Geography or Politics? Regional Inequality in Colonial India

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Abstract

Explaining regional inequality in the nineteenth century world forms a major preoccupation of global history. A large country like India, being composed of regions that differed in geographical and political characteristics, raises a parallel set of issues to those debated in global economic history. With a new dataset, the paper attempts to tackle these issues, and finds evidence to suggest that regional differences, and divergence, were significantly influenced by geographical conditions.

Geography or Politics? Regional Inequality in Colonial India[1]

The divergence debate of the last decade has stimulated research on the economic history of the non-European world. While trying to answer the broader question, why Asia, Africa, or Latin America fell behind Europe in the nineteenth century, the scholarship also emphasizes the heterogeneity of growth experiences within the periphery. The heterogeneity is seen to derive from two sources, colonialism and geography. European colonial rule, which was an agent in institutional change, is believed to have produced diverse legacies on property rights and public goods in the nations that attained freedom in the middle of the twentieth century (Acemoglu, Johnson, Robinson, 2001; La Porta, Lopez-de-Silanes, Shleifer, 2008; Austin, 2008). Locally rooted factors such as natural resource endowments are seen to have played a role too, either directly by shaping the ability of individual regions to gain from trade, or indirectly by shaping competition for resources and institutional outcomes of such competition (Sokoloff and Engerman, 2000; Sachs, 2003).

Deep heterogeneity in both these senses was present *within* a large peripheral entity, India; so much so that the question why India stayed poor while Europe became rich cannot have a single answer at all. The answer must depend on which part of India one considers. How different were the Indian regions, why were they different, and was the gap between them growing or narrowing in the era of colonial rule? One reason to enter the subject is that the answers to these questions should share parallels with the divergence discourse. Another reason arises from the historiography of India. Historians have long acknowledged the need to study regional differentiation to be able to qualify any general statement about economic transformation in India. A review of the field observes that, 'social and agricultural regions both smaller and larger than provinces have increasingly seemed appropriate units to scholars' (Bayly, 1985, p. 584). Another overview notes that 'South Asia possessed a .. series of regional economies' (Washbrook, 2001, p. 373). However, a

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shared strategy about how regional differentiation should be incorporated into economic history did not exist until recently.

A recent scholarship has broken new ground by conducting quantitative studies of regional inequality. It has found empirical support for the proposition that present-day regional inequality owes to two particular colonial legacies, property right and indirect rule. The paper is a re-examination of the issues raised in this scholarship with the aid of new dataset, and reaches a different conclusion. In particular, the role of natural resource conditions receives greater emphasis in the present paper. The rest of the paper has six sections: the nature of regional differentiation and interpretations thereof in the current literature, empirical strategy, three sections on data analyses, and conclusion.

Historiography

The productive power and livelihood pattern of Indian regions differed greatly around 1900. A district such as Bombay was possibly the most industrialized in the contemporary tropical world. In the central Indian uplands, Chanda district had no industry and only 15 per cent of its land under cultivation. The capital of this district, which was as large in area as Belgium, was a town of 17,000 people. Both Bombay and Chanda belonged in British India, but in very different geographical zones, coastal-deltaic in one case and forested uplands in another. In addition to these two zones, India contained high mountains, floodplains, savannahs, rainforests, boreal forests, and a tropical desert (see Map 1 for broad geographical divisions). In the past, such diversity made transportation cost highly variable across space. Even as one of the world's largest railway networks came up in India, and terminated at a leading Asian seaport in Bombay, Chanda in the interior remained virtually without wheeled traffic until late in the nineteenth century.

There was another way in which differences emerged and impinged on economic prospects, namely, political and institutional. India did not represent a well-defined political entity in 1800 whether in European documents or in indigenous ones. British colonialism contributed to political integration, but it created its own divisions. A little over half of the territory in colonial India (1857-1947) was directly governed by the Crown, the remainder being governed by the Indian princes and autonomous tribal councils. Although their affairs were observed by and sometimes supervised by British-appointed residents or commissioners,

formally the freedom to rule was respected (Map 2).[2] The relationship between British India and the princely states is often captured by the phrase indirect rule.

These princely states were the kingdoms, many of them former vassals of Maratha or Mughal empires, that British India did not annexe to itself. The political ground for not doing so was that these states were allies of the British, and those in northern India had demonstrated the loyalty during the great mutiny (1857). But, then, nearly all of these states were land-locked, arid or poorly irrigated, with forest cover, and for these reasons, did not yield as much value as it might cost to acquire and maintain them. The states left alone were, nevertheless, required to maintain open borders to commercial traffic. They could have their own currency or legal systems, but the monetary autonomy existed only in name. Most had little incentive to insulate themselves from the pan-regional economic tendencies. No state was known to want to erect obstacles to market integration with British India. Most of them were also pro-Empire in sentiment and resisted independence in 1947.

Depending partly on when and in what manner colonial rule had come into existence, the directly ruled territory became differentiated in respect of rural property rights. Possibly the most important institutional innovation undertaken by the East India Company state (1793-1820) was the definition of the legal title of ownership of land and the creation of a system of courts and legal procedures to verify and uphold the right. This was in theory and in practice a departure from the past system where land ownership, with or without secure title, was tied to the performance of fiscal duties, so that a peasant and a tax collector could both lay claims on a plot of land. The situation had stymied the land market, in the view of the colonial administrators. Their solution was to create an unencumbered ownership title. In practice, the title was delivered to former tax collectors (landlords or zamindars) in one part of India, individual peasants in southern and western India, and peasant collectives or extended kinship groups in parts of northern India.

