[4]For an analogous argument about the industrial revolution see Acemoglu, Johnson and Robinson (2002).

they would provide fewer public services due to simple poverty. As we will see in Section 6.3, this was in fact the case. Given that education, irrigation and the other services provided by strong states are positively associated with economic goods (Ghosh and De, 1998), it is not unreasonable that states with higher levels of inputs would be wealthier at the end of the colonial period.

It is important to note how these ideas differ from BI, and from related arguments that link the effects of land tenure to the persistent power of elites. While BI admit (and in fact show) that differences in state capacity do exist in the late 20th century, these differences are thought to be a product of social conflict and economic inequality. Former zamindars and ordinary citizens, in this view, are too busy fighting each other to demand state resources. Alternatively, a rent-seeking zamindari elite might undermine state capacity building to preserve its own power (Suryanarayan, 2014). However, the discussion in the last section suggests an alternate possibility: That differences in state capacity within India predate the social conflicts BI discuss, and indeed the local elections on which Suryanarayan focuses, but stem from the policies a colonial regime that was (relative to republican India) autonomous from local social groups and social conflicts.[5]

# 5 Data and Variables

## 5.1 Measuring State Capacity

The theoretical uncertainties surrounding the concept of state capacity have made its measurement controversial and difficult. Two basic approaches are possible: measuring the spread of state institutions directly (the "input approach"), and measuring their achievements in extracting resources and controlling behavior (the "output approach"). This analysis uses both approaches, using two separate measures. Each is measured at the level of the 1991 Indian district, as used in BI. In some cases, colonial districts covered multiple contemporary districts, and in these cases the historical data for each

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[5]Note also that colonial land revenue taxation decisions were made be provincial governments, not the local governments that (Suryanarayan, 2014) discusses.

modern district was coded based on the colonial district that covered the largest part of its territory.

The first, and most intuitive, of these measures is a measure of a key output of local state power—the level of land revenue taxation. Taxation has long been treated as one of the core functions of states, and are often taxing abilities used as a measure of state capacity that transcends differences in spending priorities (Besley and Persson, 2009; Dincecco, 2011). I use *per acre land taxation* calculated as the total land revenue in rupees divided by the total cultivated acreage fully assessed for land revenue.[6] This data was taken from the 1931 edition of the Indian Agricultural Statistics, although the tax figures for a few districts refer to the 1929-30 revenue year.

The second measure is a measure of the presence of village officials, a key institutional input to local state power. This is designed to capture the ability of the state to gather information and enforce policy within the types of rural communities that often frustrate statebuilding projects (Migdal, 1988). The ideal measure would measure the number of individuals within a village who drew their principal livelihood from the state, and thus had an incentive to get their neighbors to comply with its demands. I use the *proportion of workers who were village officials*, calculated as the total number of males who had village official as their principal occupation (group 162 in the census schedules as a proportion of the total number of male workers at the 1931 census. [7] This coding rule avoids counting individuals who did not consider village service their principal occupation, while considering the number of village officials relative to the population on whom we have occupational data. This is a relatively conservative definition: "Village watchmen" were a separate census category, and are not included here, since these watchmen were as often employed by local landlords as by the state itself.

Neither of these variables are perfect measures of state capacity, although it is questionable if state capacity could ever be perfectly measured. Taxation rates are dependent

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[6]A small amount of land was not accessed, usually because it was held by a religious institution or because the holder's ancestors had been granted perpetual freedom from taxes by a previous government.

[7]"Workers" in this analysis includes both "earners" and "working dependents," and thus anyone earning a living in any sector, without respect to the formality of employment or whether their earnings were in cash or kind. The definition of "village officials" excluded employees of district and tehsil boards, or urban local government bodies, who were counted separately. Data is missing for certain Bihar districts. Workers was chosen as the denominator rather than population because occupational data was not collected for all respondents.

on the underlying productivity of the soil as well as state policy. It should be noted, however, that because the British tended to implement permanent zamindari tenure in relatively fertile lowland areas, this pre-existing variation should lead to underestimate the negative effect of zamindari tenure on tax receipts (BI 1204). To address this problem, all the main models include a set of controls designed to capture the ecological determinates of agricultural production, including soil type, rainfall, and temperature.

Similarly, who was and who was not a village official and what was and what was not a principal occupation, while not completely subjective questions, inevitably involved some level of independent judgment by the census takers. The 1931 census, which was chosen as the last non-wartime colonial census, was also conducted under conditions of fiscal stringency at a time of political unrest, although the census officials concluded that these last problems had little effect outside of urban Gujarat (Hutton, 1933). However, the broad regional patterns of village officials appear to be little affected by the vagaries of census procedure. At the provincial level, the correlation between the concentration of village officials in 1891 (the first census with somewhat reliable occupation figures) and 1931 is high ($\rho = .72$). At a theoretical level, it is also unclear if errors in census enumeration should be biasing the results. Since village officials were closely associated with the operation of the census, we should expect them to be one of the occupational groups least affected by under or overcounting. Note, also, that even if measurement error is thought to be higher in areas with low state capacity, this would lead to the overestimation of state capacity in these areas (and thus attenuation bias in the sample overall).

One major advantage of the village official and land taxation measures is that they are aggregated at the district level. State spending data are only available at the provincial level, where most budgetary authority rested. Section 6.3 uses a number of these measures, including per capita spending on education and irrigation (two broadly beneficial public services) and the proportion of education revenue drawn from school fees (an interesting metric of the inadequacy of local spending on education). All the provincial level data is calculated using the official statistics in (India, 1922).

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## 5.2 Measuring Land Tenure

BI's primary independent variable was the proportion of land within a district held under "non-landlord" tenures (ryotwari and village-based), calculated from turn of the century district gazetteers. Some of the coding of village-based land tenures has been questioned (Iversen, Palmer-Jones and Sen, 2013), and there are considerable subtle differences among land tenure systems. For the purposes of consistency, I use BI's here as the primary measure of land tenure systems.

To supplement this measure, I also construct a set of alternative measures based on the 1931 *Agricultural Statistics*, which use a more nuanced four part classification system of land tenure systems: ryotwari, village-based, temporarily settled zamindari and permanently settled zamindari. These categories can be used to measure two alternative definitions of "landlord" tenure: The proportion of land under ryotwari tenure (with village-based and zamindari systems grouped together as the excluded category) and the proportion of land under permanent zamindari tenure (with village-based, ryotwari and temporary zamindari systems grouped together as the excluded category).[8] Table A.8 shows that using these measures does not produce a stronger direct effect of land tenure than the original BI measure.

## 5.3 Dependent Variables and Model

No reliable estimates of income or economic productivity exist at the district level in India. To solve this problem, BI examined productivity and investment in agriculture, the most important economic activity in rural India. These measures have the additional advantage of isolating changes in rural income and productivity (the outcomes most likely to be affected by differences in colonial state capacity or land tenure) from industrialization or other changes in the urban economy. To ease comparisons between my results and theirs, I continue this strategy, and use BI's agricultural data (originally taken from the India Agriculture and Climate Data Set assembled by the World Bank) covering the 1954-1985 period.

