HARVARD | BUSINESS | SCHOOL

Direct versus Indirect Colonial Rule in India: Long-term Consequences

Lakshmi Iyer

Working Paper

05-041

Direct versus Indirect Colonial Rule in India: Long-term Consequences*

Lakshmi Iyer†

October 2008

Abstract

This paper compares economic outcomes across areas in India which were under direct British colonial rule with areas which were under indirect colonial rule. Controlling for selective annexation using a specific policy rule, I find that areas which experienced direct rule have significantly lower levels of access to schools, health centers and roads in the post-colonial period. I find evidence that the quality of governance in the colonial period has a significant persistent effect on post-colonial outcomes.

Keywords: colonial rule, development, public goods

JEL classification: O11, P16, N45

*I thank two anonymous referees, Josh Angrist, Simon Johnson, Kaivan Munshi, Nathan Nunn, Rohini Pande, Marko Terviö and numerous seminar participants for extremely helpful comments. I am grateful to Daron Acemoglu, Abhijit Banerjee and Esther Duflo for valuable advice and guidance throughout this project, the MIT Department of Economics and the MacArthur Foundation for financial support, Esther Duflo for generously sharing her code for the randomization inference procedure and Latika Chaudhury for data from the 1911 census.

†Harvard Business School, Boston MA 02163. Email: liyer@hbs.edu

1 Introduction

Does the experience of colonial rule have a long-term impact on economic development? This is a topic which has generated considerable debate. Several scholars have emphasized the negative effects of colonial rule on development, citing factors such as excessive exploitation of colonies, drain of resources or the growth of a "dependency" complex (see Frank, 1978 or Bagchi, 1982). Others emphasize the positive role of colonial empires in securing peace and external defense (Lal, 2004), and encouraging international trade and capital movements (Ferguson, 2002). Some authors also hold the view that resource endowments or area characteristics are the major determining forces of long-term outcomes, and that colonial rule plays only a minor part (e.g. Herbst, 2000 on Africa, or Roy, 2002 on India).

I examine the colonial experience of one country, India, and compare the long-term outcomes of areas which were under *direct* British colonial rule with those which were under *indirect* colonial rule. Indirect rule in this context refers to those areas of India which were under the administration of Indian kings rather than the British crown; these were known as the "native states" or the "princely states." The defense and foreign policies of these native states were completely controlled by the British during the colonial period, but they enjoyed considerable autonomy in matters of internal administration. After the end of colonial rule in 1947, all these areas were integrated into independent India, and have since been subject to a uniform administrative, legal and political structure. The analysis in this paper, therefore, cannot answer the question of what outcomes would have been like in the complete absence of colonial rule, but does illustrate the persistent effects of different degrees of colonial rule.

The major issue in such a comparison is, of course, the problem of selection. It is unlikely that the British randomly annexed areas for direct colonial rule. I am able to solve the selection problem by taking advantage of a unique feature of British annexation policy in India. Between 1848 and 1856, the British Governor-General Lord Dalhousie implemented

the notorious "Doctrine of Lapse," under which he refused to recognize adopted heirs and annexed several native states where the ruler died without a natural heir. This policy enables me to use the death of a ruler without an heir in the specific period of 1848 to 1856 as an instrument for becoming part of the British empire, and thus coming under direct colonial rule. The identifying assumption here is that the death of a ruler without an heir, in this specific period of time, is likely to be a matter of circumstance and unlikely to have a direct impact on outcomes in the post-colonial period.

I find that the directly-ruled British areas have significantly lower availability of public goods such as schools, health centers and roads in the post-colonial period, and are not significantly better in terms of agricultural investments and productivity. These instrumental variable estimates, which control for selective annexation, contrast sharply with OLS results which show directly-ruled British areas having significantly higher agricultural investments and productivity. This suggests strongly that the British annexed areas with the greatest agricultural potential, but did not invest as much as native states in physical and human capital. This under-investment is costly for development: directly ruled areas have higher levels of poverty and infant mortality in the post-colonial period.

I perform several robustness checks for my instrumental variable strategy, to verify that the fact of a ruler dying without a natural heir does not have an independent effect on long-term outcomes. In particular, I conduct a "falsification exercise" where I consider deaths of rulers without natural heirs in a different period when the "Doctrine of Lapse" had been officially abandoned by the British (so that death would not result in becoming part of the British empire). I find no significant differences here, supporting the conclusion that it is the fact of direct colonial rule which matters for the long run, rather than other aspects of historical ruler deaths.

I consider several different explanations of why we might see greater investment in

human and physical capital in the indirectly ruled areas. I find that the gap between direct and indirect rule areas on these measures is narrowing over time, suggesting that differences in post-colonial institutions are unlikely to be the intervening mechanism. The differences in human capital outcomes, such as literacy, were present in the colonial period itself. I examine the operation of one specific institution – electoral democracy – and find no differences in electoral participation or the competitiveness of elections between direct and indirect rule areas in the post-colonial period.

I then examine differences in colonial period institutions and find three suggestive facts. First, native states raised higher taxes per capita than directly ruled British areas, but this does not explain the differences in access to public goods. However, it does rule out the possibility that excessive colonial extraction is the driving mechanism. Second, local institutions, such as the prevalent land tenure system, matter for long-term outcomes only in the British areas and not in indirectly ruled areas. Third, the fact that the British retained the right to depose native state rulers in cases of "misrule" appears to play an important role. This right was exercised quite often and thus constituted a credible threat. I find that areas where the British deposed the rulers were indeed the worst-performing ones in the sense that these areas do not show any significant advantage compared to the directly-ruled British areas. Overall, this pattern of results suggests that good governance in the colonial period has very persistent effects, and that directly ruled areas were on par with the least well governed native states.

This paper is part of a growing research program demonstrating the long-term impacts of colonial rule. The question of what outcomes would have been had European countries never established vast overseas empires is quite difficult to answer because of the potential for spillover effects from colonies to non-colonies. Most comparative research has therefore focused on the effects of different types or "flavors" of colonial rule. Feyrer and Sacerdote

(2007) find that islands with longer periods of colonial rule have better present-day outcomes; Bertocchi and Canova (2002) find that the post-independence economic performance of British colonies in Africa is less volatile than that of French and German colonies.

Several papers have examined the long-term consequences of specific institutions instituted by colonial powers. These include the property rights institutions created by colonial rulers (Acemoglu, Johnson and Robinson, 2001); the distribution of historical property rights (Engerman and Sokoloff, 2005; Banerjee and Iyer, 2005); the legal systems put in place by colonial powers (La Porta et. al., 1998a, 1998b; Berkowitz and Clay, 2004); the systems of tax collection (Berger, 2008); the extent of slavery (Nunn, 2008); and colonial investments in education and health (Huillery, 2006). Some of these studies use innovative instrumental variables to get around the problem of selection. Acemoglu, Johnson and Robinson (2001) use initial settler mortality as an instrument for the strength of property rights institutions; Feyrer and Sacerdote (2007) use wind patterns as an exogenous determinant of colonial rule; and Banerjee and Iyer (2005) rely on exogenous changes in British land policy.

The rest of the paper is organized as follows: section 2 describes the British colonial experience in India and the nature of indirect colonial rule in the native states. Section 3 discusses why indirect rule might have different long-term consequences than direct colonial rule. Section 4 briefly discusses the OLS comparions between areas under direct and indirect rule and Section 5 describes the instrumental variables strategy and provides estimates of the causal impact of British rule. Section 6 documents differences between areas under direct and indirect rule over time, section 7 provides empirical evidence on several possible intervening mechanisms, and section 8 concludes the paper.

2 Direct and Indirect British Colonial Rule in India

2.1 British India and the Native States

The British empire in the Indian subcontinent lasted nearly 200 years. Beginning in 1757, all the areas of present-day India, Pakistan, Bangladesh and Burma were brought under British political control by the middle of the nineteenth century. Of this area, "British India" was defined as "all territories and places within Her Majesty's dominions which are for the time being governed by Her Majesty through the Governor-General of India";[1] the remaining areas were referred to as the "native states" or the "princely states" by the Colonial government and were ruled by hereditary kings.[2] I will use the term "native states" throughout the paper.

About 680 native states were recognized by the Foreign Office in 1910. Native states constituted about 45% of the total area of British India (excluding Burma and Sind) and about 23% of the total population in 1911. The map in Figure 1 shows the geographic distribution of native states. We see that native states were present in all parts of India, with somewhat higher concentrations in the western and central parts of the country.

[1] Interpretation Act of 1889

[2] The precise definition of a native state was the matter of some debate. Sir William Lee-Warner (1910), for instance, defines a native state as "a political community, occupying a territory in India of defined boundaries, and subject to a common and responsible ruler who has actually enjoyed and exercised, as belonging to him in his own right duly recognized by the supreme authority of the British Government, any of the functions and attributes of internal sovereignty." According to the Imperial Gazetteer (Hunter et. al. 1908), a major defining feature can be said to be "the personal rule of the chief and his control over legislation and the administration of justice." In practice, this meant that "Whether or not a so-called Native State is what it professes to be is a question of fact which, in the absence of a legal decision, must be settled by the present action of the British paramount power." i.e. native states were those which had been recognized by the British as such.

Native states varied considerably in all dimensions. Some consisted of only a few villages, while the largest native state, Hyderabad, had an area of 98,000 square miles. They had varying degrees of legal autonomy, from "first class states" having maximum legal powers (including that of the death penalty over their own subjects, though not over British subjects) to "third class states" who could only try civil cases involving small sums of money. Native states also varied considerably with regard to their systems of administration and revenue-collection, their currency, legal codes, law enforcement and justice systems. Over time, some states adopted the legal codes and currency prevailing in British India, though the British usually did not force them to do so but waited instead for "the willing cooperation of the Native princes." The majority of rulers were Hindu kings, though there were several Muslim and Sikh rulers as well.[3]

2.2 British Policy Towards the Native States

Why didn't the British bring the whole Indian subcontinent under direct colonial rule? This was mainly because of a major policy change in the nineteenth century: after the "Sepoy Mutiny" of 1857, the British stopped all further annexation of native states into the British empire. In fact, British policy towards the native states underwent considerable changes over time, from the policy of the "ring-fence" (1765-1818) to that of "subordinate isolation" (1818-1858) to that of "non-annexation with the right of intervention" (1858-1947). This variation over time was heavily influenced by the views of different Governor-Generals.

The ring-fence: In the initial period of British rule (1765-1818), the dominant policy

[3]Appendix Table 1 lists details of the major native states in our data set. In 1877, the largest and most important states were designated by the British as "salute states" and the rulers were entitled to a ceremonial gun salute. The table lists the native states in order of the number of guns in the salute, reflecting their importance in the eyes of the British.

was of non-intervention: the East India Company did not wish to annex too much territory under their own administration, both because they were numerically and politically weak, and because they wanted to maintain a "ring-fence" between their areas and the stronger empires of the Marathas and the Sikhs. This was exemplified, for instance, in Clive's decision not to annex Oudh and Delhi in 1765 after the Battle of Buxar, or the decisions of Cornwallis and Barlow to return many conquered areas to Indian rulers in the peace treaties signed after the battles of 1802-1804. Nevertheless, the East India Company annexed a number of areas during this period, mostly by fighting and winning wars against Indian rulers (Table 1). Several territories were also ceded or granted to the British by native rulers, usually for non-payment of debts or tribute.

Subordinate isolation*:* In 1817-1818, the British won a series of battles against the Pindari raiders of central India, as well as the Maratha rulers of Poona, Nagpur and Indore. This set of military victories led to the British emerging as the dominant political power in the subcontinent. The British now followed the policy of "subordinate isolation:" all native states were made politically subordinate to the British and accepted the British as the "Paramount Power" in India. They could not declare war, establish relations with other states or employ Europeans without explicit British permission. Many of them signed treaties with the British which regulated the size of their armed forces and several native states had British forces stationed within their territory. Most of the native states also had annual tribute obligations to the British government (or in some cases to another native state): for the native states in our data set, the tribute varied from zero to 28% of state revenue. However, they were allowed considerable autonomy in internal matters unless they had specific treaty provisions.[4]

[4]These could be explicit restrictions, such as the ruler of Panna being asked to abolish the practice of *sati* (widow-burning) in his kingdom, or more general ones, such as the ruler of Oudh being required to

During 1818-1848, the East India Company continued annexing areas, though at a somewhat slower rate. The pace of British annexation picked up considerably after Lord Dalhousie became Governor-General in 1848. In addition to fighting the second Sikh war in Punjab, Lord Dalhousie also annexed areas by taking over territories due to non-payments of debts (Berar), accusing the native rulers of "misrule" (Oudh) and, most controversially, by refusing to recognize adoptions and annexing areas where the native ruler died without a natural heir (the so-called policy of "lapse").