Did regional differences in economic conditions derive mainly from geographical diversity or from political-institutional diversity? Were they mainly 'natural' or mainly 'manmade'? Until recently, the empirical literature did not present a clear answer to questions like these, which have a bearing on discussions of

[2] On general political history of the 'princely states', see Fisher (1991); on description of ruling families, Malleson (1875). Current historical scholarship deals mainly with political culture, administrative culture, and social modernization. See, for example, Jeffrey (1978); Bhagavan (2003); and the survey by Zutshi (2009).

the long-term growth pattern in India. In the 1960s and the 1970s, a neoclassical strand in the literature explored the growth-inequality interaction, testing the then popular hypothesis that market-led growth should benefit regions that had resources in demand in abundance, whereas a 'backwash' effect might lead to a spatial concentration of the gains from trade (Williamson, 1965; Myrdal, 1957). Another contemporary strand, inspired by the concepts of 'enclave' and 'parasitical cities', paid attention to unequal political power of business groups (Hoselitz, 1954-5; Leys, 1974; Bagchi, 1976). But neither approach engaged with history or geography very deeply.

A recent scholarship has returned the field to the geography-versus-politics problem. It tests the association between the political-institutional legacies of colonialism and late-twentieth-century pattern of regional inequality in the supply of public goods, and finds it to be statistically significant. One key contribution, Banerjee and Iyer (2005), make use of the World Bank agriculture and climate dataset for India, which provides annual averages for 400-odd districts during 1957 to 1986. Their main result, which uses a subset of districts, is that in those districts of British India where the colonial rulers had delivered property rights to non-cultivating landlords or zamindars (in 1793), rather than to the cultivating peasant, agricultural productivity was higher and investments lower in the post-independence period. The underlying argument is that in the landlord areas, conflicts and lack of cooperation between the elite and the peasants became more likely and made lobbying for resources in the post-independence period less successful. Banerjee, Iyer and Somanathan (2010) use the World Bank dataset for an expanded number of districts, divide these up into those that were formerly princely states (indirectly ruled) and those forming part of British India (directly ruled) as well as by landlord property and peasant property areas. They find that the provision of some of the public goods examined was negatively correlated with a dummy for districts which had formerly been directly ruled and under landlord systems.

A third contribution to this scholarship, Iyer (2010), supplements the direct-indirect-rule data by public goods data for 1961-1991, and estimates the relationship between being directly ruled in the colonial period and agricultural performance and provision of public goods in the modern period. In this analysis, the motivation of princely states to perform is explained with reference to the landed property regimes and an annexation threat first applied systematically during 'the doctrine of lapse' in

force between 1846 and 1856. Iyer (2010) finds no significant effect of direct rule on agriculture, but a negative effect on public goods. The reason adduced for this is that the princely states were less constrained by British Indian priorities, as well as faced an incentive to be well-governed, being under threat of removal by the British.[3]

The confirmation found in this corpus that the princely states were more progressive than British India and indirect rule more welfare-inducing than direct rule overturns an earlier result from a more limited statistical test (Hurd, 1975; Simmons and Satyanarayana, 1979). The new scholarship has spawned several attempts at extensions (Kapur and Kim, 2006; Chaudhary, 2010) and one critique of the methodology of Banerjee and Iyer (2005) (Iversen, Palmer-Jones, Sen, 2012).

Although the empirical strategy adopted in these contributions is innovative, it has limitations. There are three issues in particular. First, the colonialism and public goods scholarship takes for granted that the formal designation of a region (as landlord or as a princely state) should in theory correspond to a substantive institutional type. This issue of the coincidence or otherwise of formal and substantive institution is under-researched, and where researched, disputed. A few examples will illustrate the problem. In the core zone of landlordism, Bengal, historians disagree on who actually controlled land and, in turn, shaped local politics (Ray, 1979). On the other hand, in some of the princely states, the 'elite' who descended from warlords and nobility much like the landlords in British India controlled land and influenced the dispensation of public goods. One example of elite power was Hyderabad, the largest among the princely states (Leonard, 1971). The public goods literature also assumes that the relationship between British India and the princely states was significant, uniform, and well-defined. This is questionable too. One historian, for example, writes, 'Hyderabad State was technically under British indirect rule, but this status was one of the least significant things about it' (Leonard, 2003: 364). It is inevitable that, pending more work on this theme, historians will identify the formal designation of a region as landlord or a princely state with a real institutional type. But such practice is at best founded on a shaky assumption. Therefore, it is also necessary to explore alternative methods that obviate the need to introduce hard segmentation between regions. I explore one such alternative, spatial correlation, in this paper.

[3] On the conditionality, see Lee-Warner (1910), pp. 280-312.

Second, in the public goods scholarship, geography is approximated by an array of qualities, such as soil, rainfall, and proximity to the coasts, rather than by any specific concept of zoning. I prefer to follow a classification scheme that derives from a definite conception of space found in colonial geography. This conception is justified more fully in the next section.

Third, the design of the tests in the public goods scholarship carries a potential oversight. The design of the tests involves regressing post-1960 effects on causes that had been introduced 120-170 years earlier, namely, the formal inauguration of landlord property in 1793 or an annexation threat that was credibly applied for the last time in 1848-56. The procedure entails a systematic underestimation of the role of geographical factors in economic change and regional differentiation. Geography should matter to economic change in a variety of ways. Among the most important channels is trade in goods intensive in resources that are unequally distributed in space. Nineteenth century trade in India was dominated by agricultural commodity trade under a more or less laisser-faire regime. Therefore, trade was a geographically influenced process in the nineteenth century. On the other hand, the collapse of international trade in the 1930s, the severely regulated trade regime after 1947, prohibition on agricultural trade – all of these factors put an end to the colonial economic system in which resources and commodities had contributed more directly to economic growth. Trade-GDP ratio in the 1960s was less than one-third of what it was in the 1920s. In other words, between 1870 and 1930 a trade-driven process of growth and regional differentiation had begun and exhausted itself. Correlation between 1960s variable values with early-1800s variable values builds in an oversight of this process.