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[8]The first measure is thus similar to that used by Iversen, Palmer-Jones and Sen (2013).

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BI used eight variables as measures of agricultural development of which five are measures of agricultural inputs: The proportion of the land irrigated, the amount of fertilizer used (in kg per hectare), and the proportion of land sown with high-yield varieties of rice, wheat and other cereals. Three are measures of agricultural yields: the mean log yield for fifteen common crops and the logged yields for rice and wheat. Many of BI's models include controls for date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type (red, black and alluvial) and coastal districts, a practice I follow. Further discussion of the collection of these variables can be found in the Agriculture and Climate Dataset codebook and in BI's data appendix.[9]

The unit of observation in the agricultural data is the district year. Since the colonial state capacity and land tenure variables do not vary at the year level, I follow BI in pooling the year observations, including year fixed effects, and clustering at the district level. The equation estimated is thus

$$Y_{it} = Constant + \alpha_t + \pi StateCapacity_i + \beta NonLanded_i + \rho X_i + \epsilon_{jd} \qquad (1)$$

With $Y_{it}$ being the particular agricultural variable, $\pi$ and $\beta$ being the coefficients of interest, $X_i$ being a vector of controls, and $\alpha_t$ being a vector of year fixed effects.

# 6   Results

## 6.1   Replicating Banerjee and Iyer

Table 1 reports the results of a set of regressions that examine BI's basic land tenure hypothesis without introducing measures of state capacity. The basic BI results are reproduced in Column Two. BI's results are somewhat sensitive to functional form, whether the absence of controls (Column One) or the presence of state fixed effects (Column Three). In these alternative specifications, the association of land tenure with the agricultural outcomes weakens somewhat, sometimes becoming statistically insignif-

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[9] https://assets.aeaweb.org/assets/production/articles-attachments/aer/data/sept05_app_banerjee.pdf and https://ipl.econ.duke.edu/dthomas/dev_data/datafiles/india_agric_climate.htm.

icant. This suggests that the BI results might be sensitive to unobserved confounds, such as colonial state capacity.

Table 1: Land Tenure and Agricultural Outcomes: Replicating Banerjee and Iyer

|  | (1) | (2) | (3) |
| VARIABLES | Simple | Controls | State FE |
| --- | --- | --- | --- |
| Proportion of gross cropped area irrigated | .0292 | .065* | .028 |
|  | (.036) | (.034) | (.035) |
| Fertilizer use (kg/ha) | 12.898*** | 10.70*** | 5.20 |
|  | (3.188) | ( 3.34) | (3.19) |
| Proportion of rice area under HYV | .184 | .078* | .0003 |
|  | (.034) | (.043) | (.0419) |
| Proportion of wheat area under HYV | -.171*** | .091** | .027 |
|  | (.049) | ( .045) | (.038) |
| Proportion of other cereals area under HYV | .075** | .057* | .043* |
|  | (.030) | (.03) | (.025) |
| Log (yield of 15 major crops) | .100 | .157 ** | .058 |
|  | (.076) | (.071) | (.072) |
| Log (rice yield) | .326*** | .170** | .016 |
|  | (.069) | (.08) | (.077) |
| Log (wheat yield) | -.0243 | .228*** | .150*** |
|  | (.091) | (.067) | (.044) |
| Year FE | YES | YES | YES |
| Controls | NO | YES | YES |
| State FE | NO | NO | YES |

Standard errors in parentheses
*** p¡0.01, ** p¡0.05, * p¡0.1

Each cell represents the coefficient from a regression of the dependent variable in the left column on BI's measure of non-landlord control. Data are from 1956 to 1987. Data for area under high-yielding varieties ( HYV) is after 1965. Controls are date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal districts. Column Two of this table exactly replicates BI's Table Three, Column One.

## 6.2   Land Tenure and Colonial State Capacity

Section Four presented historical evidence that the capabilities of the colonial state were substantially greater in areas with ryotwari and village-based land tenure systems than in areas with permanent and temporary zamindari systems. The results of these differences in state structure can be seen in Figure 1, which plots the proportion of land under non-landlord tenure in each district (taken from BI) and the proportion of village

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Figure 1: Land Tenure and Colonial State Capacity

(a) Village Officials            (b) Taxation
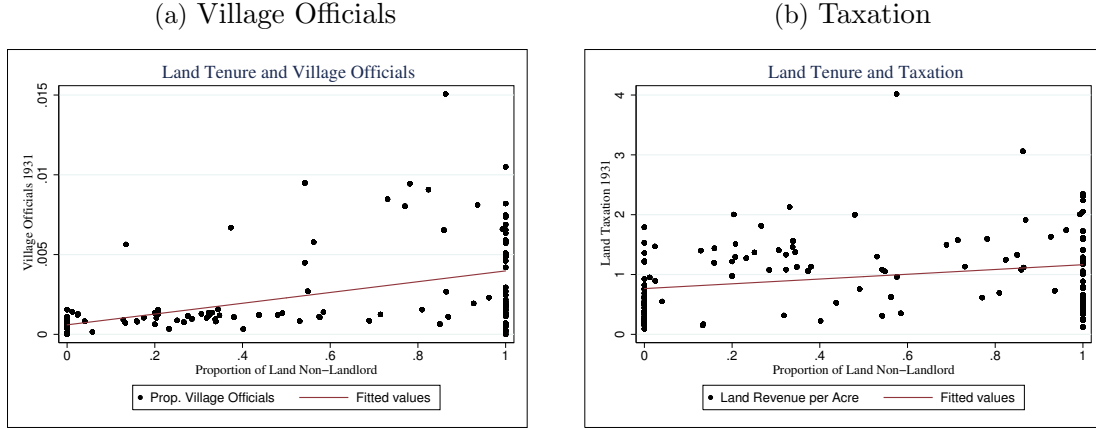


Note: The X axis in both figures is BI's measure of proportion of land under non-landlord control. The Y axis shows the per acre land taxation in rupees in 1931 and the logged proportion of total workers who were village officials at the 1931 census.

officials within the workforce, taken from the 1921 census. There is a positive association between the variables, which are correlated at $\rho = .48$, .68 if the logged proportion of village officials is used.

Another regional difference was that taxation in zamindari areas was much lighter than in ryotwari and village areas. Even before accounting for the superior productivity of zamindari areas (which were more likely to be in the fertile lowlands), in 1931, districts with over 50% of the land permanently settled had a per-acre taxation rate of RS .62, as against RS .99 in other areas. This relationship is shown graphically in Figure 1b.

Table 2 tests whether these negative relationships are statistically robust. Panel A estimates the association of BI's land tenure measure with three measures of colonial state capacity: Taxation, village officials and all public employees. Colonial land-tenure systems have a substantial positive association with all three measures of colonial state capacity, with the pattern being statistically significant for all. Moving from a completely landlord-based system to a completely non-landlord system would increase estimated taxation per acre by half a standard deviation, and increase the proportion of village officials by one standard deviation.