The end of annexation: In 1857, Indian soldiers in the British army mutinied against their officers. The causes of this "Sepoy Mutiny" are not very clear, and historians disagree as to whether it was a planned war of independence against British power, or an uncoordinated uprising of soldiers who felt a threat to their religion and traditional practices (Spear, 2002), or simply a mutiny by soldiers who wanted increased pay and greater career opportunities (David, 2002). After some initial reverses, the British rallied and were able to suppress the mutiny by the end of 1858. The actions of the rulers of the native states during the revolt were varied. Some rulers of previously annexed states (e.g. Jhansi) became leaders of the mutiny, and a few others (e.g. Rajgarh) explicitly or covertly helped the mutineers. However, many native states aided the British by supplying troops and equipment, or by defending the Europeans within their territory.

The mutiny was a major shock to British power in India. The administration of India was taken over by the British Crown from the East India Company in 1858, and, since the British felt that the native states had played an important role in helping them during the mutiny, plans of further annexation were given up, with the Queen's proclamation of 1858 stating specifically that "We desire no extension of our present territorial possessions." Thus,

implement policies which "shall be conducive to the prosperity of his subjects, and be calculated to secure the lives and property of the inhabitants."

the areas which had not been annexed until 1858 continued to be native states till the end of British rule in 1947.

Although outright annexation of territory was given up in 1858, the British reserved the right to intervene in the internal affairs of native states "to set right such serious abuses in a Native Government as may threaten any part of the country with anarchy or disturbance."[5] They exercised this right in several native states, often by deposing the ruler and installing another in his place (usually a son, brother, cousin or adopted heir) or by appointing a British administrator or council of Regency for some time before allowing the king to take up ruling powers again.[6] During World War I, several native rulers contributed troops and resources to the British war effort. Partly as a result of this, the policy of isolation of native states was finally abandoned and a Council of Princes was constituted in 1921 where they could officially meet and cooperate with each other.

2.3 Native States in Independent India

When the British left in 1947, all native states signed treaties of accession to the newly independent nations of India or Pakistan, sometimes under the threat of military action. By 1950, all the native states within the borders of India had been integrated into independent India, and were subject to the same administrative, legal, and political systems as those of the erstwhile British Indian areas. The rulers of these states were no longer sovereign rulers, but many of them continued to play an active role in the politics of post-Independence India. They were granted annual incomes ("privy purses") by the Indian government as partial compensation for their loss of state revenue, but this privilege, along with all other

[5]Lord Canning, Government of India Foreign Department Despatch No. 43A to S/S, 30 April 1860.

[6]Different Viceroys used this power to intervene in different degrees; one of the most vigorous in this regard was Lord Curzon, Viceroy from 1899 to 1905, during whose tenure fifteen rulers were either forced to abdicate or temporarily deprived of their powers (Ashton 1982).

princely honors, was discontinued in 1971.

3 Why Might Direct Colonial Rule Matter for Long-term Outcomes?

Why should areas directly ruled by a colonial power have different long-run outcomes compared to areas ruled indirectly by local rulers? One hypothesis is that differences in historical circumstances might affect post-colonial policies or the functioning of modern institutions and therefore lead to differences in post-colonial outcomes. This has been shown in other studies, such as the greater propensity of historically unequal Indian states to enact land reforms (Banerjee and Iyer, 2005), or the functioning of the legal system across differents U.S. states (Berkowitz and Clay, 2004). I check for the presence of such policy effects by running regressions with state fixed effects in section 5.5.

One major institutional difference between areas under direct and indirect rule is likely to be in the operation of democratic processes. Members of the erstwhile ruling families of the native states continued to be active in the politics of post-colonial India, with several former princes being elected to national and state level political office (Allen and Dwivedi, 1998). Such candidates have significant electoral advantages in terms of higher name recognition, strong ties with the local elites, as well as greater resources. Their presence in politics may result in higher voter participation and a more informed electorate and therefore greater pressure on political representatives to deliver public goods.[7]

[7]There are two offsetting factors to this: first, higher electoral advantages may translate into *lower* incentives for politicians to actually deliver public goods and second, areas under direct British rule had a longer experience with democratic processes, since provincial elections had been held in these areas during the colonial period following the Government of India Act of 1935. An early study by Richter (1975) finds lower voter turnout and higher victory margins for candidates in native state constituencies in the elections

I investigate this possibility in two ways. First, I provide evidence in section 6 that strongly suggests that the differences arose mainly in the colonial period and are narrowing in the post-colonial period. Second, I use data from post-colonial elections to test whether voter turnout or measures of electoral competitiveness were different across areas of direct and indirect rule.

I then turn to the question of why directly ruled areas might have different economic outcomes during the colonial period, and consider several potential hypotheses. The first hypothesis is that colonial rulers might set up poor institutions in places where they do not intend to settle over the long term. For instance, property rights may be poorly protected, or there might insufficient focus on investments which primarily benefit the local population rather than the colonial power.[8] This hypothesis is plausible in the Indian context, because the British did not settle in India in large numbers: as late as 1911, the proportion of Christians in India was less than 1.3% of the population.

I focus on one important institution: the land revenue system. Land revenue was the largest source of government revenue, both for British India and for the native states. Banerjee and Iyer (2005) have shown that areas with landlord-based revenue systems, where landlords were in charge of revenue collection, have worse long-run outcomes compared to places with "cultivator-based" systems, where the ruler collected the revenue directly from the cultivators. The former system resulted in greater land inequality, and could indirectly have led to worse governance by the colonial state, since most of the gains of any productivity

of 1957, 1962 and 1967. However, this analysis does not control for omitted variables or selection into direct rule.

[8]Several previous studies have highlighted the role of such factors. Acemoglu, Johnson and Robinson (2001) find that colonies where settlement was deterred by the disease environment have poorer indicators of property rights protection, and Feyrer and Sacerdote (2007) find that Pacific islands which were colonized during the era of enlightenment have better outcomes in the long run.

improvements would be captured by the landlords.[9] This paper differs in two important ways: the analysis of Banerjee and Iyer (2005) does not include the indirectly ruled areas, and they find that the primary channel of influence is through the impact of historical institutions on post-colonial policy. In Section 7, I extend the analysis to include indirectly ruled areas, and find a much more nuanced result.

Another version of the "extractive institutions" hypothesis is that colonial rulers might resort to excessive taxation as part of a strategy to extract the colony's resources to the benefit of the colonial power, and that they might be able to do this more effectively in directly ruled areas. In India, Mukherjee (1972) estimates the extent of "economic drain" from India to Britain to be be of the order of 0.04-0.07% of national income over the period 1840-1900, which is not very large. British colonial rulers also imposed significant tribute obligations on the native states, so it is not clear that the burden of "drain" would be different across the two types of areas. I explicitly compare tax collections across British areas and the native states, and examine whether this can explain the differences in long-term outcomes.

A third possibility is that the rulers of native states had better incentives to provide public goods to their subjects, compared to British administrators. The historical record indicates two key institutional differences: first, native states rulers had much longer tenures than British administrators, which might play a role in undertaking long-term investments such as schools or health facilities.[10] The natives states in our dataset had, on average,

[9]This is particularly the case for those landlord-based areas where revenue commitments to the British colonial rulers had been fixed in perpetuity, leaving the landlords as residual claimants. Banerjee and Iyer (2005) also document other channels through which this historical institution plays a role.

[10]Some empirical work in other settings support this hypothesis: Rauch (1995) demonstrates that city mayors in the United States with longer tenures have a higher likelihood of undertaking long-term infrastructure projects, while Do and Iyer (2008) show that Vietnamese farmers who are assured of a longer tenure on their land are more likely to plant long-term crops.

between four and five kings over the period 1858-1947, while British India was ruled by 24 different Governors-General. Lower level administrators had even higher rates of turnover: in 1936, two-thirds of district officers in British India had held their posts for less than one year (Potter, 1996). Second, as described in section 2.2, the British reserved the right to depose native state rulers if they governed badly enough to provoke widespread protest. This was a credible threat: 21 of the 71 native states in our dataset had their king deposed in the period 1858-1947. They were usually replaced by a relative (brother, son, cousin), but this would still mean a significant diminution in wealth and personal status for the previous king. British administrators, on the other hand, were promoted on the basis of seniority (Das 2001); the usual "penalty" for bad performance would be being transferred to another district.[11] In section 7, I test whether the quality of governance during the colonial period matters for long-term outcomes, by testing whether outcomes vary across native states whose rulers were deposed for misrule and those whose rulers were never deposed.

4 Comparing Areas under Direct and Indirect Rule

4.1 Data

I compare outcomes across British India and native state areas, using district-level data from the post-Independence period. A district in India is an administrative division below state level. In 1991, India had 415 districts in 17 major states,[12] a district on average having an area of 7500 sq.km. and a population of 1.5 million. The major reason I use district-level

[11] In fact, Potter (1996) cites incompetence of officers as one of the reasons for the relatively short tenure of officers in a given district.

[12] The states included in our analysis are Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. These states accounted for 96% of India's population in 2001.

data is because for each modern district, I am able to use old and new maps to find out whether it was a part of the British empire or a native state as of 1947. This is much harder to do for state level data because modern state boundaries in India are completely different from older native state or British province boundaries, mainly due to the 1956 reorganization of states on a linguistic basis.

For each district, I create a "British dummy" which equals one if the district was formerly part of British India. Some modern districts comprise several native states, while some native states were large enough to extend over several modern districts. A few districts contain areas from both the British empire and the native states, in which case the British dummy is assigned to be one if the major part of the district belonged to the British empire. This will be the main independent variable in the analysis.

One major drawback of district-level data in India is the absence of data on per capita income, consumption or net domestic product (these are available only at state level). I therefore conduct my analysis using other proxies for economic well-being. The major outcomes I consider are measures of agricultural investment and productivity (agriculture accounted for 37% of India's total GDP and 67% of the working population in 1981); the availability of public goods such as schools, health centers and roads; and health and education outcomes. In addition, I analyze data on the relative size of the manufacturing sector in district employment, as well as district-level poverty estimates from Topalova (2005). Data sources are listed in Appendix Table 2.

4.2 OLS Estimates of the Impact of Direct Colonial Rule

I first run ordinary least squares (OLS) regressions of the form:

$$y_i = \alpha + \beta Brit_i + \gamma X_i + \epsilon_i \quad (1)$$

where y_i is an outcome variable for district i, $Brit_i$ is a dummy for whether the district was part of the (directly ruled) British empire and X_i are other district characteristics (mainly geography). Since some native states extended over several districts and the main dependent variable $Brit_i$ is assigned at the native state level, I compute standard errors clustered at the level of the native state to take into account possible correlation in outcomes across districts which used to be part of the same native state.[13]

The regression in (1) may not indicate a causal effect of having direct British rule, because the main dependent variable $Brit_i$ is potentially endogenous. For instance, if it were the case that the British annexed the areas which had the most potential for agricultural productivity, then the OLS regression would yield an over-estimate of the causal impact of British rule. On the other hand, it is also possible that only the most unproductive areas came under British rule (because local rulers did not put in much effort to defend these areas). In this case, the OLS regression provides an underestimate of the impact of direct British rule.

In fact, we see that areas which were annexed to the British empire have significantly higher rainfall and significantly lower proportion of barren or rocky areas, compared to areas which were part of native states (Table 2). This suggests that British annexation policy was selective and geared towards picking out the areas which were likely to be more favorable to agriculture. There are no significant differences in other geographical characteristics such as latitude, altitude or major soil types. I will be controlling for geographic variables in all the regressions, but these differences could indicate the presence of other unobserved differences which might bias the OLS estimates.

[13]For British empire areas, "native states" for the purpose of clustering are assigned according to region and date of annexation. For instance, all areas annexed from Mysore after the 1792 Mysore War are grouped together as belonging to the same "native state."

To identify the causal impact of direct rule, I need an exogenous determinant of annexation. For this, I make use of Lord Dalhousie's "Doctrine of Lapse," according to which the British would take over a native state if its ruler happened to die without a natural heir. I will argue that this is a plausibly exogenous determinant of whether a district became part of the British empire, and use this as an instrument to estimate the impact of British rule. Before describing this strategy in detail in section 5, I will briefly discuss the results from the estimation of (1).