Consider the process that we may miss noticing. Throughout Indian history, agricultural production, long-distance trade, and the formation of powerful imperial states were more likely to concentrate in the deltas of eastern and southern India and the Ganges and Indus floodplains. These areas usually had higher cropping intensity, greater irrigation potentials, and yielded more revenue per area, than the arid lands, deserts, forests, and dry uplands in the interior. Major commercial towns tended to be situated in these areas, reflecting the availability of larger volumes of agricultural surplus in them. Not only was the quality of land better in the former zones, trade costs were lower too. The flat terrain and the presence of large rivers made it possible to move goods and people by the two relatively cheaper modes of long-distance

transportation, namely, carts and boats. In the rest of the region, the upland and the forests made it impossible to move cargo over land by anything other than the expensive and slow mode of caravan trains.

The British territories contained more of the coasts-deltas-floodplains, whereas more of the uplands and forests fell within the domain of the princely states (see Maps 4 and 5). The landlord areas too consisted largely of deltas, coasts, and riparian plains. This is well recognized in the public goods scholarship (see, for example, the careful treatment of agriculture in both Banerjee and Iyer, 2005, and Iyer, 2010). If globalization was indeed a significant influence on regional inequality, we should expect the British Indian and the landlord areas to forge ahead of the princely states and non-landlord areas. Even though a key tradable, cotton, came from the dry-land, the major examples of agricultural commercialization were in fact located in the floodplains (wheat and sugarcane from Punjab and United Provinces), the coasts (rice from Krishna-Godavari delta, cotton from coastal Gujarat), and the deltas (rice from Bengal). Higher land revenue potential led to greater local revenue available for spending on public goods. Commercial profits were also channelled into education and health-care on quite an extensive scale, when these profits concentrated in the port cities, the case of Parsi charitable institutions of Bombay being a well-known example. The effect is expected to have been reinforced by a bias in the provision of public goods in favour of those goods that potentially aided commodity trade. For example, in colonial India, major infrastructure projects were prioritized with reference to agricultural production (canals) and agricultural trade (railways). In the mid-nineteenth century documents outlining plans for a railway system in India, the benefit for trade took precedence. Even as the first twenty-five years of railway construction proved to be a burden on the exchequer, 'the trade and revenues of the country testified to the value of the new means of communication' (India b, 1908, v. 3: 368).

Putting these pieces together, we should see in the nineteenth century a virtuous circle develop at the regional level between trade, state capacity, and infrastructure. We should also see that the collapse of world trade from the 1920s and the regulated trade regime of post-colonial India put an end to this circle so that the formerly leading regions fell behind. If this hypothesis has merit, tests of association between 1960s inequality and institutional causes introduced in 1793 and 1848-56 need to be re-examined for two reasons, (a) they bypass the historical

process of economic change and regional differentiation that occurred in between, and (b) they produce an outcome that is counter-intuitive.

With a contemporary dataset, I revisit the subject.

The data and empirical strategy

The 25-volume Imperial Gazetteer of India (1908) did not set out to collect statistics. But it made use of a uniform questionnaire in its descriptions of territorial units, so that it is possible to pick from the descriptive sections numbers pertaining to area, population, revenue, rainfall, cultivated and irrigated areas, roads, railway network, literacy, and the size of the largest town. For 430 districts of British India and 130 princely states, partial or full details are available. The territory includes lower Burma, as well as the Shan states in eastern Burma over which British India established overlord status without direct governance or control. Some of the regions so governed do not yield much usable data. Together, the units for which there is data (excluding Burma) accounted for 276 million persons and 1.4 million square miles of territory. According to the census of 1901, India's population (excluding Burma) was 284 million, and the area 1.53 million square miles. Despite the exclusions, then, the Gazetteer dataset still accounts for 97 per cent of population and 93 per cent of area. Missing data for many of the smaller districts and states poses a problem. Using nearest comparable units some of the gaps was filled as far as possible.

In the first step of the statistical analysis, these regional units are classified into two political clusters (British India and princely states), two institutional clusters (landlord zones and peasant-property zones), and two geographical clusters (coasts-deltas-floodplains and deserts-uplands). The first pair is easily defined. One practical advantage of working with a 1908 dataset is that the political units enter the analysis exactly as they appear on the map, whereas the use of World Bank data entails a complicated task of reassigning areas across new boundaries. The Gazetteer data also allows us to work with undivided India and a much larger set of territorial units of both types. The second distinction between landlord property and non-landlord property has seen a recent controversy over which areas were formally designated as one or the other (see Iversen, Palmer-Jones, Sen, 2012). I follow the orthodox classification, where Bengal, Bihar, coastal Orissa, parts of the southeastern

coast known as the Circars, and sections in Madras Presidency (especially Ramnad area) formed units in the zamindari or landlord tenure (see Map 3).

Colonial geography (see, for example, Medlicott, 1862) divided India into four principal zones, the Himalayas and the submontane, the central and south Indian plateau, the seaboard and the delta, and the floodplains of the Ganges and the Indus. I ignore the mountains and the submontane, which were not part of the core agricultural zone except in narrow fluvial tracts, and consolidate the other zones into two. By this scheme, a classification consisting of coasts, deltas, and the floodplains of the Himalayan rivers on the one hand, and the uplands and arid regions in the interior on the other hand, seems to capture the most crucial difference in resource conditions well enough.

Productive capacity anywhere in India depended on agricultural conditions. Agriculture was constrained by the extreme tropical heat and the long dry season, and helped by replenishment of ground and surface water by the monsoon rains for three months of the year. In 1908, productivity of land depended only moderately upon soil nutrients. It depended more directly on cropping intensity, which was a function of irrigation water. Canals and surface wells, the two common modes of accessing water bodies depended on the availability of large rivers in proximity as well as alluvial soil, so that irrigation potentials reinforced the natural productive capacity of the deltas and the great floodplains. A flat terrain with plentiful rains allowed for a controllable supply of irrigation water, and therefore, more land cultivated and above-average cropping intensity (Maps 4 and 5). The deltas, floodplains, and the coasts satisfied these conditions, or some of them. Uplands and low-rainfall zones were deficient in irrigation potentials. Because of this reason, the core agricultural zones in the subcontinent formed in the deltas, the coasts, and the floodplains of the Indus and the Ganges.