These associations also hold when we examine the effects of permanently settled zamindari tenure rather than the potentially problematic "non-landlord tenure." Panel B

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Table 2: Land Tenure and Colonial State Capacity

| VARIABLES | (1) Taxation 1931 | (2) Village Off. 1931 | (3) Public Administration 1931 |
|---|---|---|---|
| *Panel A: Landlord Tenure* | | | |
| Non-Landlord | 0.357*** | 1.386*** | 0.480** |
| | (0.126) | (0.239) | (0.217) |
| | | | |
| Observations | 182 | 161 | 188 |
| R-squared | 0.342 | 0.530 | 0.455 |
| *Panel B: Permanent Land Tenure* | | | |
| Permanent Zamindari | -0.356* | -1.187** | -1.166*** |
| | (0.197) | (0.483) | (0.347) |
| | | | |
| Observations | 182 | 160 | 188 |
| R-squared | 0.343 | 0.531 | 0.464 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variables are the average land revenue in rupees per acre in 1931, and the logged proportion of workers employed as village officials, and in public administration (other than village officials) at the 1931 census. Controls are date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The independent variables are BI's measure of proportion of land under non-landlord control and the proportion of land under permanent zamindari tenure in 1931. Constants are suppressed.

shows that permanently settled areas have lower levels of all four state capacity measures than other areas.

The differences in state structure were just as apparent at the provincial level, though the internal heterogeneity of tenure systems within provinces makes it harder to make generalizations. Table 3 shows that in 1920 there were approximately eight times as many local board members in the (primarily) Ryotwari provinces (Bombay and Madras) as in the main zamindari provinces (Bengal and Bihar), and a similar disproportion in the number of non-village public employees.[10] Column Three of Table 3, shows broadly the same pattern for per capita taxation at the provincial level: per capita land taxation in Bombay was on average more than twice that of Bengal and Bihar provinces in 1920. In the appendix, Figure A.2 shows that at the provincial level these differences were quite stable over time, and remained virtually unchanged between 1871 and 1911.

Since they were unable to tax effectively, the provincial governments of areas domi-

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[10] "Public force" employees have not been included here, since their distribution is skewed by the existence of military garrisons.

Table 3: Provincial Land Tenure Systems and State Capacity, 1921

| Province | (1) PC Local Boards | (2) % Public Admin | (3) Land Rev. PC | (4) Irrig. Exp. Per 000 | (5) Edu. Exp. Per 000 | (6) % Fees |
|---|---|---|---|---|---|---|
| *Primarily Permanent Zamindari* | | | | | | |
| Bengal | 29.9 | .33 | 11 | 101 | 14 | 42 |
| Bihar | 27.8 | .26 | 9 | 4 | 7 | 25 |
| *Primarily Ryotwari* | | | | | | |
| Bombay | 160.2 | 1.85 | 32.5 | 422 | 43 | 16 |
| Madras | 173.4 | .93 | 25.5 | 147 | 19 | 15 |
| *Mixed and Village-Based* | | | | | | |
| Central Provinces | 134.6 | .87 | 26.75 | 182 | 32 | 9 |
| Punjab | 54.8 | 6.6 | | 715 | 33 | 21 |
| United Provinces | 24.1 | .51 | 26.2 | 128 | 11 | 16 |

Note: Column One shows the number of local and district board members per millions of people, 1919-20 (India, 1922). Column Two show the percentage of male workers who worked in Public Administration, 1921, taken from the census of India. Column Three shows the land revenue in pence per capita in fully accessed areas, in 1919-20 (India, 1922). Columns Four and Five show provincial per capita expenditure in Rupees per thousand people on irrigation and education, 1919-20 (India, 1922). Column Six shows the percentage of educational expenditure coming from school fees, 1919-20 also taken from (India, 1922).

nated by zamindari tenure–especially Bihar and Orissa and Bengal —were underfunded relative to the provincial governments where Ryotwari tenure was common. Table 3 shows the per capita taxation levels of Indian provincial governments in 1920 and their educational and irrigation expenditures. The "ryotwari" provinces were able to spend a consistently higher amount on broadly beneficial public services. Irrigation expenditures were much lower in the provinces with large permanently settled estates (Bengal and Bihar) than in the other provinces, even if we ignore the very high levels of spending in Punjab: In 1921, Ryotwari Bombay spent more than a hundred times as much as Bihar. Education spending also tended to be higher in provinces with ryotwari and village-based systems, with a correspondingly lower proportion of expenditure coming from student fees.[11]

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[11]This inequality is very noticeable even before we account for the fact that in colonial India public goods were underdistributed and maldistributed in areas with elected councils controlled by local elites (Chaudhary, 2009; Suryanarayan, 2014).

## 6.3 State Capacity, Land Tenure and Outcomes

Table 4 examines whether the association between land-tenure and 20th century agricultural productivity is driven by differences in colonial state capacity. Along with the land tenure variable, these models include per capita land revenue from 1931 and the standard set of control variables. Colonial taxation has a strong positive association with agricultural yields and investments, with the association being insignificant and negative only for two measures relating to the use of high-yield seeds. Substantively, an increase of one rupee per acre in 1931 taxation level (a little over a standard deviation) is associated with an increase of 14 percentage points in the proportion of land irrigated, and an additional 14 kilos per hectare of fertilizer usage (about .7 standard deviations). Even more interestingly, the inclusion of the tax variables reduces the estimated effect of non-landlord tenure by approximately 50%, making the effect statistically insignificant in all but one model (compare Table 1, Column Two to Table 4 Panel A).

Given the results of Table 1, it is unsurprising that in Table 4, Panel B, which adds state fixed effects, non-landlord tenure has little or no significant effect on the agricultural outcomes. More interestingly, the association of colonial taxation with outcomes is more consistently estimated within states than between them: While the estimate effect size drops in the fixed effects model, taxation has a positive association with every agricultural variable, and all but one of these associations is statistically significant. These results are also substantively identical after dropping three districts that were outliers on taxation levels in 1931.

The relationship between colonial taxation and the agricultural variables is readily perceptible in the raw data. Figure 2 shows the perceptible positive relationship between colonial taxation and post-independence fertilizer use and average crop yields. Similarly, omitting the land tenure variables does not affect the positive relationship between the agricultural outcomes and colonial taxation (Table 4, Panel C).