4.3 Does the Mode of Annexation Matter?

A simple comparison of British areas with native state areas suggests that British areas have significantly higher agricultural investments and productivity in the post-colonial period, and slightly lower levels of infrastructure at the village level, such as schools, health centers, canals and roads (Tables 3 and 4). Each entry in Table 3 and Table 4 represents the coefficient from a regression of the form (1) for the listed dependent variables (irrigation, fertilizer etc.). Over the period 1956-1987, former British empire areas had a higher proportion of irrigated area, greater fertilizer usage, faster adoption of high-yielding varieties – and consequently higher agricultural yields. Breaking out the results by mode of annexation employed suggests that the selective annexation story might be relevant: areas which were annexed either through cession, misrule or conquest do better than areas annexed due to "lapse" or death of a native ruler without an heir. We find a similar trend for the results on village-level infrastructure: while the differences are generally not statistically significant, areas annexed by means of "lapse" have significantly lower levels of most of these infrastructure variables (Table 4). All the results are very similar when I use the number of years under direct British rule as the

main independent variable, rather than a dummy for British rule.[14]

5 IV Estimates of the Impact of Direct Colonial Rule

5.1 Does the Period of Annexation Matter?

As discussed earlier, places which came under direct British rule are likely to be systematically different from places which did not. This is likely to be of greater significance for early annexations, since they were mainly annexed by conquest for which the British had to expend considerable resources. As a first step towards controlling for this selectivity in annexation, I compare areas which were annexed by the British towards the end of the annexation period (i.e. on or after 1848) with those which were never annexed. In this period, many of the annexations were not by conquest, and hence the selection bias is likely to be smaller than in the full sample. I find that the directly ruled areas no longer have any significant agricultural advantages, and continue to have slightly lower levels of public goods provision (Tables 7 and 8, Column 3). This suggests that selection bias is likely to be a major confounding factor. I now construct instrumental variable estimates as a more precise way to control for the selectivity in annexation.

5.2 The Doctrine of Lapse

Lord Dalhousie, Governor-General of India from 1848-1856, articulated an unusual policy of annexation in 1848: "I hold that on all occasions where heirs natural shall fail, the territory should be made to lapse and adoption should not be permitted, excepting in those cases in which some strong political reason may render it expedient to depart from this general rule."

[14]The number of years under direct British rule is highly correlated with the British dummy; the correlation coefficient is 0.84.

He used this policy to annex several states where Indian rulers died without a natural heir. Eight native states (comprising 20 modern districts) had rulers die without a natural heir during the Governorship of Lord Dalhousie. Of these, four native states (Satara, Sambalpur, Jhansi and Nagpur), comprising 16 districts, were successfully annexed. The other four did not become part of the British empire due to various reasons: the annexation of Ajaigarh was reversed by Dalhousie's successor Lord Canning; the annexation of Karauli was disallowed by the East India Company's Court of Directors; Orccha was allowed to adopt an heir because of a prior agreement; in Chhatarpur, a nephew of the king was allowed to succeed.[15] We should note that in each of these cases, Lord Dalhousie recommended applying the policy of lapse i.e. the fact these areas were ultimately not annexed was not a result of Dalhousie selectively applying the policy of lapse, but of factors beyond his control.

Of the remaining 65 native states (161 districts) where such a "lapse" did not occur, Lord Dalhousie annexed only three (18 districts). These were the states of Punjab, Berar and Oudh, which were annexed by means of conquest, non-payment of debt and misrule respectively.[16] The policy of lapse thus meant that areas where the ruler died without a natural heir had a higher probability of being annexed. This is confirmed by our first stage regressions, which are discussed in detail in section 5.3.

We should note that Lord Dalhousie's policy was in contrast to the policies followed by several earlier British administrators who recognized adoptions by native rulers. In fact, rulers dying without natural heirs was not an unusual occurrence during this century. For instance, Table 5 shows that in the period 1835-1847 (immediately before Dalhousie came to India), fifteen rulers died without natural heirs but only one of these states was annexed. This meant that Dalhousie's policy was an unexpected event for the native states; not surprisingly,

[15]The historical details are presented in Appendix Table 3.

[16]Lord Dalhousie also annexed the small states of Jaitpur, Udaipur and Baghat, of which the latter two annexations were reversed by Lord Canning.

it was extremely unpopular among the native rulers. This policy was withdrawn when the British Crown took over the administration in 1858; in fact, official documents guaranteeing British recognition of adopted heirs were sent out to native rulers to reassure them against any future doctrines of lapse. This lends greater validity to our identifying assumption that the policy of lapse provides an exogenous determinant of British annexation, since the death of a ruler without a natural heir in the specific period of 1848-1856 is likely to be a matter of circumstance, rather than caused by systematic factors which might also affect long-term outcomes.

5.3 Constructing an Instrumental Variable for Direct Colonial Rule

For each native state, I construct an instrumental variable *Lapse* as follows: *Lapse* equals one if the native state was not annexed before 1848 and ruler died without an heir in the period 1848-1856; *Lapse* equals zero if the native state was not annexed before 1848 and such a death did not occur during 1848-56; *Lapse* cannot be assigned to places which were annexed before 1848, since these were already ruled by the British. Since the policy of lapse was irrelevant for places which had already been annexed before Lord Dalhousie came to India in 1848, the sample for the IV regressions necessarily consists of places which had not been annexed in or before 1847 (hereafter the "post-1847 sample"). The sample thus consists of those native states which were never annexed ($Brit = 0, Lapse = 0$ or 1), those which were annexed due to lapse after 1847 ($Brit = 1, Lapse = 1$) and those which were annexed after 1847 by other means ($Brit = 1, Lapse = 0$). We should note that using *Lapse* as an instrument for *Brit* would yield consistent estimates as long as *Lapse* itself does not have a direct impact on outcomes, *even if there was some selectivity in British annexation among*

places with Lapse $= 1$.[17]

The first stage regression for the IV strategy is :

$$Brit_i = \pi_0 + \pi_1 Lapse_i + \pi_2 X_i + u_i \tag{2}$$

where $Lapse_i$ is as defined above and X_i are other control variables (mainly geography).

As expected from the historical description, the *Lapse* dummy is a statistically significant predictor of the *Brit* dummy, while geographic variables do not predict British annexation in the period after 1848 (Table 6). Further, annexation is predicted by the interaction of two events: the ruler dying in 1848-1856 and the ruler dying without an heir and not by either of these separately (Table 6, Column 4). As expected, *Lapse* predicts British annexation even better if I drop the native states annexed for other reasons (Table 6, Column 5).

5.4 Instrumental Variable Estimates

As suggested by the comparison of late-annexed places with the native states, the instrumental variable estimates show no significant advantages for directly ruled areas in terms of agricultural investments and productivity measures (Table 7). All the IV estimates are smaller in magnitude than the OLS estimates and statistically insignificant (Table 7, Column 4). Further, the coefficients for fertilizer usage, total yield and rice yield are significantly different from the OLS estimates for the full sample. These results are robust to excluding the areas annexed by Lord Dalhousie for non-lapse reasons (Table 7, Column 5). The concern here is that these might be the "best" areas in some sense, since the British went to the trouble of annexing them even when the rulers did not die without natural heirs.[18]

[17] See Angrist and Krueger (1999) for a detailed explanation of this point.

[18] Note that since we have potentially removed the best places from the *Lapse* $= 0$ group, these results are likely to be biased upward.

The difference between the OLS and the IV results suggests that there was a high degree of selectivity in British annexation policy, and that annexation was directed towards acquiring areas with the highest agricultural potential. This is not surprising in view of the fact that land revenue was the biggest source of government revenue throughout the colonial period. The mostly insignificant IV estimates in turn imply that British rule had no significant causal impact on long-term agricultural outcomes.

We should note that this lack of a causal effect on agricultural outcomes is not offset by directly ruled areas moving resources to other sectors. For instance, the directly ruled areas have a similar proportion of their workforce employed in manufacturing, compared to indirectly ruled areas over the period 1961-1991; IV results for 1991 alone indicate that indirectly ruled areas in fact have a slightly higher proportion of their workforce in manufacturing (Additional Table 1).

Turning to the availability of health and education infrastructure, the IV estimates indicate a statistically significant negative impact of direct British rule on the availability of middle schools, health centers and roads (Table 8, Column 4). The IV estimates imply very large differences in public goods availability: districts which were part of the British empire have 37% fewer villages with middle schools, 70% fewer villages equipped with primary health subcenters, and 46% fewer villages with access to good roads in 1981 and 1991.

These differences in access to health and education facilities have implications for development outcomes. The IV estimates show that infant mortality rates were significantly higher in British areas (Table 9). We see no significant differences in literacy rates, which probably reflects the fact that the differences in primary schools are no longer significant in the 1981 and 1991 data. In terms of overall welfare, we find that areas under direct rule have significantly higher proportions of their population below the poverty line over the period

1983-1993. These differences are very large in magnitude: directly ruled British areas have nearly 40% higher poverty rates and 33% higher infant mortality rates in the early 1990s, compared to native state areas. These gains are also more widespread in the sense that native state areas have lower levels of consumption inequality during these periods.

I perform a number of specification checks for the IV results, before going on to discuss the validity of this instrumental variable strategy. The IV estimates are robust to dropping the areas annexed by Lord Dalhousie for non-lapse reasons (Table 8, column 6), to the addition of soil type dummies (the overall estimate for the combined public goods regression is -0.062), and to controlling for population density (overall public goods difference is now -0.057), though population density is probably endogenous in this context, since it has the potential of being affected by public health policies.[19] The results are also robust to dropping the native states of Mysore and Travancore, which were arguably the best in terms of public goods provision. The religion of the ruler has some impact: areas ruled by Sikh kings were much more likely to have better post-colonial outcomes, while there are few significant differences between the areas ruled by Hindu or Muslim kings (Additional Table 4).

5.5 Assessing the Validity of Lapse as an Instrument

The validity of the identification strategy used above rests on the assumption that *Lapse* is a legitimate instrument for British rule. This means that *Lapse* must be uncorrelated with the residual error term ϵ in equation (1). In other words, if the event of ruler death without natural heir in the period 1848-1856 influences long-term outcomes for reasons other than British annexation, or if the areas with $Lapse = 1$ are in some way different from other areas, then the instrumental variable estimates are no longer consistent. In this section, I

[19]This was especially true in the colonial period when the major cause of death was from epidemics and famines.

consider various arguments which might affect the validity of my instrument; some of these arguments are countered by the historical evidence and some by direct econometric tests. I run most of these tests on the reduced form specification, the results of which are very similar to the IV specification (Table 10, Column 1).[20]

First, *Lapse* may not be a valid instrument if the policy was tailored towards acquiring native states with certain characteristics. The historical evidence does not support the case that the Doctrine of Lapse was put in place in order to obtain any specific states. In particular, Lord Dalhousie admitted that the states he most wanted were Oudh and Hyderabad;[21] however, neither of these could be annexed by lapse, since the rulers of both states already had natural heirs when Dalhousie arrived in India. They were in fact annexed by other means.[22] The Doctrine of Lapse thus seems to have been an additional means to annex more territory, and not targeted to any particular state.

Second, the instrument may be called into question if the British deliberately caused the death of certain rulers. Again, the historical evidence does not indicate any such moves on their part, neither were they ever accused of this even by the royal families affected by the Doctrine of Lapse. A related issue is the question of whether some native states established "fake" natural heirs to avoid being taken over by lapse. The unexpected nature of Dalhousie's policy, and the prominence of royal families, suggests that this was not very easy to do; there are also no accounts of the British being suspicious of the bona fides of natural heirs.

[20] Since we have a case of one endogenous variable and one instrument, the IV coefficients are exactly equal to the reduced form coefficients divided by the coefficient on the instrument in the first stage.

[21] "I have got two other kingdoms on hand to dispose of – Oudh and Hyderabad. Both are on the highroad to be taken under our management." (Private correspondence in 1848, quoted in Rahim 1963).

[22] The ruler of Oudh was accused of misrule, and part of Hyderabad was annexed due to non-payment of debts.

Third, it is possible that the event of a ruler dying without an heir might reflect some characteristics of the area (such as bad climate), or of the ruling family (such as genetic weaknesses), which might arguably affect long-term outcomes directly. To control for this, I re-run the regressions of public goods on the *Lapse* dummy after adding dummies for ruler death in 1848-1856 (as a proxy for bad conditions in those years) and for the ruler ever dying without heirs in the post-1818 period (as a proxy for a physically weak royal family). The estimates obtained are in fact larger in magnitude than the specification without these controls (Table 10, Column 2). Further, these controls are usually insignificant in all the regressions.