A final point about the procedure adopted here needs an explanation. The 1908 dataset is rich enough to allow us to work with a range of indicators of economic well-being of regions, including tax collection, literacy, transportation density, urbanization, and irrigation ratio or the quality of land resources. Descriptive analysis considers all of these benchmarks. However, none of these stands for a direct measure of well-being or productive capacity, as income or yield would. Regional domestic product before 1950 is unavailable. The attempt to construct regional incomes is somewhat promising for the British Indian provinces

(see Caruana-Galizia, 2013, for an innovative reconstruction). But it is a futile quest for many of the princely states that did not collect basic economic data.

For measurement of inequality, a proxy is used. On the assumption that the size of the regional government bears a positive relation with the productive capacity of the territory, the size of the fisc (revenue per square mile) can be used as a proxy of the productive power of a region. Unlike after independence in 1947, there was little transfer of saving or revenue between territories, and state revenue came mainly (over 50 per cent) from land. Production conditions in agriculture depended on irrigation prospects, which depended on climate and topography.

We do not have much choice in the matter of selecting the benchmark variable, but the use of revenue per square mile can be defended. Revenue is a reasonable index of regional productive power if (a) there was a close interdependence between the fiscal system and the production system, (b) factor payments mattered little to the composition of regional incomes, and (c) tax rates did not differ between regions significantly. All three are defensible assumptions.

State revenues were mainly raised from land tax, so that agricultural production and government finance were closely related. Internal migration did increase in the colonial period, but with the prevailing low wages and very limited facilities for remittance, its impact on factor income flows should be relatively small. In principle, if the tax-rate is high in a low-income area and low in a high-income one, the same level of collection could hide large inequality in incomes, and therefore, the use of the proxy could under- or over-estimate inequality. Tax-rates are not available directly. But the variation in tax-rate is unlikely to have been large. The rate of taxation on land was based on a tradition of cadastral surveys and maintenance of local registers that was long-standing and pre-colonial in most parts of India. The tradition, furthermore, drew on notions of fair taxation that were also very old. There was an official discourse in British India on the desirability of following a Ricardian principle of taxing potential scarcity rent, while at the same time, basing the minimum tax rate upon indigenous tradition. Under these conditions, the tax rate would have approached, by 1908 at least, when these principles had been in operation for nearly a century, a uniform level, subject to

variations in land quality (see Roy, 2012, for further discussion on land revenue policy).[4]

Measures of inequality by this benchmark are sensitive to population in a systematic way. Any type of region, however defined, that produced more value per land area measured by fiscal revenue tended to be more densely populated (see Map 6, and contrast Maps 7 and 8). This inverse relationship should suggest that the higher population density of the well-endowed regions was partly an effect of in-migration in search of easier agricultural livelihood and partly an effect of lower mortality rates because these regions ensured food security better. In that case, population density can be seen as an endogenous variable in a process driven by unequal resource endowments. This prospect justifies using measures per area rather than measures per capita.

Using this dataset, I examine the hypotheses that

a. Regions better endowed in natural resources were also better endowed in public goods, which is tested by a comparison of cluster means;
b. Relative geographical situation exerted a significant impact upon public goods and productivity, which is tested by estimating spatial correlation; and
c. The extent of regional inequality increased in the free trade era, which is tested by comparing two revenue datasets fifty years apart.

Comparison of cluster means

Tables 1 and 2 show the averages of the benchmark indices for these zones. Table 1 shows that the coastal-deltaic-floodplain regions were on average better-off than the arid uplands and that the princely states were poorer than British India. These findings are interdependent since more of the coastal-deltaic-floodplains areas formed part of British India. Table 2 suggests that property regime is not a good predictor of regional inequality. Some of the indices favour the non-landlord regions, whereas literacy and transportation density are higher in the landlord regions, if marginally. Of the public and quasi-public goods on which this dataset has any

[4] One potential problem with ignoring tax-rate is that the landlord areas had fixed taxes forever, whereas the non-landlord ones allowed for revisions. In practice, revisions had become rare after 1880. In any case, if tax-rates did differ on this account, it would pose a problem for the use of tax-per-area as a measure of the productivity of the area in question only if the landlord areas appear to yield less tax on average. It would, then, be difficult to identify the effect of tax-rate from the effect of the capacity of the land to produce taxes. In practice, the landlord areas produce more taxes on average at this time, so that this issue can be ignored.

information, transportation density appears to differ widely, being higher in the delta-coastal-floodplains regions as well as in British India (see also Map 9). Literacy, however, varies in a narrower range and did not necessarily concentrate in the endowed zones (see also Map 10). I will return to this finding later. There is also a difference in level of urbanization (approximated by the size of the largest town) between geographical and political zones.

A number of results illustrate the poorer endowments of the princely states, the lower average rainfall, a smaller proportion of cultivable land, lower irrigation ratio, revenue per square mile, urbanization, transportation density, and literacy (Table 1, also Maps 1 and 4). Transportation density is especially important because of its potential link with trade costs. Because of the uplands terrain, all-weather roads there were very few in the territory of the states. As we have seen, railways were at the start a private good in British India, and motivated by expected profits from trade. Not surprisingly, in the floodplains of the Ganges and the Indus, railways started early (1850s) and followed the major arteries of road and river-borne commercial traffic. Railways started late in the princely states, and construction was mainly led by the governments, though in some of the long-distance lines cutting through the states partnerships with private companies and British Indian government were also present. If these through lines are excluded, the majority of the lines constructed by the princely states seem to have served mainly passenger traffic. In some parts of India (such as Kathiawad in Gujarat), political fragmentation was so great that the state railways were built in small uncoordinated segments, often in the outlandish two-feet or 'narrow' gauge, that did not feed effectively into the long distance broad-gauge routes running through British India. This set of factors accounted for a lower railway density in the states. That being said, the gap in the railways did narrow over time. From the 1870s, the British Indian government started taking control of the railway system and non-commercial motivations (such as famine relief) took precedence. State railway construction gathered speed as well.