These results also generally hold if other measures of colonial state capacity are substituted for the taxation measure. Table A.3 reproduces the results, using the proportion of village officials as an alternative measures of state capacity. After including these measures and state fixed effects, the BI non-landlord tenure measure has a tiny

Table 4: Taxation, Land Tenure and Agricultural Outcomes

| VARIABLES | (1) Irrigation | (2) Fertilizer | (3) HYrice | (4) HY Wheat | (5) HY Cereal | (6) Yield | (7) Rice Yield | (8) Wheat Yield |
|---|---|---|---|---|---|---|---|---|
| *Panel A: Basic Model* | | | | | | | | |
| Non-Landlord | 0.00334 | 3.993 | 0.0990* | 0.0354 | 0.0565 | 0.0479 | 0.120 | 0.152** |
| | (0.0328) | (3.612) | (0.0530) | (0.0495) | (0.0354) | (0.0690) | (0.0879) | (0.0708) |
| Taxation | 0.146*** | 14.27*** | -0.00779 | 0.0590** | -0.0201 | 0.255*** | 0.105** | 0.140*** |
| | (0.0397) | (4.059) | (0.0338) | (0.0267) | (0.0194) | (0.0643) | (0.0503) | (0.0420) |
| | | | | | | | | |
| R-squared | 0.440 | 0.538 | 0.377 | 0.651 | 0.356 | 0.524 | 0.416 | 0.598 |
| | | | | | | | | |
| *Panel B: State FE* | | | | | | | | |
| Non-Landlord | -0.00665 | -1.111 | -0.0176 | 0.0236 | 0.0283 | 0.0310 | -0.0460 | 0.116** |
| | (0.0334) | (3.403) | (0.0511) | (0.0461) | (0.0267) | (0.0765) | (0.0906) | (0.0476) |
| Taxation | 0.109*** | 9.668*** | 0.0282 | 0.0610*** | 0.0309*** | 0.159*** | 0.126*** | 0.114*** |
| | (0.0384) | (3.283) | (0.0285) | (0.0233) | (0.0112) | (0.0553) | (0.0386) | (0.0306) |
| | | | | | | | | |
| R-squared | 0.621 | 0.607 | 0.562 | 0.728 | 0.569 | 0.636 | 0.544 | 0.660 |
| | | | | | | | | |
| *Panel C: Only Taxation* | | | | | | | | |
| Taxation | 0.109*** | 9.575*** | 0.0269 | 0.0628*** | 0.0331*** | 0.161*** | 0.122*** | 0.122*** |
| | (0.0380) | (3.247) | (0.0277) | (0.0223) | (0.0114) | (0.0545) | (0.0366) | (0.0297) |
| | | | | | | | | |
| Adjusted R-squared | 0.617 | 0.603 | 0.556 | 0.724 | 0.562 | 0.632 | 0.538 | 0.654 |
| | | | | | | | | |
| Observations | 3,654 | 4,333 | 3,046 | 2,979 | 2,960 | 4,351 | 4,351 | 3,780 |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variables are the agricultural outcomes used in Table 1. Data are from 1956 to 1987. Data for area under high-yielding varieties ( HYV) is after 1965. Controls are date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The taxation data, from the 1931 land revenue reports, is in rupees per acre.

and inconsistently signed association with the agricultural outcomes. The presence of village officials, by contrast, has a positive association with yields and investments, one that is statistically significant for approximately half of the dependent variables.

## 6.4  Has State Capacity Persisted?

One of the implications of Section Four was that colonial state capacity will affect contemporary outcomes in part through the medium of contemporary state capacity. If this is correct, we should expect levels of state capacity and public service provision to be

Figure 2: Colonial State Capacity and 20th Century Agriculture

(a) Fertilizer

(b) Yields
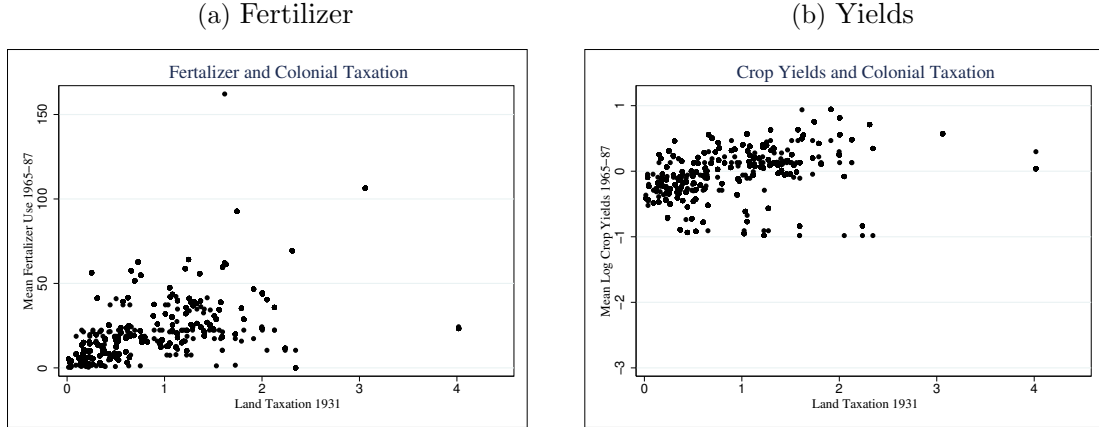


Note: The X axis in both figures is per acre land taxation in rupees in 1931. The Y axis shows the mean log yield for 15 crops for 1965-1987, and the mean kilograms of fertilizer used per acre, 1956-1987

higher in areas that had higher levels of state capacity in colonial times, despite decades of centralizing fiscal and development policy designed to eliminate these inequalities. Table A.2 demonstrates that the inequalities in state capacity seen in the colonial data are alive and well today. Indian states (the level of government for which the most data is available), are grouped by the most common land tenure system, which is highly correlated (as Tables 3 showed) with colonial state capacity. While there is considerable variation from state to state, overall, levels of state taxation were approximately twice as high in 2011 in the primarily village-based and ryotwari states, than in the permanent zamindari areas, a level of inequality only slightly smaller than in the colonial period. Similarly, both the presence of government employees in general and policemen in particular are lower in the permanently settled areas than elsewhere, again reflecting colonial inequalities.

These differences hold at the district level as well. Table A.6 examines the relationship between colonial taxation and the presence of two local public goods, paved roads and primary schools. In each case, the dependent variable is the proportion of villages with the good at the 1991 census. While the availability of public goods in India is conditioned by a wide variety of political factors, the availability of these two, which have strong norms of universal provision, should be at least associated with the capabilities of the state, if only because roads and schools help the state create a presence in rural

villages. Colonial state capacity, as measured by per-acre taxation, is positively and significantly associated with these public goods, supporting the idea that colonial state capacity differences have persisted over time.

It is difficult to identify a monocausal explanation for why differences in state capacity have proved so resilient over time, despite attempts by the central and state governments to reduce them: all three explanations identified in Section 2.3 are plausible, though difficult to test with existing data. It is worth noting, however, that there is a considerable literature on the failure of government programs in India to achieve their declared objectives, and of the state to control its local agents(Anderson, Francois and Kotwal, 2015; Weiner, 1991; Banerjee et al., 2012; Duflo and Hanna, 2005). If constructing local bureaucracies in India is as difficult as these studies describe, it would be very difficult for any government to have eliminated differences in state capacity within the few decades after independence.