Fourth, I check directly whether ruler death without natural heirs has any long-term impact on public goods availability without British annexation. For instance, such a death may result in an extended period of political turmoil which might have lasting consequences. As mentioned earlier, the policy of lapse was officially given up after 1858. I regress public goods outcomes on a dummy which equals one if the ruler died without a natural heir in the period 1858-1884 during which such a death would not result in British annexation.[23] The estimates using this "fake instrument" are much lower in magnitude than the results using the *Lapse* dummy, and they are also statistically insignificant (Table 10, Column 3). This falsification test strongly supports the hypothesis that the impact of *Lapse* is only through British annexation.

Fifth, it was not the case that territories annexed by lapse were administered differently compared to areas annexed by other means. The lapsed areas were added to existing British provinces and brought under the prevailing administrative systems in those provinces. In particular, we should note that they were integrated into different British provinces: Nagpur and Sambalpur were merged with the Central Provinces, Satara with Bombay and Jhansi

[23]There were 12 such deaths in ten native states of our dataset.

with the North-West Provinces. In the post-colonial period as well, these areas belong to four different states. I explicitly include state fixed effects to see whether state-level policies can explain the differences between areas under direct and indirect rule. We see that many of the public goods differences continue to be significant, though they are lower in magnitude (Table 10, Column 4). Thus, the results we observe cannot be fully attributed to a specific administrative difference or state policy.

Sixth, the standard errors might be incorrect due to small sample bias. As mentioned earlier, I correct for possible correlation of errors within districts of the same native states by using the method of clustering, but the consistency of these standard errors requires a large sample. To account for this, I compute exact finite-sample p-values for the estimates using the method of "randomization inference."[24] This consists of re-assigning the *Lapse* dummy randomly, computing the reduced form estimator and simulating the finite sample distribution of our estimator. The implied standard errors are larger than the ones obtained by clustering but our overall estimate is still significant with a p-value of 0.05 (Table 10, column 5).

Finally, I present propensity score matching estimates for the reduced form regressions. We should note that the small size of the dataset does not make it particularly well-suited for propensity score matching methods.[25] Nevertheless, the balancing property was satisfied, and we see that several of the propensity score matching estimates are still statistically significant, though the magnitudes are smaller than the baseline estimates (Table 10, column 6). It is also worth pointing out that the coefficient for the combined public goods becomes larger (-0.034) when we do not include primary schools, and also becomes statistically significant.

These robustness checks support the conclusion that direct British rule had a significant

[24]See Bertrand, Duflo and Mullainathan (2004) for details.

[25]See Zhao (2004) for some evidence that propensity score matching does not work as well as other methods when the sample size is small.

negative impact on the availability of public goods in the post-colonial period.

6 Differences in Outcomes in Earlier Periods

The differences in human capital investments documented above were present in the colonial period and are narrowing over time in the post-colonial period, when British areas and native states were subjected to a uniform system of administration. I provide three pieces of evidence towards this view. First, IV estimates using public goods data from 1961 show that British empire areas had lower levels of primary schools, middle schools and medical dispensaries in 1961 itself, though as before the OLS results do not indicate any significant differences (Table 11).[26] Though the estimated differences for middle and high schools are lower in magnitude than the differences in Table 10, they are larger as a proportion of the mean level in 1961. It is also interesting to note that there are large differences in the availability of primary schools, which are not present in the later period data.

Second, controlling explicitly for the 1961 level reduces the magnitude and statistical significance of the results from 1981 and 1991 (Additional Table 2), though some of the IV coefficients are still significant at the 10% level of significance. We note a similar trend in the infant mortality and poverty results in Table 9: the difference in the later periods is smaller (in percentage terms) than in the earlier period. This is consistent with the strong convergence effects on public goods provision documented in Banerjee and Somanathan (2007), mainly due to the explicit commitments by the Indian government to equalize access to public goods. On the other hand, there does not seem to be any noticeable time path in the agricultural outcomes: the OLS and IV results for 1956 (the first year for which I have data) are not statistically different from the overall results, except for fertilizer usage where

[26]The data on rural health centers, canals and roads are missing for several states in this year.

the difference is insignificant in the early periods but becomes larger in the later periods (regressions not shown).

Overall, these results strongly suggest that post-colonial institutions did not contribute to the differences in outcomes across areas with direct and indirect rule, and may in fact have mitigated some of these differences. I also test this directly by examining whether one specific post-colonial institution, electoral democracy, worked differently across areas of direct and indirect rule. As detailed in section 3, this is an institution which might function differently across these two types of areas. Using data on state-level elections from the 1960s and from the 1980s, I find that there are no significant differences in voter turnout or the vote margin of the winning candidates, a proxy for the competitiveness of elections (Additional Table 5).

Third, I use literacy data from the 1911 census to provide direct evidence of human capital differences in the colonial period. Though the overall level of literacy was very low during this period (only 5.2% of the population could read and write), the literacy rate in British areas was 3 percentage points lower (Table 11, Panel B). This is in contrast to the lack of any literacy difference in the post-colonial period (Table 9), which is consistent with the differences in the availability of primary schools being wiped out by post-colonial policy.

Historical descriptions also indicate that at least some native states were greatly committed to investments in education and health during the colonial period. For instance, the native state of Mysore carried out smallpox vaccination as early as 1806. The state of Travancore announced a policy of free primary education in 1817, whereas the East India Company decided to give assistance "to the more extended and systematic promotion of general education in India" only after the influential Dispatch written by Sir Charles Wood in 1854. The state of Baroda was probably the first to introduce compulsory primary education in 1892, while the British passed a compulsory education act in the nearby Central

Provinces only in 1920. Roy (2000) also notes that "the British government did not build an effective mass education system."

7 Why Did the Native States Provide More Public Goods?

In this section, I examine specific institutional differences across areas with direct and indirect rule in the colonial period, as discussed in section 3. I first verify that the differences in public goods are not explained by differences in the level of taxes collected by the native states. We should note that native states raised more revenues from their subjects than the British: revenue figures from the 1890s indicate that the native states raised 3.42 rupees per capita in revenue, while the corresponding figure for British India was only 2.47 rupees.[27] I re-ran the IV regression and added an additional control variable for taxes collected per capita in 1896. The coefficient on the dummy for direct British rule remains almost unchanged, while the tax variable is never statistically significant (Table 12, Column 2).

The second institution I examine is the type of land revenue system. We find that native states are not more likely to have a different land revenue system on average: 63% of native state districts are classified as having cultivator-based systems, compared to 62% of British districts. Controlling for this important historical institution reduces the magnitude of the differences on the direct rule dummy, but the overall difference remains significant at the 10% level of significance and the land revenue system variable itself is rarely statistically

[27]The revenue and tribute data were obtained from Chakrabarti (1896). We should note that native states paid tribute to the British out of their revenues; subtracting this from their collections and adding the tribute amount to the British revenues means that native states had 3.20 rupees per capita available for spending, while the British areas had 2.69 rupees.

significant (Table 12, Column 3). I investigate this relationship further by looking at the impact of land revenue systems separately within British and native state areas. I find that a cultivator-based land revenue system is associated with better public goods outcomes within British areas, consistent with the results of Banerjee and Iyer (2005), but that the land revenue system does not matter within native state areas (Additional Table 3, Columns 1 and 2).[28] Taken together with the overall negative effects of direct rule, these results suggest that having a more equitable land revenue system can mitigate the effects of direct colonial rule. If we think of having an intermediary landlord class as another way of instituting "indirect" rule, the key difference with the native state rulers is that this class of landlords had no penalties for poor governance: they could be deprived of their privileges only if they failed to pay their revenue commitments to the British state.

The third institutional difference highlighted in section 3 related to the incentives of the administrators. The kings in native state areas had longer tenures than typical British administrators, and were also liable to be deposed for poor governance. It is difficult to assess the empirical significance of these factors directly: the length of tenure of the ruler is highly correlated with the direct rule dummy (correlation = 0.90), and all the kings were subject to the "disciplining" mechanism of potential British intervention. I document some evidence that poor governance in the past is predictive of future outcomes. I re-ran the IV regression, and included a dummy variable for whether the ruler of that native state was ever deposed by the British for misrule. I find that this variable usually has a negative sign and is statistically significant for several public goods (Table 12, Column 4). The inclusion of

[28] I thank an anonymous referee for this suggestion. I also tried combining these two regressions by adding the interaction of the direct rule dummy and the cultivator-based land revenue system dummy as an additional variable. I find that the difference between the direct and indirectly ruled areas is mainly for areas with a landlord-based land revenue system. Among places with a cultivator-based land revenue system, the difference between direct and indirect rule areas is statistically insignificant.

this variable increases the size of the negative coefficients on the British dummy, which now represent the difference between the directly ruled areas and the areas with kings who were never deposed. In fact, there are no significant differences in public goods between British areas and native state areas where the ruler had been deposed for poor governance.[29]

This set of results strongly suggests that indicators of poor colonial period governance (whether the ruler was ever deposed in native state areas, whether the area had a landlord-based land revenue system in the directly ruled areas) have a persistent long-term impact on post-colonial outcomes. The overall result of the directly ruled areas lagging behind then suggests that the institutional features of indirect rule favored better governance, on average, in the native states compared to the directly ruled areas.

8 Conclusion

In this paper, I use an unusual feature of British annexation policy to compare long-run outcomes of areas in India which were under direct British colonial rule with areas which were ruled by local kings under the indirect political control of the British. The annexation of areas where the local ruler died without a natural heir provides an exogenous determinant of whether an area came under direct British rule, and therefore controls effectively for the selectivity in colonial annexation policy. The instrumental variable results indicate that directly ruled areas lag behind in the availability of public goods such as schools, health facilities and roads in the post-colonial period, with adverse consequences for development outcomes such as poverty and infant mortality rates.

The study highlights three key features which are relevant to understanding the impacts of history. First, the paper documents that colonial annexation policy was indeed very

[29]The difference between the coefficient on the British dummy and the coefficient on the "ruler ever deposed" variable is never statistically significant.

selective and tended to focus on areas with higher agricultural potential. This needs to be kept in mind for any future research on the impact of colonial policies and institutions.

Second, indicators of the quality of governance in the colonial period have very persistent effects on long-term outcomes. In particular, the effect of direct versus indirect rule depends crucially on the incentives faced by local administrators. For India, the indirect rule exercised by landlords within the British empire leads to worse outcomes, while the indirect rule exercised by hereditary kings results in better outcomes. The key difference is that kings were explicitly subject to being removed in cases of gross misrule, while landlords did not have this institutional constraint.

Third, the impact of colonial period governance becomes more muted over the longer term in the face of explicit post-colonial policies designed to equalize access to schools, health centers and roads. It is therefore possible to undo the effects of historical circumstances, though the results in this paper indicate that this process can take several decades.