What has been said of the roads and the railways, would apply to the ports with even greater force. The four major ports, Bombay, Calcutta, Madras, and Karachi, were all located in British India. Among the larger princely states, only Travancore-Cochin had a long seafront. In turn, the economy of this state was also more export-oriented than other princely states. Of the other major states, Baroda

was well-connected by rail with Bombay port. Still, few of the princely states had easy access to the sea and a comparable history of long-distance commerce by sea.

Are the differences between clusters of significant order? Table 3 presents results of tests of significance of the difference in means. The benchmark variable is revenue collection. The tests are conducted for pairs of broad clusters, as well as interactions between them (for example, geographical differences within a political cluster). In addition, following on a procedure introduced in Banerjee and Iyer (2005), the difference in means between two reconstructed clusters is conducted, one of the clusters consisting of landlord territories and the other of non-landlord territories, subject to the condition that each landlord territory shared a border with at least one non-landlord territory. This pair is added under the assumption that contiguous units, even when institutionally different, were geographically similar, so that if the difference between them turns out to be insignificant the result would indicate that institutional differences mattered less than we may expect. Map 11 shows the cluster (in darker shade) for which this exercise was done, whereas other similar clusters of contiguous and institutionally differentiated territories in eastern and southeastern India (shown in lighter shade) involve too few observations for a meaningful result.

Table 3 suggests two results. Princely states were significantly better-off than British India and the non-landlord territorial units significantly better-off than the landlord ones only if we consider revenue per capita. If, however, we consider revenue per square mile, differences between political and institutional clusters cease to be significant, and geographical differences alone matter (see also Maps 8 and 9). In the case of contiguous units, the nature of landed property makes little difference to either one of the benchmarks.

In view of the criticism of cluster-based analyses offered earlier, it is desirable that we confirm the nature of the differentiation by means that do not depend on clustering at all. Spatial autocorrelation supplied such a tool.

Spatial autocorrelation

Autocorrelation in cross-section datasets is a recognized problem, but tends to receive less attention in economic history than that in time-series or pooled data. This is so because the phenomenon of correlated errors is more pro-intuitive in temporal data as the effect of 'inertia' than correlated errors in spatial data. In recent

years, spatial autocorrelation has been used more often in several fields straddling economics and geography. One example is consumption studies, when the consumption of one family depends on the consumption by its next-door neighbour. A regression of consumption on income or wealth will not produce efficient estimates in such contexts and a special test is needed to measure the extent of correlation between neighbour units (Case, 1999). Other examples of the use of the tool are studies on diffusion of technological innovation (Ó Huallacháin and Leslie, 2005), the clustering of urban poverty (Longley and Tobón, 2004), and the spread of epidemic contagion (Smallman-Raynor, Johnson and Cliff, 2002).

The technique finds frequent use in geography. This is to be expected, for the effect of such qualities of the earth as soil, rainfall or terrain does not change drastically, but only gradually, between one spatial unit and another contiguous spatial unit. Therefore, it is standard in spatial econometrics to assume that the features of one unit should predict features of neighbourhood units, giving rise to autocorrelation between the errors. As in the case of time-series data the smaller the unit the bigger is the correlation. Conversely, if in a spatial economic dataset such as the one in question autocorrelation turns out to be significant, that characteristic can be read as geographical in origin. In theory, merely the presence of a high autocorrelation is not sufficient proof that geography is more important than other influences, because we do not know why neighbourhood exerts an influence. Such patterns can follow, for example, if administrative practices are transferable between contiguous areas. But, then, any effect that crosses borders between territorial units does not necessarily influence the aggregate measure. If such local effects are a mix of positive and negative correlation (an example of a negative effect being one where one unit draws trade away from or exploits a neighbour), they can even cancel each other out. The coefficient will be significant if a large number of units display dependence on neighbours, which points at a single process generating such effect. If we are explaining the generation of land revenue, distribution of agricultural resources is the likely reason. If the cluster averages also point in the same direction, there is stronger confirmation of the hypothesis.

Regression models, in the presence of such a process, can be of questionable value. If we have reason to assume that the causal model is such that the error of one unit should predict errors of neighbourhood units, it is necessary to measure the

extent of the problem. A regression with fixed effects such as region dummy will still entail an underestimation of the residual variance common to all such cases.

The specification for an explanatory model in the presence of spatially autocorrelated errors is,

$$y = rWy + xb + e$$

where e are the spatially uncorrelated errors, x the independent variable values for regions i = 1 .. n, r the spatial coefficient, and W a matrix of weights capturing contiguity, distance, overlap, lagged distance, or any other appropriate index of neighbourhood effects between each pair of y_i and y_j. In actual computation, the weights are row standardized values. In this paper, I have taken 'first order contiguity', where the weights are 1 when region pairs share borders and 0 otherwise. There are a number of measures for spatial autocorrelation coefficient. The commonly used ones are products of similarity between paired values and proximity between them. One of these is Moran's I, defined as

$$I = \frac{n}{W} \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij}(y_i - \bar{y})(y_j - \bar{y})}{\sum_{i=1}^{n} (y_i - \bar{y})^2}$$

where w_{ij} is the weight between observation i and j, and W is the sum of all w_{ij}'s, and another is Geary's C, which estimates similarity between paired values as difference between them rather than as deviations from respective means.

$$C = \frac{(n-1) \sum_i \sum_j w_{ij} \, (y_i - y_j)^2}{2W(y_i - \bar{y})^2}$$

(see Griffith and Layne, 1999). The I takes a value between -1 and 1, with positive values indicating positive autocorrelation. The second measure is commonly used for local spatial autocorrelation.