## 6.5  Other Factors Influencing Colonial State Capacity

Many factors other than land tenure could plausibly have influenced colonial state capacity. Like modern states, colonial states may have avoided topographically difficult areas or poor areas. Colonial differences may also have reflected precolonial differences is state capacity (Foa, 2016), which was closely associated with the land tenure system. Thus, while some portion of colonial state capacity and land tenure regimes may reflect (exogenous) colonial choices, another portion may reflect (endogenous) local factors.

How can these two mechanisms be separated? This paper adopts three approaches, all of which show that land tenure system choice influenced colonial state capacity even after accounting for endogeneity. Firstly (and unlike BI), all the main models include state fixed effects, accounting for many cultural and geographical differences among districts. Secondly, (like BI) Panel B of Table A.7 focuses only on districts which border other districts with different land tenure systems, thus minimizing observable differences. Despite the small number of observations, these models yield fairly similar results to Table 4.

Finally, Panel A of Table A.7 follows BI in using a two stage least squares model to

account for endogenous selection into land tenure systems, instrumenting land tenure with the date of British conquest. While the validity of the exclusion restriction for this instrument is not beyond criticism (Lee, 2017; Mukherjee, 2013), it is the best existing effort to model the exogenous element of land tenure choice. However, the choice of the IV or OLS model is not driving the results: Table A.7 shows results nearly identical to those in the OLS models in Table 4.

Section A.1 describes some additional statistical tests, not discussed here for reasons of space. These include controlling for colonial-era agricultural outcomes and urbanization, including princely states in the dataset, and conducting a formal mediation analysis. None of these alternative analyses show different results.

# 7 Conclusion

These findings, and the broader historical discussion in Section Four, indicate that while there are noticeable differences between the 20th century development trajectories of zamindari and non-zamindari areas, these differences stem from the structure of the colonial state, and that any effect of the land tenure system is mediated by state capacity. In areas under zamindari tenure, the colonial state collected lower levels of taxes, spent less on public goods, and had fewer village level officials. These differences in colonial state capacity have a strong positive influence on both 20th century public goods and agricultural inputs and outcomes. Land tenure systems themselves have little or no influence on outcomes once the state capacity differences are accounted for.

These findings provide further empirical support for theories in comparative politics that propose state capacity as having important implications for economic development. It expands on this literature by showing that these differences can in some cases be traced back to colonial policy, and persist for long periods. The findings also enrich the existing literature on colonialism, which has often been concerned with institutional quality of regimes rather than their capacity. While many mechanisms may be important in the persistence of colonial differences, state capacity is clearly worthy of sustained examination.

Finally, these findings suggest a slightly different set of solutions for the political

and economic problems of eastern and northern India than BI proposed. Instead of attempting to reduce social conflict, it suggests that enhancing the capacity of the Indian state might have positive effects. By placing officials in rural villages, and attempting to collect taxes, modern Indian states could potentially undo the negative results of colonial failures in state building.

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# Online Appendix

# 1 Additional Statistical Tests

## 1.1 Colonial Agricultural Outcomes

The state capacity literature suggests that the effect of colonial state capacity on modern agricultural outcomes works through its effect on contemporary state capacity or society-state relations. It is, however, possible that high-capacity colonial states themselves encouraged higher levels of agricultural investments and productivity, for instance through the differential levels of irrigation investment between provinces revealed in Table 3, and that these differences have persisted over time. In this case, persistence would be economic rather than political.

Banerjee and Iyer are skeptical of this mechanism, noting that the divergence in yields and investments between zamindari and non-zamindari areas became marked only several decades after independence. However, it is also possible to test this mechanism directly, while including measures of state capacity. Table A.9, Panel A shows the results of a set of regressions that include land taxation, and also two measures of colonial agricultural productivity taken from the 1931 agricultural statistics: the proportion of land irrigated and the proportion of grain cultivation that was rice and wheat (rather than cheaper subsistence grains like millet and sorghum). While both these measures have a strong positive relationship with the agricultural variables, land taxation retains its strong positive association with productivity and investment. The one exception is irrigation, where controlling for colonial irrigation reduced the effect of state capacity on contemporary irrigation to insignificance. For irrigation, then, it appears that the effects of colonialism are physical as well as institutional, an unsurprising finding given the exceptional levels of funding directed to irrigation under the late raj (Ali, 2014).

Given the prominent role of yields, it would be useful to include colonial yield data as a control. Unfortunately, the colonial-era agricultural statistics only include yield data

at the provincial level, and further complicate the matter by reporting only separate seasonal yield figures in some provinces. However, this fragmentary data does not appear to indicate that the permanently settled areas had much higher yields than areas with high proportions of ryotwari tenure. In 1921-22, winter rice yields (in pounds per acre) were 1029 in Bengal and 987 in Bihar, while the overall yield in Madras was 1065. For wheat, yields were 688 in Bengal, 984 (spring) and 451 (winter) in Bihar, and 575 in Bombay and 856 in Punjab. These figures should be compared with the 66% higher rice yields in Madras relative to Bengal and Bihar (pooled) in 1985, and the 79% higher wheat yields in Punjab relative to Bengal and Bihar in the same year.

## 1.2   Colonial Urbanization and Government

This paper has generally been concerned with the agrarian economy and rural political systems: The dependent variables, the land tenure measures, and the colonial state capacity measures are all rural in nature. Urbanization is a potential confound, both because growing cities could serve as a spur to agricultural innovation, or because certain types of land tenure and state institutions, might privilege cities over villages. Similarly, the size of the state might have little effect on rural outcomes if its institutions are concentrated in cities. Table A.9, Panel B shows the results of a set of regressions that include the proportion living in towns (as defined by the census) in 1931, and total proportion of public administrators (excluding village officials) among workers in 1931. Neither of these variables has any discernible effect on the agricultural variables in general. In addition, including these variables does not affect the positive relationship between colonial land taxation and agricultural development.

## 1.3   Princely States

The analysis above has ignored the princely states of India, since they did not have the same type of land tenure systems as British India, had different colonial institutions, and are not included in the BI analysis. However, the broad logic of the theory should extend to the princely states as well: Areas with highly developed colonial-era states should have better contemporary outcomes than other areas. Analyzing the whole sample would also

obviate any concerns that directly ruled areas are in some way unrepresentative of India as a whole.

While taxation data for the princely states is generally unavailable, census data provides some picture of state strength. As we have seen, it is not necessarily clear whether the princely states should have higher capacity states. Overall, village officials were more common in princely India than British India: .33% of the labor force vs. .25%. This concealed considerable internal variation, with Central Indian states like Hyderabad having lower levels of village officials than neighboring British areas. Table A.4 shows that including princely states does not affect the basic results, as the proportion of village officials in 1931 has a strong positive association with agricultural outcomes, even when these areas are included.