References

Acemoglu, Daron, Simon Johnson, and James A. Robinson (2001) 'The colonial origins of comparative development: An empirical investigation.' *American Economic Review* 91(5), 1369–1401

Allen, Charles, and Sharada Dwivedi (1998) *Lives of the Indian princes* (Mumbai: Eeshwar)

Angrist, Joshua, and Alan Krueger (1999) 'Empirical strategies in labor economics.' In *The Handbook of Labor Economics,* ed. Orley Ashenfelter and David Card, vol. III (North Holland) p. Chapter 23

Ashton, S.R. (1982) *British Policy towards the Indian states 1905-1939* (London: Curzon Press)

Baden-Powell, B.H. (1892) *The Land-Systems of British India 3 vols.* (Oxford: Clarendon Press)

Bagchi, Amiya Kumar (1982) *The Political Economy of Underdevelopment* (Cambridge: Cambridge University Press)

Banerjee, Abhijit, and Lakshmi Iyer (2005) 'History, institutions and economic performance: The legacy of colonial land tenure systems in India.' *American Economic Review* 95(4), 1190–1213

Banerjee, Abhijit, and Rohini Somanathan (2007) 'The political economy of public goods: Some evidence from India.' *Journal of Development Economics* 82(2), 287–314

Berger, Daniel (2008) 'Taxes, institutions and local governance: evidence from a natural experiment in colonial Nigeria.' *Working paper*

Berkowitz, Daniel, and Karen Clay (2004) 'Initial conditions, institutional dynamics and economic performance: Evidence from the American states.' *mimeo*

Bertocchi, Graziella, and Fabio Canova (2002) 'Did colonization matter for growth? An empirical exploration into the historical causes of Africa's underdevelopment.' *European Economic Review* 46, 1851–1871

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan (2004) 'How much should we trust differences-in-differences estimates?' *Quarterly Journal of Economics* 119(1), 249–276

Chakrabarti, Jadab Chandra (1896) *The Native States of India* (London: Luzac)

Das, S.K. (2001) *Public Office, Private Interest: Bureaucracy and Corruption in India* (New Delhi: Oxford University Press)

David, Saul (2002) *The Indian Mutiny: 1857* (London: Viking Penguin)

Do, Quy-Toan, and Lakshmi Iyer (2008) 'Land titling and rural transition in Vietnam.' *Economic Development and Cultural Change* 56(3), 531–579

Engerman, Stanley L., and Kenneth L. Sokoloff (2005) 'Colonialism, inequality and the long-run paths to development.' *NBER Working Paper 11057*

Ferguson, Niall (2002) *Empire: The Rise and Demise of the British World Order and the Lessons for Global Power* (New York: Basic Books)

Feyrer, James, and Bruce Sacerdote (2007) 'Colonialism and modern income: Islands as natural experiments.' *Review of Economics and Statistics (forthcoming)*

Frank, Andre Gunder (1978) *Dependent Accumulation and Underdevelopment* (London: Macmillan)

Herbst, Jeffrey (2000) *States and power in Africa: comparative lessons in authority and control* (Princeton: Princeton University Press)

Huillery, Elise (2006) 'Colonialism and development in the former French West Africa: the long-term impact of the colonial public investments.' *Working paper*

Hunter, William Wilson, James Sutherland Cotton, Richard Burn, and William Stevenson Meyer, eds (1908) *The Imperial Gazetteer of India* (Oxford: Clarendon Press)

La Porta, Rafael, Florencio Lopez de Silanes, Andrei Shleifer, and Robert Vishny (1998a) 'Law and finance.' *Journal of Political Economy* 106(6), 1113–1155

—— (1998b) 'The quality of government.' *Journal of Law, Economics and Organization* 15(1), 222–279

Lal, Deepak (2004) *In defense of Empires* (Washington D.C.: AEI Press)

Lee-Warner, William (1904) *The Life of the Marquis of Dalhousie K.T.,* vol. 1 and 2 (London: Macmillan)

—— (1910) *The Native States of India* (London: Macmillan and Co.)

Menon, A. Sreedhara (1967) *A Survey of Kerala History* (Kottayam: National Book Stall)

Mukherjee, Tapan (1972) 'Theory of economic drain: impact of British rule on the Indian economy 1840-1900.' In *Economic Imperialism: A Book of Readings,* ed. Kenneth Boulding and Tapan Mukherjee (Ann Arbor: University of Michigan Press)

Nunn, Nathan (2008) 'The long-term effects of Africa's slave trades.' *Quarterly Journal of Economics* 123, 139–176

Potter, David C. (1996) *India's Political Administrators: From ICS to the IAS* (New Delhi: Oxford University Press)

Rahim, M.A. (1963) *Lord Dalhousie's Administration of the Conquered and Annexed States* (New Delhi: S.Chand)

Rauch, James (1995) 'Bureaucracy, infrastructure and economic growth: Evidence from U.S. cities during the Progressive era.' *American Economic Review* 85, 968–979

Richter, William (1975) 'Electoral patterns in post-princely India.' In *Electoral politics in the Indian states: Three disadvantaged sectors,* ed. Myron Weiner and John Osgood Field (Delhi: Manohar Book Service)

Roy, Tirthankar (2000) *The Economic History of India 1857-1947* (New Delhi: Oxford University Press)

—— (2002) 'Economic history and modern India: Redefining the link.' *Journal of Economic Perspectives* 16(3), 109–130

Spear, T.G. Percival (2002) 'India and European expansion, c.1500-1858.' *Encyclopedia Britannica*

Topalova, Petia (2005) 'Trade liberalization, poverty and inequality: Evidence from Indian districts.' *NBER Working Paper 11614*

Zhao, Zhong (2004) 'Using matching to estimate treatment effects: Data requirements, matching metrics, and Monte Carlo evidence.' *Review of Economics and Statistics* 86(1), 91–107

TABLE 1
GROWTH OF THE BRITISH EMPIRE IN INDIA

Period	Number of districts annexed due to				
	Conquest	Ceded or granted	Misrule	Lapse	Total
1757-1790	60	19	0	0	79
1791-1805	46	37	1	0	84
1806-1818	29	0	0	0	29
1819-1835	20	0	1	0	21
1836-1847	19	0	1	1	21
1848-1856	2	4	12	16	34
1857-1947	0	1	0	0	1
Total	176	61	15	17	269

Notes:
Number of districts refers to 1991 districts. The total number of districts is 415, of which 269 were classified as belonging to British India.
The states of Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are excluded from the study.
Number of districts in subsequent regressions will be less than 415, due to missing data and because some districts were split into two or more new districts over time, and some datasets use older un-split districts.
The one district added after 1858 if Panchmahals which was ceded by the ruler of Gwalior to the British in exchange for some other territory.

TABLE 2
DIFFERENCES IN GEOGRAPHY AND DEMOGRAPHICS

Variable	# districts	# native states	Mean		Difference
			British empire	Native states	(s.e.)
Geography					
Latitude (degrees North)	407	98	23.29	22.79	0.509
					(1.813)
Altitude (metres above sea level)	359	92	392.63	413.27	-20.64
					(58.73)
Mean annual rainfall (mm)	414	98	1503.41	1079.16	424.35***
					(151.08)
Coastal district (dummy)	415	98	0.1264	0.0822	0.0442
					(0.0597)
Proportion sandy	378	96	0.0079	0.0117	-0.0038
					(0.0074)
Proportion barren/rocky	378	96	0.0050	0.0121	-0.0070**
					(0.0028)
Top two soil types					
Black soil (dummy)	362	93	0.1568	0.2937	-0.1369
					(0.1075)
Alluvial soil (dummy)	362	93	0.5254	0.4921	0.0334
					(0.1301)
Red soil (dummy)	362	93	0.2203	0.0952	0.1251
					(0.0776)
Demographic variables					
Log (population)	323	93	14.42	13.83	0.591***
					(0.155)
Population density (persons/sq.km)	322	93	279.47	169.20	110.27**
					(41.66)
Proportion rural	323	93	0.8210	0.8182	0.0028
					(0.0154)
Proportion of working population in farming	323	93	0.6961	0.7072	-0.0111
					(0.0239)
Proportion Scheduled Caste	323	93	0.1567	0.1512	0.0055
					(0.0148)
Proportion Scheduled Tribe	323	93	0.0859	0.0973	-0.0114
					(0.0271)
Proportion literate	323	93	0.3234	0.2867	0.0367
					(0.0283)

Robust standard errors in parentheses, corrected for clustering within native states.
* significant at 10%; ** significant at 5%; *** significant at 1%
Data is at 1991 district level for geographic variables, and 1961 district level for demographic variables.
Demographic data is computed as the mean from the censuses of 1961,1971,1981,1991. Population density figures exclude 1991 data.
Data sources listed in Appendix Table 2.

TABLE 3
DIFFERENCES IN AGRICULTURAL INVESTMENTS AND PRODUCTIVITY: OLS ESTIMATES

	British dummy		British dummy interacted with mode of annexation				Years of direct British rule (*1/100)
	(1)	(2)	(3)				(4)
	no controls	Geography controls	Conquest	Ceded	Misrule	Lapse	
Dependent variables (1956-87 mean)							
Proportion of area irrigated	0.111***	0.099***	0.069	0.152***	0.113**	0.062	0.079***
	(0.039)	(0.037)	(0.051)	(0.043)	(0.047)	(0.046)	(0.024)
Fertilizer usage (kg/hectare)	8.428**	7.014**	4.943	10.542***	13.731**	-1.485	5.563***
	(3.541)	(3.073)	(4.308)	(2.803)	(5.741)	(2.717)	(1.910)
Proportion of cereal area sown	0.074**	0.066**	0.046	0.103***	0.073**	0.041*	0.053***
with high-yielding varieties	(0.034)	(0.028)	(0.039)	(0.033)	(0.035)	(0.022)	(0.019)
Log total yield (15 major crops)	0.381***	0.213***	0.210**	0.236**	0.282***	0.076	0.194***
	(0.121)	(0.080)	(0.103)	(0.112)	(0.077)	(0.092)	(0.051)
Log rice yield	0.135	0.151*	0.220**	0.106	0.128*	-0.023	0.135**
	(0.112)	(0.083)	(0.106)	(0.096)	(0.077)	(0.090)	(0.056)
Log wheat yield	-0.002	-0.064	-0.017	-0.076	-0.133*	-0.185	-0.006
	(0.170)	(0.088)	(0.091)	(0.104)	(0.072)	(0.204)	(0.057)
Controls							
Latitude, rainfall, coast	no	yes		yes			yes
Proportion sandy/barren	no	yes		yes			yes
Soil type dummies	no	yes		yes			yes
# districts	271	271		271			271
# native states	83	83		83			83

Robust standard errors in parentheses, corrected for clustering within native states. * significant at 10%; ** significant at 5%; *** significant at 1%
Each cell represents the coefficient from an OLS regression of the dependent variable on the independent variable, which is
a dummy for direct British rule in (1) and (2), the dummy interacted with other variables in (3) and (4) and number of years of direct.
British rule in (5).
Data is missing for the states of Kerala, Assam, Jammu & Kashmir and Himachal Pradesh. All data are at 1961 district level.

TABLE 4
DIFFERENCES IN PUBLIC GOODS LEVELS : OLS ESTIMATES

	British dummy			British dummy interacted with mode of annexation				Years of direct British rule (*1/100)
	(1)	(2)	(3)	(4)				(5)
	no controls	Geography controls	Geography + soil controls	Conquest	Ceded	Misrule	Lapse	
Dependent variables: Proportion of villages having public goods								
(mean of 1981 and 1991 data)								
Primary school	-0.035	-0.016	-0.007	0.035	-0.121***	-0.062**	-0.007	-0.027
	(0.039)	(0.032)	(0.032)	(0.037)	(0.042)	(0.028)	(0.029)	(0.022)
Middle school	-0.035	-0.046	-0.033	-0.008	-0.106***	-0.077***	-0.085***	-0.050**
	(0.046)	(0.034)	(0.035)	(0.043)	(0.038)	(0.027)	(0.031)	(0.023)
High school	-0.045	-0.068*	-0.059	-0.041	-0.112**	-0.096***	-0.081**	-0.061**
	(0.049)	(0.040)	(0.038)	(0.045)	(0.043)	(0.034)	(0.037)	(0.026)
Primary health center	-0.010	-0.024*	-0.019	-0.018	-0.036**	-0.023*	-0.029**	-0.022**
	(0.017)	(0.014)	(0.013)	(0.016)	(0.017)	(0.013)	(0.012)	(0.010)
Primary health subcenter	0.006	-0.002	0.005	0.017	-0.033*	0.005	-0.037**	-0.002
	(0.017)	(0.017)	(0.017)	(0.021)	(0.018)	(0.013)	(0.015)	(0.012)
Canals	-0.028	-0.010	-0.011	-0.001	-0.021	-0.029**	-0.022*	-0.005
	(0.021)	(0.014)	(0.014)	(0.016)	(0.014)	(0.013)	(0.013)	(0.010)
Roads	0.028	0.043	0.077	0.066	0.033	0.097*	-0.113**	-0.007
	(0.072)	(0.065)	(0.064)	(0.095)	(0.051)	(0.055)	(0.044)	(0.053)
Combined public goods	-0.017	-0.017	-0.006	0.008	-0.057**	-0.026	-0.055***	-0.024
	(0.029)	(0.025)	(0.025)	(0.033)	(0.023)	(0.018)	(0.018)	(0.017)
Controls								
Latitude, rainfall, coast	no	yes	yes		yes			yes
Proportion sandy/barren	no	yes	yes		yes			yes
Soil type dummies	no	no	yes		no			no
# districts	404	377	340		377			377
# native states	97	96	92		96			96

Robust standard errors in parentheses, corrected for clustering within native states. * significant at 10%; ** significant at 5%; *** significant at 1%
Each cell represents the coefficient from an OLS regression of the dependent variable on the independent variable, which is a dummy for British rule in (1)-(3), the dummy interacted with other variables in (4)-(5) and number of years of direct British rule in (6).
Data is missing for middle schools in Gujarat, high schools in Madhya Pradesh and primary health subcenters in Karnataka.
Data is missing for Assam in 1981 and Jammu & Kashmir in 1991.