Moran's I is estimated in three separate cases (Table 4).[5] First, a cluster of north Indian units are taken, each one of which shares a border with at least one different political entity; that is, a princely state is included in the cluster only if it is contiguous to one or more British Indian districts (see Map 12). In the second set, again from north India, each territorial unit within a cluster shares border with at least one other unit with a different institutional entity; that is, if it is a landlord area, it is contiguous to at least one non-landlord district. The measure is carried out for the border between Bihar and Orissa (Map 11). The third exercise includes the entire population of territorial units. The first two procedures cannot be replicated in those

[5] In actual estimation, a few missing blocks were imputed zero values.

regions where a reasonable number of contiguous units with opposing political-institutional configuration cannot be found, or where these entities are too dissimilar in size. For example, the first procedure can be repeated only for a much smaller number of states and districts in south India. Similarly, the second procedure can be in principle carried out for eastern Bengal along the borders of Assam (non-landlord) and Bengal (landlord), but the number of observations would be too few (the clusters excluded are shown in lighter shade in Maps 11 and 12).

If the null hypothesis is that geographical situation exerts no systematic influence on the economic profile of regions, we would expect the autocorrelation coefficient to take a value near zero. Such a value might signify that political status or institutional features exert a strong influence in the dataset.[6] If the coefficient takes a significant value, we should conclude that, overriding political-cum-institutional differences, neighbouring units tend to be sufficiently similar.

Table 4 shows the results of the exercise. Revenue per area, population density, revenue per person and irrigation ratio all show positive autocorrelation; in ten of the twelve estimates the coefficient is significant. When we come to public and quasi-public goods, such as roads and schools, the neighbourhood effect seems to weaken, even though it remains positive in the case of states and districts, and in the global dataset. The exceptional case of literacy is pro-intuitive, and shows that only in education, where ideology of social welfare played an explicit role, was there an effective catching up via state intervention. Overall, it seems reasonable to conclude a strong effect of geographical situation, qualified but not overturned in the case of public goods.

The final step in the analysis consists of asking, was there divergence or convergence in colonial India? In order to answer the question, I combine the 1908 dataset with an earlier source.

Trend

The earlier source in question (Anon., 1853, Thornton, 1853) had collected data on the size of major states and East India Company territories. The source covers 13 regional political units, including major princely states. Although data for

[6] There is an additional reason to exclude these zones from the test. The coefficient cannot be easily interpreted if geographical features change drastically over relatively short distances. This problem is likely to affect the outcome for the southern peninsula, which is a mix between arid uplands and fertile river valleys, and for eastern Bengal where a cordillera of the Himalayas run more or less along the border between landlord and non-landlord zones. These areas are excluded from the test.

the British Indian territories began to be presented regularly and in reasonable detail from about 1840, this was the first time, and the only occasion in the nineteenth century when the states and the provinces received equal coverage in the same source. The data consists of area, population and revenue.

Again using only revenue collection data, I estimate coefficients of variation (the measure known as unconditional σ-convergence). It has limitations, but it is easy to use and a better measure to use when the number of observations is small, as in the case of 1853. Subject to the caution that the 1850 finding cannot be very robust, the results (Table 5) point at increasing inequality in the second half of the nineteenth century. For a shorter span of time within the range, 1875-1911, Caruana-Galizia (2013) finds evidence of convergence in regional GDP. The units are the British Indian provinces. For what the 1850 data are worth, the Gazetteer dataset suggests an unchanging level of inequality among the British Indian territories, and a divergence only if we include the states.

On the other hand, there was almost certainly a great decline in inequality in the twentieth century, which trend continued on in the early decades of planned development under a national government. Again, these trends alert us to the problem that the results are sensitive to whether we normalize the variables with area or population. Between 1853 and 1908, population was stagnant, but population growth accelerated after 1920, mainly in the fertile plains. By 1960, then, the gains of the more resource-endowed regions were being shared amongst a much larger population than in the colonial times.

Conclusion

The statistical analysis carried out above leads to the conclusion that the effect of geographical endowments on the pattern of regional inequality in fiscal capacity and public goods was significant in the late nineteenth century. The conclusion is based on three specific findings derived from a 1908 dataset: averages differed between geographical zones more consistently than between political and institutional zones, neighbourhood exerted a positive and significant effect on regional attributes, and regional inequality rose when there was free trade and fell when free trade ended.

The conclusion differs from that of the recent scholarship on colonialism and public goods discussed earlier, which discounts the influence of geographical

differences upon regional inequality (Banerjee and Iyer, 2005; Banerjee, Iyer and Somanathan, 2011; Iyer, 2012). There are several possible reasons for a discrepancy. First, subject to the limitations of the 1908 dataset, the present paper makes use of a specific unit of measurement, namely, fiscal capacity per area. Second, the present paper classifies geographical zones differently, following a contemporary classification scheme. Third, resource endowments did, in fact, play a bigger role in the process of economic change at the turn of the twentieth century. Around that time it outweighed other influences; but the effect faded away by the middle of the twentieth century.

The third possibility, a plausible case for which is made in the paper, suggests a particular dynamic of economic transformation in prewar India, led relatively more by globalization and market integration, rather than by the region's own specific political heritage. About 1908, the deltas and the floodplains allowed for greater density of cultivation than the rest of India, and therefore, more revenue per land. A virtuous circle developed between land productivity, state capacity, and transportation density. The circle worked better with roads than railway, where the gap narrowed, partly because railways began as a private good in British India and was state-led in the princely states all along. A similar qualification needs to be added with literacy. Again, much schooling in British India was a private good and sensitive to commercialization, whereas in the princely states, education and health-care were supplied by the government to a greater extent.