## 1.4  Mediated Effects

Section Three contended that the effect of land tenure system should be mediated through the effect of state capacity, and that any direct effect of land tenure system on development should be minor. Table A.5 tests this contention, using the mediation procedure discussed in Imai, Keele and Tingley (2010), and using average logged crop yields as the dependent variable. For both the taxation and village official measures of state capacity, the mediated effect of land tenure is positive and statistically significant. In each case, the estimated direct effect of land tenure is smaller (in the case of the village official model, near zero) and statistically insignificant. This finding provides some very limited indication that much, of the effect of land tenure on crop yields is mediated through state capacity.

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Figure A.1: Colonial Land Taxation Over Time

Figure A.2: Fertilizer



### Land Revenue by Province 1871-1911
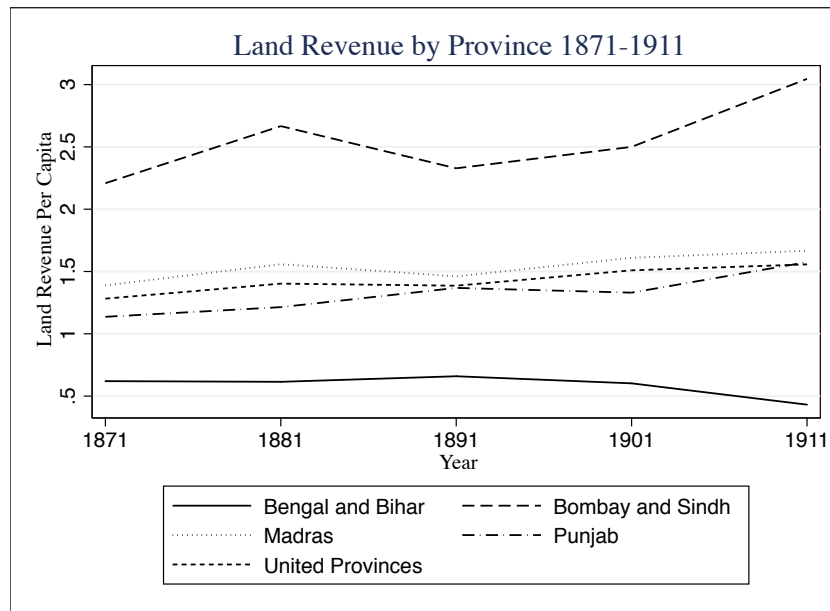
Note:The Y axis shows land revenue per capita at the provincial level in each census year in rupees per capita, taken from the *Statistical Abstract of British India* (various years). The data differ from those in Table 3 in that they do not account for tax exempt land and major cities.

Table A.1: Summary statistics

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Tax Per Acre | 0.91 | 0.649 | 0.015 | 4.018 | 4652 |
| Logged Prop. Village Officials | -6.81 | 1.474 | -12.315 | -4.195 | 4268 |
| Log. Prop. Public Administrators | -4.979 | 0.761 | -7.174 | -3.184 | 4940 |
| Prop. non-landlord | 0.508 | 0.426 | 0 | 1 | 5311 |
| Proportion of gross cropped area irrigated | 0.242 | 0.219 | 0 | 2.105 | 8654 |
| Fertilizer usage | 20.07 | 31.677 | 0 | 506.689 | 8654 |
| Prop. rice HYV | 0.207 | 0.402 | 0 | 14.28 | 8672 |
| Prop. wheat HYV | 0.448 | 1.117 | 0 | 55 | 8672 |
| Prop. other cereals HYV | 0.174 | 0.849 | 0 | 56 | 8492 |
| Prop. other cereals HYV | 0.174 | 0.849 | 0 | 56 | 8492 |
| Log yield of 15 major crops | -0.16 | 0.598 | -9.195 | 2.217 | 8668 |
| Log rice yield | -0.083 | 0.609 | -4.697 | 3.178 | 8208 |
| Log wheat yield | -0.093 | 0.657 | -3.077 | 2.891 | 7670 |
| Altitude | 351.472 | 139.615 | 33 | 906 | 8672 |
| Mean annual rainfall | 1183.077 | 555.974 | 79.156 | 4658.363 | 8672 |
| Black soil dummy | 0.24 | 0.427 | 0 | 1 | 8672 |
| Red soil dummy | 0.155 | 0.362 | 0 | 1 | 8672 |
| Alluvial soil dummy | 0.513 | 0.5 | 0 | 1 | 8672 |
| Latitude | 22.591 | 5.022 | 8.220 | 32 | 8672 |
| Coastal dummy | 0.114 | 0.318 | 0 | 1 | 8672 |
| Date of Annexation | 1807.556 | 28.839 | 1750 | 1861 | 5311 |

Table A.2: Land Tenure and Modern State Capacity

| State | Gov Employees PC | Police PC | Taxation PC |
|---|---|---|---|
| *Primarily Permanent Zamindari* | | | |
| Bihar | 0.017 | 0.655 | 3.75 |
| Orissa | 0.019 | 0.790 | 4.77 |
| West Bengal | 0.046 | 0.810 | 5.43 |
| *Primarily Village-Based* | | | |
| Haryana | 0.012 | 1.321 | 9.27 |
| Punjab | 0.029 | 2.378 | 9.08 |
| *Primarily Ryotwari* | | | |
| Maharashtra | 0.038 | 1.487 | 9.12 |
| Tamil Nadu | 0.032 | 0.981 | 8.84 |
| *Primarily Princely* | | | |
| Himachal Pradesh | 0.024 | 1.584 | |
| Karnataka | 0.021 | 0.717 | 8.21 |
| Kerala | 0.031 | 1.055 | 7.75 |
| Rajasthan | 0.027 | 0.935 | 5.58 |
| *Mixed* | | | |
| Andhra Pradesh | 0.030 | 0.850 | 6.57 |
| Gujarat | 0.023 | 1.111 | 7.77 |
| Madhya Pradesh | 0.022 | 0.910 | 5.17 |
| Uttar Pradesh | 0.020 | 0.923 | 4.49 |

The outcomes shows are per capita government employees in 2011 (taken from https://data.gov.in/catalog/employment-public-sector-and-private-sector, the civil police per 1000 people in 1992, taken from the Crime in India Dataset, and the level of per capita state taxation in 1960 rupees (taken from Besley and Burgess (2002)).