TABLE 5
DEATHS OF INDIAN RULERS WITHOUT NATURAL HEIRS

Period	Governor-General (s)	Ruler died without an heir		Annexed due to lapse		Annexed due to other reasons	
		#native states	#districts	#native states	#districts	#native states	#districts
1819-1827	Hastings, Amherst	5	14	0	0	3	17
1828-1835	Bentinck, Metcalfe	6	9	0	0	2	4
1836-1847	Auckland, Ellenborough, Hardinge	15	31	1	1	4	19
1848-1856	**Dalhousie**	**8**	**20**	**4**	**16**	**3**	**18**
1857-1863	Canning, Elgin	6	10	0	0	1	1
1864-1875	Lawrence, Mayo, Northbrook	7	20	0	0	0	0
1876-1884	Lytton, Ripon	3	5	0	0	0	0

TABLE 6
FIRST STAGE OF IV STRATEGY

Dependent variable: British dummy

	Post-1847 sample				
	no controls	geography	soils	main effects	Exclude Punjab, Berar, Oudh
	(1)	(2)	(3)	(4)	(5)
Ruler died without natural heir	0.682***	0.673***	0.669***	0.953***	0.771***
in 1848-1856 (Instrument)	(0.159)	(0.155)	(0.162)	(0.176)	(0.140)
Main effects					
Ruler died without heir				-0.231*	0.027
				(0.126)	(0.021)
Ruler died in 1848-56				-0.161	0.013
				(0.101)	(0.023)
Geography controls					
Latitude		0.012	0.016	0.015	-0.002
		(0.011)	(0.011)	(0.012)	(0.002)
Mean annual rainfall		0.000	0.000	0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Coastal dummy		-0.120	-0.096	-0.067	-0.016
		(0.082)	(0.100)	(0.089)	(0.024)
Proportion sandy		-0.289	-0.119	-0.085	-0.033
		(0.242)	(0.241)	(0.113)	(0.061)
Proportion barren/rocky		-2.791	-2.744	-2.188	-1.279
		(1.773)	(1.774)	(1.839)	(1.171)
Altitude (*1/1000)			-0.000		
			(0.000)		
Black soil dummy			0.091		
			(0.091)		
Alluvial soil dummy			0.027		
			(0.085)		
Red soil dummy			-0.030		
			(0.071)		
No. of districts	181	163	152	163	145
No. of native states	73	71	67	71	68
R-squared	0.29	0.35	0.37	0.42	0.73

Robust standard errors in parentheses, corrected for clustering within native states.
* significant at 10%; ** significant at 5%; *** significant at 1%
Post-1847 sample refers to areas which were not annexed in or before 1847.
All results are from linear regressions.
Main effect "Ruler died without heir" is a dummy which equals one if the native state had a ruler die without an heir at any time after 1818.
Main effect "Ruler died in 1848-56" is a dummy which equals one if the ruler of the native state died in the period 1848-1856.

TABLE 7
DIFFERENCES IN AGRICULTURAL INVESTMENTS AND PRODUCTIVITY: IV ESTIMATES

		Coefficient on			
	Mean of dep. var.	British dummy Full sample	British dummy Post-1847 sample	British dummy Post-1847 sample	British dummy Post-1847 sample (excluding Punjab, Oudh, Berar)
		OLS	OLS	IV	IV
	(1)	(2)	(3)	(4)	(5)
Dependent variables (1956-87 mean)					
Proportion of area irrigated	0.228	0.099***	0.063	0.059	0.058
		(0.037)	(0.046)	(0.065)	(0.053)
Fertilizer usage (kg/hectare)	20.04	7.014**	3.770	-3.145	-2.054
		(3.073)	(4.251)	(3.765)	(2.669)
Proportion of cereal area sown	0.330	0.066**	0.083**	0.051	0.061*
with high-yielding varieties		(0.028)	(0.037)	(0.038)	(0.033)
Log total yield (15 major crops)	-0.161	0.213***	0.117	0.087	0.082
		(0.080)	(0.119)	(0.127)	(0.105)
Log rice yield	-0.077	0.151*	0.046	-0.107	-0.090
		(0.083)	(0.120)	(0.215)	(0.166)
Log wheat yield	-0.114	-0.064	-0.089	-0.184	-0.164
		(0.088)	(0.113)	(0.243)	(0.219)
Controls					
Latitude, rainfall, coast		yes	yes	yes	yes
Proportion sandy/barren		yes	yes	yes	yes
Soil type dummies		yes	yes	yes	yes
# districts		271	136	136	118
# native states		83	58	58	55

Robust standard errors in parentheses, corrected for clustering within native states.
* significant at 10%; ** significant at 5%; *** significant at 1%
IV estimates computed using the *Lapse* dummy as an instrument for British rule. *Lapse* =1 if ruler died without a natural heir in the period 1848 to 1856.
Post-1847 sample refers to areas which were not annexed in or before 1847.
Data is missing for the states of Kerala, Assam, Jammu & Kashmir and Himachal Pradesh. All data are at 1961 district level.

TABLE 8
DIFFERENCES IN PUBLIC GOODS LEVELS : IV ESTIMATES

		Coefficient on			
	Mean of dep. var.	British dummy Full sample	British dummy Post-1847 sample	British dummy Post-1847 sample	British dummy Post-1847 sample (excluding Punjab, Oudh, Berar)
		OLS	OLS	IV	IV
	(1)	(2)	(3)	(4)	(5)
Dependent variables: Proportion of villages having public goods					
(mean of 1981 and 1991 data)					
Primary school	0.7720	-0.016	-0.007	-0.011	-0.012
		(0.032)	(0.039)	(0.041)	(0.036)
Middle school	0.2485	-0.046	-0.047	-0.091**	-0.083**
		(0.034)	(0.031)	(0.037)	(0.032)
High school	0.1260	-0.068*	-0.061*	-0.065	-0.064*
		(0.040)	(0.033)	(0.042)	(0.037)
Primary health center	0.0415	-0.024*	-0.015*	-0.031**	-0.028**
		(0.014)	(0.008)	(0.013)	(0.011)
Primary health subcenter	0.0753	-0.002	-0.007	-0.053**	-0.043***
		(0.017)	(0.017)	(0.021)	(0.016)
Canals	0.0477	-0.010	-0.024*	-0.043	-0.041*
		(0.014)	(0.014)	(0.028)	(0.024)
Roads	0.4344	0.043	-0.010	-0.198***	-0.157***
		(0.065)	(0.067)	(0.066)	(0.050)
Combined public goods	0.2535	-0.017	-0.026	-0.075***	-0.065***
		(0.025)	(0.021)	(0.023)	(0.019)
Controls					
Latitude, rainfall, coast		yes	yes	yes	yes
Proportion sandy/barren		yes	yes	yes	yes
# districts		377	163	163	145
# native states		96	71	71	68

Robust standard errors in parentheses, corrected for clustering within native states. * significant at 10%; ** significant at 5%; *** significant at 1%
IV estimates computed using the *Lapse* dummy as an instrument for British rule. *Lapse* =1 if ruler died without a natural heir in the period 1848 to 1856.
Post-1847 sample refers to areas which were not annexed in or before 1847.
Data is missing for middle schools in Gujarat, high schools in Madhya Pradesh and primary health subcenters in Karnataka.
Data is missing for Assam in 1981 and Jammu & Kashmir in 1991.

TABLE 9
HEALTH AND EDUCATION OUTCOMES

		Coefficient on	
		British dummy Full sample	British dummy Post-1847 sample
Dependent variables	Mean	OLS	IV
Literacy rate	0.309	0.017	0.019
(1961,1971,1981,1991)		(0.022)	(0.042)
Infant mortality rate 1981	118.7	-0.481	37.35**
		(7.48)	(14.20)
Infant mortality rate 1991	80.04	-0.772	26.87**
		(6.36)	(10.54)
Poverty 1983	0.436	0.093**	0.223**
		(0.037)	(0.097)
Poverty 1987	0.375	0.048	0.139**
		(0.042)	(0.064)
Poverty 1993	0.315	0.066*	0.123***
		(0.034)	(0.044)
Inequality 1983	0.500	-0.021*	-0.064***
		(0.011)	(0.014)
Inequality 1987	0.460	-0.011	-0.045*
		(0.013)	(0.023)
Inequality 1993	0.428	0.002	-0.079**
		(0.018)	(0.032)
Controls			
Latitude, rainfall, coast		yes	yes
Proportion sandy/barren		yes	yes
# districts		377	157
# native states		96	69

Robust standard errors in parantheses, , corrected for clustering within native states.
* significant at 10%; ** significant at 5%; *** significant at 1%
Post-1847 sample refers to areas which were not annexed in or before 1847.
Instrument is a dummy for whether the ruler died without an heir in the period 1848-1856.
Infant mortality rate is computed as the number of deaths per 1000 live births.
The measure of poverty is the head count ratio which measures the proportion of people below the poverty line in a district.
The measure of inequality is the standard deviation of log consumption.
The number of observations for the poverty and inequality regressions is 360 for the OLS regressions and 160 for the IV regressions.

TABLE 10
REDUCED FORM REGRESSIONS FOR PUBLIC GOODS: ROBUSTNESS CHECKS

	Coefficient on					
	Lapse dummy Post-1847 sample Base specification (1)	Lapse dummy Post-1847 sample With "main effects" (2)	Fake instrument Native states sample Falsification test (3)	Lapse dummy Post-1847 sample State fixed effects (4)	Lapse dummy Post-1847 sample Exact *p*-values (5)	Lapse dummy Post-1847 sample Propensity score matching (6)
Dependent variables: Proportion of villages having public goods						
(mean of 1981 and 1991 data)						
Primary school	-0.007	-0.032	-0.094**	0.002	-0.007	0.009
	(0.028)	(0.050)	(0.039)	(0.027)	[0.48]	(0.026)
Middle school	-0.061**	-0.100*	0.006	-0.028	-0.061	-0.023
	(0.025)	(0.052)	(0.034)	(0.019)	[0.14]	(0.022)
High school	-0.049	-0.048	-0.067	-0.023***	-0.049	-0.016
	(0.032)	(0.059)	(0.047)	(0.008)	[0.24]	(0.014)
Primary health center	-0.021***	-0.015	-0.012	-0.007*	-0.021	-0.006*
	(0.008)	(0.020)	(0.016)	(0.003)	[0.14]	(0.003)
Primary health subcenter	-0.036***	-0.062**	-0.011	-0.014**	-0.036	-0.026**
	(0.011)	(0.025)	(0.016)	(0.007)	[0.05]	(0.010)
Canals	-0.029**	-0.128**	0.017	-0.002	-0.029	-0.008
	(0.015)	(0.050)	(0.041)	(0.014)	[0.11]	(0.007)
Roads	-0.134***	-0.142*	-0.023	-0.025***	-0.134	-0.093**
	(0.032)	(0.083)	(0.050)	(0.009)	[0.06]	(0.024)
Combined public goods	-0.051***	-0.079**	-0.023	-0.013*	-0.051	-0.023
	(0.012)	(0.030)	(0.022)	(0.008)	[0.05]	(0.027)
Combined public goods	-0.058***	-0.087***	-0.011	-0.016***	-0.058	-0.029**
(Excluding primary schools)	(0.012)	(0.031)	(0.023)	(0.005)	[0.01]	(0.012)
Controls						
Latitude, rainfall, coast	yes	yes	yes	yes	yes	yes
Proportion sandy/barren	yes	yes	yes	yes	yes	yes
# districts	163	163	128	163	163	151
# native states	71	71	63	71	71	66

Robust standard errors in parentheses, corrected for clustering within native states. * significant at 10%; ** significant at 5%; *** significant at 1%
Post-1847 sample refers to areas which were not annexed by 1847. Lapse dummy equals one if ruler died without a natural heir in the period 1848 to 1856.
Column (2) includes dummies for whether the ruler died in 1848-1856 and whether the ruler ever died without an heir in the post-1818 period.
"Fake instrument" is a dummy for whether the ruler died without an heir in the period 1858-1884.
Column (4) shows p-values [in square brackets] constructed by the randomization inference procedure, to adjust for possible small-sample bias in clustering.
Standard errors for propensity score matching estimates are computed using bootstrap.
Data is missing for middle schools in Gujarat, high schools in Madhya Pradesh and primary health subcenters in Karnataka.
Data is missing for Assam in 1981 and Jammu & Kashmir in 1991.