The final piece in the story is the hypothesis of a rise and decline of regional inequality. By virtue of possession of more fertile land, the deltas, floodplains, and coasts were better situated to gain from the nineteenth century globalization, which encouraged export of crops like wheat and rice, increased the capacity of the states as well as commercial actors, and led to more spending both on private and government accounts on roads, railways, schools, and hospitals. The geographically endowed zones took part in a 'Smithian' growth process, whereas the princely states were less able to do so.[7] The Smithian process slowed after the Great Depression, and was deliberately weakened after 1947. After 1931, the colonial state became bankrupt, the world market in primary products crashed, the ideology of laisser-faire was under attack, a new ideology of the developmental state was in ascendance, and growing

[7] This is economic growth driven by the extension of markets with or without institutional and technological change. For a discussion, see Saito (2006).

fear of famine led to the imposition of strict controls over commodity trade. When social overhead expenditure was made a priority by the rising ideological tide, the princely states proved less constrained by the commitment to imperial priorities than was British India, whereas the commodity processing and exporting zones lost their lead in the new economy.

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Table 1. Descriptive Statistics for Political and Geographical Zones, 1908

	British India	Princely States	Coasts, deltas, floodplains	Uplands and arid areas
Population (million)	224.0	60.4	159.1	125.3
Area (1000 sq miles)	901	577	437	1042
Density (person/sq mile)	249	105	364	120
Rainfall (inch)[a]	43	22	43	31
Agricultural land/total area (%)[a]	40	34	46	34
Agricultural land per capita (sq mile/1000 persons)[b]	1.61	2.35	1.24	2.43
Irrigated land/agricultural land (%)[a]	20.8	14.6	27.5	14.6
Revenue/sq mile (Rs)[a]	518	395	737	359
Land Revenue/Revenue (%)[a]	63	51	65	56
Revenue per capita (Rs)[b]	2.07	3.91	2.04	3.00
Road and rail mileage per 1000 sq mile[a]	46	29	48	36
Literacy (%)[b]	4.5	3.6	4.6	4.0
Size of largest town[b]	42558	21739	49932	23166

a. Area-weighted. b. Population-weighted.

Sources: For Tables 1-3, see text.

Table 2. Descriptive Statistics for Institutional Zones, 1908

	Landlord	Non-landlord
Population (million)	78	145
Area (1000 sq miles)	187	714
Density (person/sq mile)	419	203
Rainfall (inch)[a]	66	37
Agricultural land/total area (%)[a]	42.7	42.9
Agricultural land per capita (sq mile/1000 persons)[b]	1.01	2.16
Irrigated land/agricultural land (%)[a]	17.8	21.0
Revenue/sq mile (Rs)[a]	549	694
Land Revenue/Revenue (%)[a]	46	73
Revenue per capita (Rs)[b]	1.31	2.17
Road and rail mileage per 1000 sq mile[a]	58	54
Literacy (%)[b]	5.33	4.16
Size of largest town[b]	31735	43195

a. Area-weighted. b. Population-weighted.

Table 3. Tests of Significance of Difference in Means (t-statistics)

	Tax/capita	Tax/area
British India and Princely States	-5.294*	0.257
Landlord and Non-landlord units	-7.865*	-0.893
Landlord and non-landlord units sharing borders	2.271	0.811
Two geographical zones (Coast-delta-floodplains and uplands)	-3.981*	6.265*
Two geographical zones within British India	-1.669	6.611*
Two geographical zones within Princely States	0.573	3.184*
Two geographical zones within Landlord areas	2.034	3.618*
Two geographical zones within non-landlord areas	-0.711	6.343*

** Significant at 1% level.

Table 4. Moran's *I* output

Clusters	Obs.	Tax/person	Tax/area	Population density	Irrigation ratio	Transportation density	Literacy
		1	2	3	4	5	6
Princely states and districts in north India that share borders	58 (28 states and 30 districts)	0.170	0.350*	0.558*	0.535*	0.308	0.146
Landlord and non-landlord units sharing borders (North India)	17 (8 landlord, 9 non-landlord)	0.231	0.374*	0.587*	0.603*	-0.311*	-0.063
Global	388	0.352*	0.336*	0.701*	0.586*	0.465*	0.171