Table A.3: Bureaucracy, Land Tenure and Agricultural Outcomes

| VARIABLES | (1) Irrigation | (2) Fertilizer | (3) HYrice | (4) HY Wheat | (5) HY Cereal | (6) Yield | (7) Rice Yield | (8) Wheat Yield |
|---|---|---|---|---|---|---|---|---|
| Non-Landlord | -0.0280 | -1.211 | -0.0279 | 0.00505 | 0.00791 | -0.0103 | -0.0742 | 0.0812 |
| | (0.0417) | (4.431) | (0.0612) | (0.0437) | (0.0220) | (0.0889) | (0.102) | (0.0550) |
| Log Vill. Off. | 0.0582*** | 4.033** | 0.0254 | 0.0258 | 0.0296** | 0.0762* | 0.0641* | 0.0286 |
| | (0.0191) | (1.763) | (0.0212) | (0.0205) | (0.0122) | (0.0402) | (0.0354) | (0.0282) |
| | | | | | | | | |
| Observations | 3,465 | 4,109 | 2,879 | 2,806 | 2,787 | 4,127 | 4,109 | 3,529 |
| R-squared | 0.633 | 0.598 | 0.564 | 0.724 | 0.520 | 0.642 | 0.548 | 0.660 |
| | | | | | | | | |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variables are the agricultural outcomes used in Table 1. Data are from 1956 to 1987. Data for area under high-yielding varieties ( HYV) is after 1965. Controls are date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The key independent variables, taken from the 1931 census, is the logged proportion of total workers who were village officials.

Table A.4: Bureaucracy, Princely States and Agricultural Outcomes

| VARIABLES | (1) Irrigation | (2) Fertilizer | (3) HYrice | (4) HY Wheat | (5) HY Cereal | (6) Yield | (7) Rice Yield | (8) Wheat Yield |
|---|---|---|---|---|---|---|---|---|
| Log Vill. Off. | 0.0308* | 3.191*** | 0.0282** | 0.0370** | 0.0254* | 0.0484 | 0.0484 | 0.0453* |
| | (0.0164) | (1.218) | (0.0141) | (0.0153) | (0.0149) | (0.0335) | (0.0295) | (0.0259) |
| Direct Rule | -0.188*** | -18.62** | -0.207** | -0.0573 | -0.138* | -0.839*** | -0.290** | -0.721*** |
| | (0.0682) | (7.995) | (0.0874) | (0.105) | (0.0701) | (0.177) | (0.132) | (0.149) |
| Constant | 4.039*** | 248.9*** | 0.785 | 0.705 | 0.203 | 6.484*** | 5.840*** | 3.020** |
| | (0.935) | (87.46) | (1.475) | (1.086) | (0.530) | (1.914) | (2.198) | (1.273) |
| | | | | | | | | |
| Observations | 3,883 | 4,607 | 3,202 | 3,035 | 3,111 | 4,607 | 4,589 | 3,838 |
| Adjusted R-squared | 0.602 | 0.588 | 0.573 | 0.701 | 0.517 | 0.618 | 0.532 | 0.630 |
| | | | | | | | | |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variables are the agricultural outcomes used in Table 1. Data are from 1956 to 1987. Data for area under high-yielding varieties ( HYV) is after 1965. Controls are altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The key independent variable, taken from the 1931 census, is the logged proportion of total workers who were village officials.

Table A.5: State Capacity as a Mediator

| VARIABLES | (1) Estimate | (2) 95% Confidence Interval |
|---|---|---|
| Village Official ACME | .0420 | (-.001, .105) |
| Direct Effect | .002 | (-.162, .171) |
| Taxation ACME | .044 | (.000, .110) |
| Direct Effect | .029 | (-.09, .228) |
| | | |
| Controls | YES | YES |
| State FE | YES | YES |
| Year FE | YES | YES |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table reports the average causal mediated treatment effects of the proportion of landlord cultivation in the district of average log yields as mediated by a state capacity measure (taxation or village officials) and the direct effects of the proportion of landlord cultivation in the district. The effect of land tenure on state capacity is estimated using a linear model that includes state fixed effects and controls date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The effect of state capacity on yields is estimated using a linear model that includes all these variables as well as state capacity and year fixed effects.

Table A.6: Colonial Taxation and Modern State Capacity

| VARIABLES | (1) Primary Schools | (2) Paved Roads | (3) Primary Schools | (4) Paved Roads |
|---|---|---|---|---|
| Taxation 1931 | 0.0345** | 0.0313* | | |
| | (0.0163) | (0.0163) | | |
| Log. Village Off. | | | 0.0305*** | -0.000355 |
| | | | (0.0104) | (0.0113) |
| Constant | -0.615 | 0.00794 | -0.513 | 0.162 |
| | (0.740) | (0.743) | (0.723) | (0.781) |
| | | | | |
| Controls | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES |
| Observations | 171 | 171 | 154 | 154 |
| R-squared | 0.828 | 0.899 | 0.848 | 0.884 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variables are the proportion of villages having primary schools and paved roads in 1981. Controls are date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions.

Table A.7: Causal Tests: Taxation, Land Tenure and Agricultural Outcomes

| VARIABLES | (1) Irrigation | (2) Fertilizer | (3) HYrice | (4) HY Wheat | (5) HY Cereal | (6) Yield | (7) Rice Yield | (8) Wheat Yield |
|---|---|---|---|---|---|---|---|---|
| *Panel A: Instrumental Variables* | | | | | | | | |
| Non-Landlord | -0.0500 | 0.561 | -0.103 | -0.0309 | 0.109 | -0.363 | -0.770** | 0.0112 |
| | (0.0756) | (6.094) | (0.102) | (0.149) | (0.0723) | (0.252) | (0.361) | (0.137) |
| Taxation 1931 | 0.113*** | 9.528*** | 0.0347 | 0.0653*** | 0.0245* | 0.191*** | 0.184*** | 0.121*** |
| | (0.0385) | (3.309) | (0.0290) | (0.0249) | (0.0128) | (0.0540) | (0.0440) | (0.0292) |
| Constant | 3.622*** | 197.1*** | 1.456 | 0.504 | 0.0727 | 5.421** | 5.895** | 1.658 |
| | (0.798) | (67.32) | (1.303) | (1.190) | (0.563) | (2.083) | (2.555) | (1.282) |
| | | | | | | | | |
| Observations | 3,654 | 4,333 | 3,046 | 2,979 | 2,960 | 4,351 | 4,351 | 3,780 |
| R-squared | 0.619 | 0.607 | 0.558 | 0.727 | 0.561 | 0.594 | 0.437 | 0.659 |
| *Panel B: Border Districts* | | | | | | | | |
| Non-Landlord | 0.00226 | 1.695 | 0.0290 | 0.0620 | -0.00259 | 0.0980** | 0.00592 | 0.174*** |
| | (0.0233) | (4.850) | (0.0860) | (0.0410) | (0.0306) | (0.0446) | (0.0662) | (0.0529) |
| Taxation | 0.214*** | 14.85** | 0.127 | -0.0293 | -0.0920*** | 0.131* | 0.188* | -0.0207 |
| | (0.0286) | (5.553) | (0.103) | (0.0344) | (0.0310) | (0.0650) | (0.0922) | (0.0934) |
| Constant | 4.405*** | 213.3* | 2.288 | 1.442 | -0.235 | 4.039*** | 2.306* | 0.837 |
| | (0.431) | (115.7) | (2.902) | (0.861) | (0.373) | (1.432) | (1.300) | (1.487) |
| | | | | | | | | |
| Observations | 754 | 895 | 630 | 602 | 625 | 895 | 895 | 695 |
| Adjusted R-squared | 0.884 | 0.559 | 0.705 | 0.768 | 0.547 | 0.870 | 0.736 | 0.647 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variables are the agricultural outcomes used in Table 1. Data are from 1956 to 1987. Data for area under high-yielding varieties ( HYV) is after 1965. Controls are date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The taxation data, from the 1931 land revenue reports, is in rupees per acre. In Panel A, BI's measure of proportion of land under non-landlord control is instrumented with the date of annexation by the British, as described on (Banerjee and Iyer, 2005, :1203-1205). In Panel B, the sample is restricted to districts on the border between land tenure zones, as coded by BI.