TABLE 11
DIFFERENCES IN PUBLIC GOODS LEVELS IN 1961 AND 1911

	Mean of dep. var.	No. of districts (no. of native states)	Coefficient on British dummy OLS Full sample	Coefficient on British dummy IV Post-1847 sample	Coefficient on British dummy IV Post-1847 sample Excluding Punjab, Oudh, Berar
Panel A: Proportion of villages having public goods in 1961					
Primary school	0.5126	234 (81)	0.024	-0.127*	-0.106*
			(0.041)	(0.067)	(0.062)
Middle school	0.0972	219 (78)	-0.040	-0.068*	-0.058*
			(0.035)	(0.035)	(0.030)
High school	0.0303	286 (88)	-0.032	-0.037	-0.031*
			(0.020)	(0.022)	(0.018)
Dispensaries	0.0733	234 (81)	-0.075*	-0.069*	-0.062*
			(0.043)	(0.039)	(0.036)
Rural health center	0.0244	159 (54)	-0.007	-0.007	-0.005
			(0.010)	(0.008)	(0.007)
Canals	0.0017	134 (49)	0.003	-0.000	-0.000
			(0.003)	(0.000)	(0.000)
Roads	0.2124	234 (68)	0.052	-0.077	-0.047
			(0.055)	(0.092)	(0.069)
Panel B: 1911 Census					
Fraction literate	0.052	311 (121)	0.006	-0.035*	-0.029**
			(0.009)	(0.018)	(0.014)
Controls					
Latitude, rainfall, coast			yes	yes	yes
Proportion sandy/barren			yes	yes	yes

Robust standard errors in parentheses, corrected for clustering within native states.
* significant at 10%; ** significant at 5%; *** significant at 1%
Post-1847 sample refers to areas which were not annexed in or before 1847.
Instrument is a dummy for whether the ruler died without an heir in the period 1848-1856.
Data on rural health centers and canals is missing for UP, Tamil Nadu, Rajasthan, Orissa and Maharashtra.
Data on primary schools, middle schools and dispensaries is missing for Uttar Pradesh.
Data on middle schools, canals and roads is missing for West Bengal.
Data on roads is missing for Punjab and Rajasthan.
Regressions for 1911 literacy data are at the level of the native state for smaller native states and at the district level for larger native states and British areas. Regressions include controls for total population and sex ratio.

TABLE 12
THE ROLE OF TAX REVENUES, INSTITUTIONS AND RULER QUALITY IN PUBLIC GOODS PROVISION

	Base specification	Controlling for tax revenue per capita		Controlling for land tenure system		Controlling for whether ruler was ever deposed by	
	British dummy IV	British dummy IV	Tax revenue per capita IV	British dummy IV	Cultivator-based land revenue system dummy IV	British dummy IV	Ruler ever deposed IV
	(1)	(2)		(3)		(4)	
Dependent variables: Proportion of villages having public goods							
(mean of 1981 and 1991 data)							
Primary school	-0.011	0.012	0.014	0.064	0.090**	-0.019	-0.045
	(0.041)	(0.046)	(0.011)	(0.046)	(0.044)	(0.045)	(0.044)
Middle school	-0.091**	-0.049	0.000	-0.063	0.035	-0.103**	-0.074**
	(0.037)	(0.034)	(0.007)	(0.051)	(0.036)	(0.039)	(0.031)
High school	-0.065	-0.102**	-0.005	-0.065	0.006	-0.070	-0.027
	(0.042)	(0.049)	(0.008)	(0.054)	(0.037)	(0.049)	(0.048)
Primary health center	-0.031**	-0.063*	0.001	-0.034**	-0.005	-0.035**	-0.020
	(0.013)	(0.036)	(0.010)	(0.016)	(0.010)	(0.015)	(0.014)
Primary health subcenter	-0.053**	-0.066	0.001	-0.050*	0.001	-0.061***	-0.039*
	(0.021)	(0.055)	(0.013)	(0.027)	(0.019)	(0.021)	(0.023)
Canals	-0.043	-0.034**	-0.001	-0.031	-0.002	-0.048	-0.028
	(0.028)	(0.017)	(0.003)	(0.022)	(0.019)	(0.029)	(0.019)
Roads	-0.198***	-0.230***	-0.013	-0.163*	0.113	-0.225***	-0.151**
	(0.066)	(0.086)	(0.015)	(0.093)	(0.089)	(0.069)	(0.073)
Combined public goods	-0.075***	-0.081***	-0.002	-0.054*	0.034	-0.085***	-0.056**
	(0.023)	(0.029)	(0.006)	(0.028)	(0.026)	(0.024)	(0.025)
Controls							
Latitude, rainfall, coast	yes	yes		yes		yes	
Proportion sandy/barren	yes	yes		yes		yes	
# districts	163	163		140		163	
# native states	71	71		51		71	

Robust standard errors in parentheses, corrected for clustering within native states.
* significant at 10%; ** significant at 5%; *** significant at 1%
All regressions are for the ``Post-1847'' sample consisting of areas which were not annexed in or before 1847.
Column (1) shows the base IV specifications from Column (5) of Table 8.
Data is missing for middle schools in Gujarat, high schools in Madhya Pradesh and primary health subcenters in Karnataka. Data is missing for Assam in 1981 and Jammu & Kashmir in 1991.

APPENDIX TABLE 1: MAJOR NATIVE STATES IN 1947

Native state	No. of guns in salute	Date of treaty with British	Area (sq.miles)	Population (1896)	Religion of ruler	No. of modern districts
Baroda	21	1802	8,570	2,185,005	Hindu	3
Gwalior	21	1781	29,046	3,115,857	Hindu	9
Hyderabad	21	1759	98,000	9,845,594	Muslim	20
Kashmir	21	1846	80,000	1,534,972	Hindu	14
Mysore	21	1799	24,723	4,186,188	Hindu	10
Bhopal	19	1817	6,873	954,901	Muslim	3
Indore	19	1805	8,400	1,054,237	Hindu	3
Kolhapur	19	1766	2,816	800,189	Hindu	1
Travancore	19	1723	6,730	2,401,158	Hindu	6
Udaipur	19	1818	12,670	1,494,220	Hindu	3
Bharatpur	17	1803	1,974	645,540	Hindu	1
Bikaner	17	1818	22,340	509,021	Hindu	3
Bundi	17	1818	2,300	254,701	Hindu	1
Cochin	17	1791	1,361	600,278	Hindu	3
Jaipur	17	1818	14,465	2,534,357	Hindu	3
Jodhpur	17	1818	37,000	1,750,403	Hindu	5
Karauli	17	1817	1,208	148,670	Hindu	1
Kota	17	1817	3,797	517,275	Hindu	1
Kutch	17	1809	6,500	512,084	Hindu	1
Patiala	17	1809	5,887	1,467,433	Sikh	5
Rewa	17	1812	1,000	1,305,124	Hindu	4
Tonk	17	1817	2,509	338,029	Muslim	1
Alwar	15	1803	3,024	682,926	Hindu	1
Banswara	15	1818	1,300	152,045	Hindu	1
Datia	15	1804	836	182,598	Hindu	1
Dewas	15	1818	2,566	142,162	Hindu	1
Dhar	15	1819	1,740	149,244	Hindu	1
Dholpur	15	1779	1,200	249,657	Hindu	1
Dungarpur	15	1818	1,000	153,381	Hindu	1
Idar	15	1812	4,966	258,429	Hindu	1
Jaisalmer	15	1818	16,447	108,143	Hindu	1
Kishangarh	15	1818	724	112,633	Hindu	1
Orchha	15	1812	2,000	311,514	Hindu	1
Partabgarh	15	1818	1,460	79,568	Hindu	1
Rampur	15	1794	899	541,914	Muslim	1
Sirohi	15	1823	3,020	142,903	Hindu	1
Bhavnagar	13	1807	2,860	400,323	Hindu	1
Cooch Behar	13	1773	1,307	602,624	Hindu	1
Dhrangadhra	13	1807	1,142	99,686	Hindu	1
Jaora	13	1818	872	108,434	Muslim	2
Jhalawar	13	1838	2,694	340,488	Hindu	1
Jind	13	1809	1,323	294,862	Sikh	1
Junagadh	13	1807	3,283	387,499	Muslim	2
Kapurthala	13	1846	620	252,617	Sikh	1
Nabha	13	1809	928	261,824	Sikh	1
Nawanagar	13	1807	1,379	316,147	Hindu	1
Palanpur	13	1809	3,150	234,402	Muslim	1

Native state	No. of guns in salute	Date of treaty with British	Area (sq.miles)	Population (1896)	Religion of ruler	No. of modern districts
Porbandar	13	1807	636	71,072	Hindu	1
Rajpipla	13	1821	1,514	59,834	Hindu	1
Ratlam	13	1819	729	87,314	Hindu	1
Ajaigarh	11	1807	802	81,454	Hindu	1
Ali Rajpur	11	1818	836	56,287	Hindu	1
Barwani	11	1818	1,362	56,445	Hindu	1
Bijawar	11	1811	973	113,285	Hindu	1
Bilaspur	11	1846			Hindu	1
Cambay	11	1771	350	86,074	Muslim	1
Chamba	11	1846	3,180	115,773	Hindu	1
Charkhari	11	1804	788	143,015	Hindu	1
Chhatarpur	11	1806	1,169	164,376	Hindu	1
Faridkot	11	1809	612	97,034	Hindu	1
Gondal	11	1807	687	135,604	Hindu	1
Jhabua	11	1821	1,336	147,100	Hindu	1
Mandi	11	1846	1,000	147,017	Hindu	1
Morvi	11	1807	821	90,016	Hindu	1
Narsinghgarh	11	1818	623	112,427	Hindu	1
Panna	11	1807	2,568	227,306	Hindu	1
Pudukkottai	11	1803	1,101	302,127	Hindu	1
Radhanpur	11	1813	1,150	98,129	Muslim	1
Rajgarh	11	1818	655	117,533	Hindu	1
Sailana	11	1819	114	29,723	Hindu	1
Sirmur	11	1815	1,077	112,371	Hindu	1
Tehri Garhwal	11	1820	4,180	199,836	Hindu	3
Wankaner	11	1807	376	30,491	Hindu	1
Balasinor	9		189	46,328	Muslim	1
Bansda	9	1802	384	34,122	Hindu	1
Chhota Udepur	9	1822	873	71,218	Hindu	1
Dharampur	9		794	101,289	Hindu	1
Dhrol	9		400	21,177	Hindu	1
Kalahandi	9	1829				1
Khilchipur	9	1818	273	36,125	Hindu	1
Limbdi	9		344	40,186	Hindu	1
Maihar	9		400	71,709	Hindu	1
Mayurbhanj	9	1829	4,243	385,737	Hindu	2
Nagod	9	1809	450	79,629	Hindu	1
Rajkot	9	1807	283	46,540	Hindu	1
Sangli	9		896	196,832	Hindu	1
Savantwadi	9	1730	900	174,433	Hindu	1
Bashahr	9	1815	3,320	64,345	Hindu	1
Dhenkanal		1829	1,463	208,316		1
Keunjhar		1829	3,096	215,612	Hindu	1
Raigarh			1,486	128,943		1
Sarguja		1817	6,055	270,311	Hindu	1

Native states listed in decreasing order of the number of guns in ceremonial salute.

Number of modern districts refers to the number of districts containing areas from the native state.

Several modern districts contain areas from more than one native state.

Native state boundaries may or may not coincide with modern district boundaries.

APPENDIX TABLE 2 : DATA SOURCES

Post-Independence data

Data on district geography, crop areas, yields, irrigation, fertilizer use, adoption of high-yielding varieties: India Agriculture and Climate Data Set (World Bank)
http://www-esd.worldbank.org/indian/home.cfm

Public goods at village-level 1961, 1981, 1991: Census reports

District level data on population, literacy, occupation classes, proportion of scheduled castes etc:
Indian Database Project Vanneman, Reeve and Douglas Barnes (2000)
Indian District Data, 1961-1991: Machine-readable data file and codebook, Center on Population, Gender, and Social Inequality, College Park, Maryland.
URL: http://www.bsos.umd.edu/socy/vanneman/districts/index.html

Matching post-Independence districts with British districts and native states

Districts and maps of British India: Baden-Powell (1892)
Districts and maps of modern India: http://www.mapsofindia.com
District Gazetteers (various issues)

Historical data

Area and revenue of Native States: Chakrabarti (1896), Hunter et.al. (1908)

Details of death of kings in Native States: District Gazetteers; Lee-Warner (1904); Menon (1967)
http://www.dreamwater.net/regiment/RoyalArk/India/India.htm;
http://www.uq.net.au/~zzhsoszy/ips

Literacy and infant mortality in earlier periods : District Gazetteers

District-level poverty and inequality: Topalova (2005)

APPENDIX TABLE 3 : DETAILS OF NATIVE STATES WHERE RULERS DIED WITHOUT NATURAL HEIR IN 1848-56

Native state	Year of death of ruler	Details
Major kingdoms annexed by Lord Dalhousie		
Satara	1848	State created in 1818 for defeated Maratha ruler; ruler deposed in favor of his brother in 1842; state annexed by lapse in 1848.
Sambalpur	1849	Part of Bhonsla kingdom originally; handed over to a local ruler Maharaja Sahi in 1818 and to his queen on his death in 1827. Kingdom given to relative Narayan Singh in 1833 after local insurrection. Annexed by Doctrine of Lapse in 1849 when ruler died without heir.
Jhansi	1853	First treaty of protection with British in 1804; ruler died without heir in 1835 and in 1838 but successors installed by British and state not annexed; state annexed by Lord Dalhousie due to lapse in 1853.
Nagpur	1854	Bhonsla ruler defeated in 1818 and kingdom put under British administration till 1830; Taken over by Doctrine of Lapse in 1854 after death of ruler in December 1853.
Major kingdoms where rulers died without heir in 1848-56 but which were not annexed		
Orchha	1852	Lord Dalhousie did not annex on grounds of Orchha being a non-tributary state; also the British had a prior agreement with the queen (made in 1841) which allowed her to adopt an heir.
Karauli	1853	Ruler died without heir in 1853; Lord Dalhousie recommended annexation but was disallowed by the East India Company's Court of Directors.
Chhatarpur	1854	Ruler died without heir in 1854, and was succeeded by his nephew.
Ajaigarh	1855	Ruler died without heir in 1855 and the state was annexed by Lord Dalhousie. Royal family remained loyal to the British during the 1857 revolt and the state was returned to an adopted heir by Lord Canning in 1857.

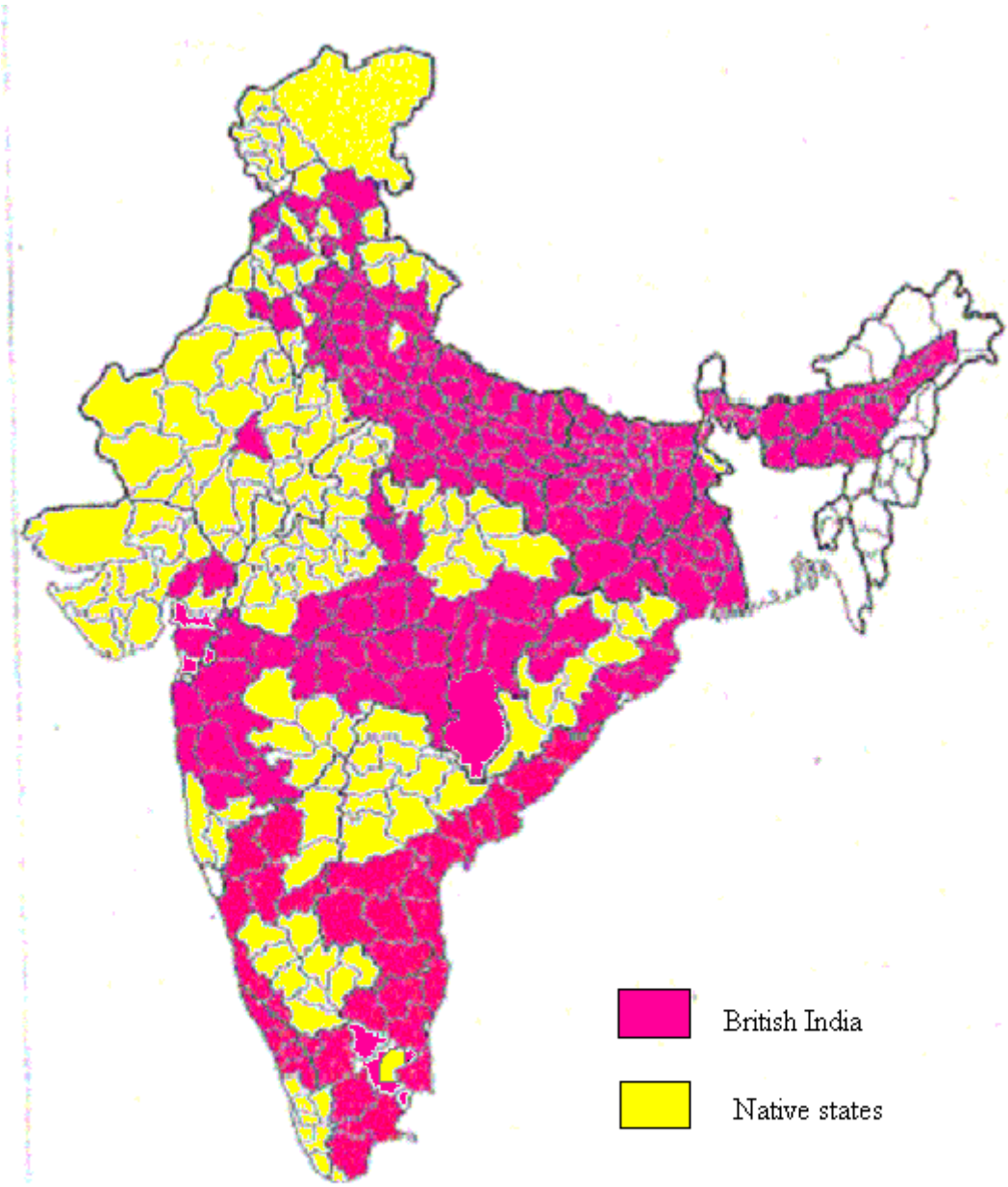

Figure 1 : British India and Native States

Additional table 1: The impact of colonial rule on structural change

	Fraction of workforce in		Fraction of rural workforce in		Fraction of workforce in		Fraction of rural	
	1961-1991	1961-1991	1991 only	1991 only	1961-1991	1961-1991	1991 only	1991 only
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
British dummy	0.004	-0.015	-0.001	-0.005	-0.001	0.052	0.007	0.054*
	(0.006)	(0.010)	(0.005)	(0.007)	(0.020)	(0.032)	(0.019)	(0.032)
Controls								
Latitude, rainfall, coast	yes	yes	yes	yes	yes	yes	yes	yes
Proportion sandy/barren	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes			yes	yes		
# districts	1245	620	313	155	1245	620	313	155
# native states	94	70	94	70	94	70	94	70

Robust standard errors in parantheses, corrected for clustering within native states.

* significant at 10%; ** significant at 5%; *** significant at 1%

Instrument is a dummy for whether the ruler died without an heir in the period 1848-1856.

Data is for the census years 1961, 1971, 1981 and 1991.

Additional Table 2: Is there convergence in public goods provision?

	OLS		IV	
	Coefficient on		Coefficient on	
	British dummy	1961 level	British dummy	1961 level
Primary school	0.016	0.239**	0.074**	0.491***
	(0.024)	(0.095)	(0.032)	(0.058)
Middle school	-0.010	0.734***	-0.063*	0.941***
	(0.028)	(0.094)	(0.034)	(0.174)
High school	-0.014	1.528***	-0.011	1.464***
	(0.011)	(0.125)	(0.017)	(0.113)
Primary health center	-0.024**	0.872***	-0.045*	1.470***
	(0.011)	(0.301)	(0.024)	(0.157)
Canals	0.021	0.139	-0.015	6.645*
	(0.015)	(0.242)	(0.049)	(3.718)
Roads	0.062	0.355***	-0.061*	0.242***
	(0.039)	(0.081)	(0.036)	(0.077)
Controls				
Latitude, rainfall, coast	yes		yes	
Proportion sandy/barren	yes		yes	
# districts	225		124	
# native states	78		60	

Robust standard errors in parentheses, corrected for clustering within native states.

* significant at 10%; ** significant at 5%; *** significant at 1%

Data on rural health centers and canals is missing for UP, Tamil Nadu, Rajasthan, Orissa and Maharashtra.

Data on primary schools, middle schools and dispensaries is missing for Uttar Pradesh.

Data on middle schools, canals and roads is missing for West Bengal.

Data on roads is missing for Punjab and Rajasthan.

Additional Table 3: The impact of land tenure systems

	Coefficient on dummy for	
	British empire	Native states
	OLS	OLS
	(1)	(2)
Dependent variables: Proportion of villages having public goods		
(mean of 1981 and 1991 data)		
Primary school	0.049	0.058
	(0.044)	(0.054)
Middle school	0.106***	0.011
	(0.035)	(0.049)
High school	0.070**	-0.035
	(0.028)	(0.040)
Primary health center	0.028***	-0.012
	(0.009)	(0.012)
Primary health subcenter	0.032	0.008
	(0.023)	(0.018)
Canals	0.004	-0.009
	(0.014)	(0.026)
Roads	0.263***	0.129
	(0.059)	(0.101)
Combined public goods	0.080***	0.023
	(0.026)	(0.034)
Controls		
Latitude, rainfall, coast	yes	yes
Proportion sandy/barren	yes	yes
# districts	234	105
# native states	31	43

Robust standard errors in parentheses, corrected for clustering within native states. * significant at 10%; ** significant at 5%; *** significant at 1%
Data is missing for middle schools in Gujarat, high schools in Madhya Pradesh and primary health subcenters in Karnataka.
Data is missing for Assam in 1981 and Jammu & Kashmir in 1991.

Additional Table 4: Does the religion of the ruler make a difference?

	Coefficient on		
	British dummy	Muslim ruler	Sikh ruler
Dependent variables: Proportion of villages having public goods			
(mean of 1981 and 1991 data)			
Primary school	0.028	0.085*	0.295***
	(0.039)	(0.048)	(0.047)
Middle school	-0.095*	-0.028	0.195***
	(0.049)	(0.045)	(0.039)
High school	-0.072	-0.036	0.149***
	(0.061)	(0.060)	(0.034)
Primary health center	-0.036*	-0.014	0.046***
	(0.019)	(0.017)	(0.011)
Primary health subcenter	-0.063**	-0.022	0.054
	(0.027)	(0.019)	(0.054)
Canals	-0.053	-0.031*	0.025
	(0.033)	(0.018)	(0.048)
Roads	-0.186***	-0.021	0.634***
	(0.069)	(0.048)	(0.092)
Combined public goods	-0.074***	-0.013	0.200***
	(0.028)	(0.025)	(0.042)
Controls			
Latitude, rainfall, coast		yes	
Proportion sandy/barren		yes	
# observations		374	
# native states		93	

Robust standard errors in parentheses, corrected for clustering within native states. * significant at 10%; ** significant at 5%; *** significant at 1%
Data is missing for middle schools in Gujarat, high schools in Madhya Pradesh and primary health subcenters in Karnataka.
Data is missing for Assam in 1981 and Jammu & Kashmir in 1991.

Additional Table 5: Political participation and competition

	Voter turnout in state		Voter turnout in state		Winning margin (%)		Winning margin (%)	
	1960s OLS	1960s IV	post-1980 OLS	post-1980 IV	1960s OLS	1960s IV	post-1980 OLS	post-1980 IV
British dummy	0.015	-0.050	-0.015	-0.013	0.003	0.072	-0.003	0.006
	(0.031)	(0.063)	(0.019)	(0.028)	(0.019)	(0.077)	(0.006)	(0.012)
Mean of dependent variable	0.56	0.55	0.60	0.60	0.19	0.19	0.15	0.15
Controls								
Latitude, rainfall, coast	yes	yes	yes	yes	yes	yes	yes	yes
Proportion sandy/barren	yes	yes	yes	yes	yes	yes	yes	yes
# districts	164	102	314	135	164	102	314	135
# native states								

Robust standard errors in parentheses, corrected for clustering within native states. * significant at 10%; ** significant at 5%; *** significant at 1%
Voter turnout is measured as the fraction of voters who actually voted in the election.
Winning margin is computed as the difference between the vote share of the winning candidate and the runner-up candidate.
Post-1980 data includes elections between 1980 and 2004.
1960s data is for the first election in the state after 1959. This regression is based on data from the states of
Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Punjab.