Table A.8: Alternate Measures of Land Tenure

| VARIABLES | (1) Irrigation | (2) Fertilizer | (3) HYrice | (4) HY Wheat | (5) HY Cereal | (6) Yield | (7) Rice Yield | (8) Wheat Yield |
|---|---|---|---|---|---|---|---|---|
| *Panel A: Permanent Zamindari Tenure* | | | | | | | | |
| Permanent Zam. Tenure | 0.00304 | 5.335 | -0.0272 | 0.0491 | 0.0347 | -0.187** | -0.266*** | -0.109* |
| | (0.0461) | (3.893) | (0.0726) | (0.0574) | (0.0221) | (0.0723) | (0.0700) | (0.0571) |
| Taxation 1931 | 0.109*** | 9.772*** | 0.0259 | 0.0648*** | 0.0346*** | 0.154*** | 0.112*** | 0.119*** |
| | (0.0381) | (3.223) | (0.0282) | (0.0225) | (0.0115) | (0.0545) | (0.0369) | (0.0295) |
| Constant | 3.506*** | 152.7** | 1.503 | 0.0128 | -0.0415 | 6.385*** | 6.837*** | 2.614** |
| | (0.950) | (74.04) | (1.504) | (1.310) | (0.548) | (2.026) | (1.999) | (1.320) |
| | | | | | | | | |
| Observations | 3,654 | 4,333 | 3,046 | 2,979 | 2,960 | 4,351 | 4,351 | 3,780 |
| R-squared | 0.621 | 0.608 | 0.562 | 0.728 | 0.569 | 0.641 | 0.551 | 0.659 |
| *Panel B: Ryotwari Tenure* | | | | | | | | |
| Ryotwari Tenure | -0.0516 | -0.960 | -0.0230 | 0.0608 | 0.00465 | 0.212 | 0.0816 | 0.150* |
| | (0.0550) | (4.689) | (0.0798) | (0.0588) | (0.0694) | (0.138) | (0.126) | (0.0766) |
| Taxation 1931 | 0.111*** | 9.610*** | 0.0276 | 0.0607*** | 0.0330*** | 0.154*** | 0.119*** | 0.118*** |
| | (0.0387) | (3.300) | (0.0287) | (0.0224) | (0.0112) | (0.0540) | (0.0364) | (0.0296) |
| Constant | 3.555*** | 198.5*** | 1.286 | 0.408 | 0.251 | 4.725** | 4.576** | 1.606 |
| | (0.779) | (66.17) | (1.336) | (1.111) | (0.450) | (1.825) | (1.837) | (1.156) |
| | | | | | | | | |
| Observations | 3,654 | 4,333 | 3,046 | 2,979 | 2,960 | 4,351 | 4,351 | 3,780 |
| R-squared | 0.622 | 0.607 | 0.562 | 0.728 | 0.568 | 0.640 | 0.544 | 0.659 |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variables are the agricultural outcomes used in Table 1. Data are from 1956 to 1987. Data for area under high-yielding varieties ( HYV) is after 1965. Controls are date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The taxation data, from the 1931 land revenue reports, is in rupees per acre.

Table A.9: Taxation, Land Tenure and Agricultural Outcomes

| VARIABLES | (1) Irrigation | (2) Fertilizer | (3) HYrice | (4) HY Wheat | (5) HY Cereal | (6) Yield | (7) Rice Yield | (8) Wheat Yield |
|---|---|---|---|---|---|---|---|---|
| *Panel A: Colonial Agricultural Outcomes* | | | | | | | | |
| Taxation 1931 | 0.0154 | 5.984** | 0.0120 | 0.0508** | 0.0296** | 0.0988** | 0.0918*** | 0.0864*** |
| | (0.0154) | (2.363) | (0.0254) | (0.0217) | (0.0128) | (0.0384) | (0.0333) | (0.0244) |
| Irrigation 1931 | 0.749*** | 21.38*** | 0.0201 | 0.220*** | -0.0543 | 0.434*** | 0.321*** | 0.308*** |
| | (0.0521) | (6.359) | (0.0813) | (0.0782) | (0.0344) | (0.115) | (0.107) | (0.0924) |
| High Value Food | -0.0131 | 13.78** | 0.176* | -0.148 | -0.0474 | 0.700*** | 0.545*** | -0.317** |
| Grains 1931 | (0.0424) | (6.474) | (0.0914) | (0.105) | (0.0595) | (0.176) | (0.140) | (0.148) |
| | | | | | | | | |
| *Panel B: Urbanization and State Size* | | | | | | | | |
| Taxation 1931 | 0.108*** | 9.569*** | 0.0260 | 0.0615*** | 0.0333*** | 0.161*** | 0.122*** | 0.119*** |
| | (0.0363) | (3.255) | (0.0258) | (0.0213) | (0.0113) | (0.0534) | (0.0367) | (0.0304) |
| Public Admin 1931 | 0.0192 | -2.068 | -0.00886 | -0.0301 | -0.0176 | -0.00389 | 0.0434 | 0.0119 |
| | (0.0282) | (1.789) | (0.0275) | (0.0232) | (0.0159) | (0.0511) | (0.0378) | (0.0306) |
| Urbanization 1931 | -0.0391** | 1.180 | -0.0297 | -0.0224* | -0.0106 | -0.0186 | -0.0315 | 0.0172 |
| | (0.0185) | (1.867) | (0.0299) | (0.0131) | (0.0137) | (0.0273) | (0.0264) | (0.0252) |
| | | | | | | | | |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 3,277 | 3,885 | 2,725 | 2,657 | 2,757 | 3,903 | 3,903 | 3,586 |
| R-squared | 0.838 | 0.670 | 0.581 | 0.733 | 0.576 | 0.712 | 0.559 | 0.665 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dependent variables are the agricultural outcomes used in Table 1. Data are from 1956 to 1987. Data for area under high-yielding varieties ( HYV) is after 1965. Controls are date of British rule, altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The controls variables are the proportion of cropped area irrigated in 1931, the proportion of area under food grains planed with wheat and rice in 1931, the logged proportion of workers in public administration in 1931, the logged proportion of the population in towns in 1931, and the proportion of land under permanent zamindari tenure in 1931.