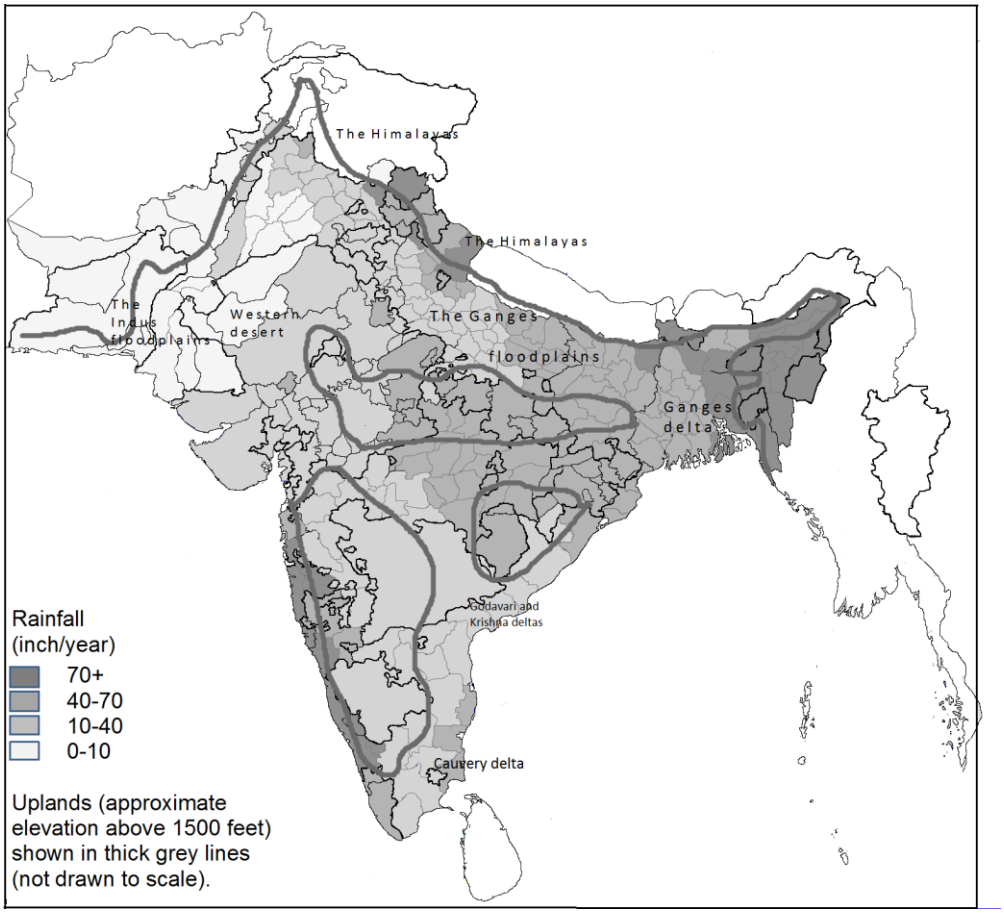
* P-value of z-statistic less than 0.01 (one-tailed).

Table 5. Measures of regional inequality in colonial India

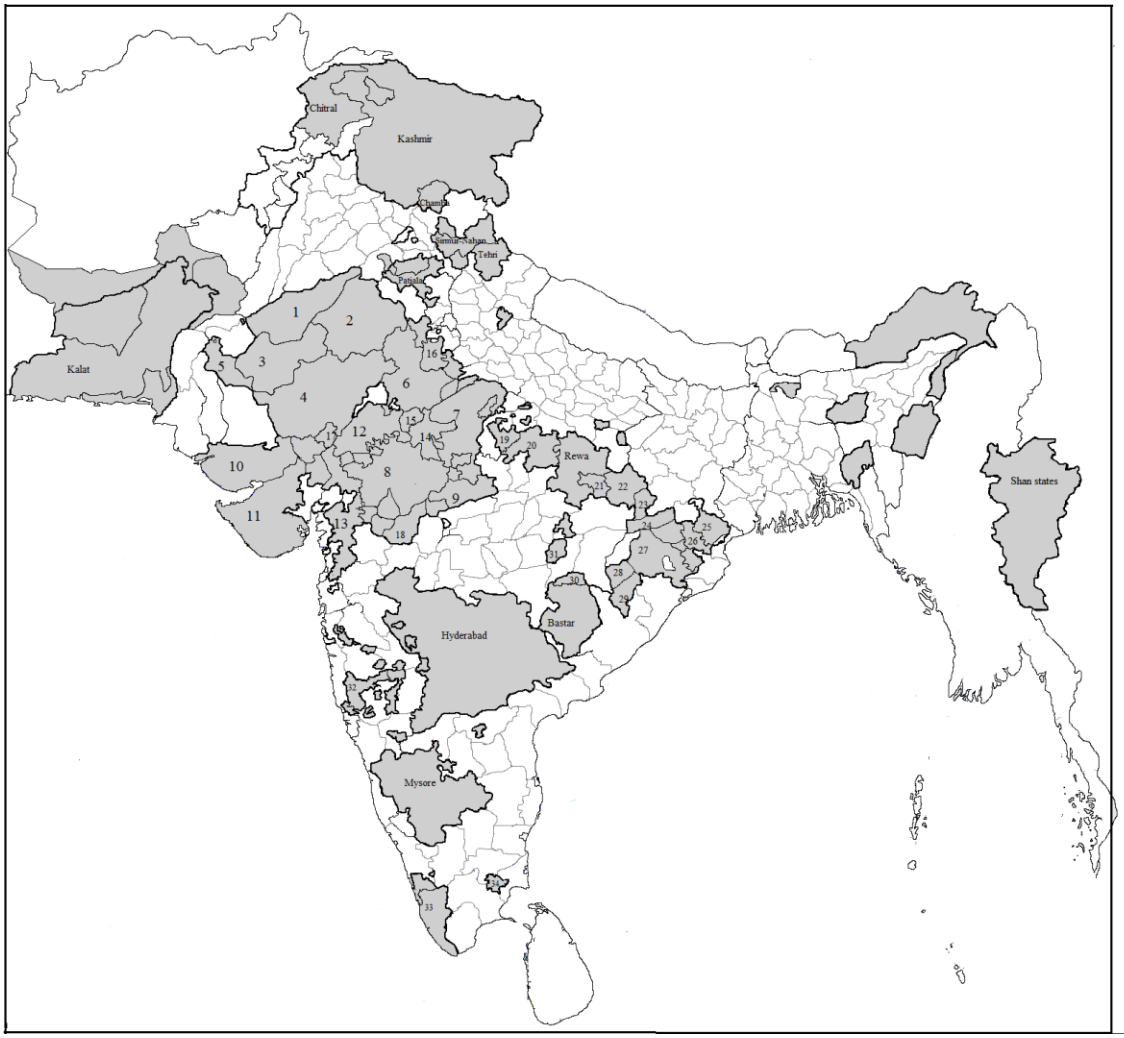
	1850 (13)	1908 (325)	1950 (14)	1965 (16)
Colonial India (R/A)	0.68	0.84		
Colonial India (R/P)	0.44	1.16		
States, Indian Union (Y)			0.25	0.17

Note: The numbers stand for coefficients of variation of revenue per square mile (R/A), revenue per capita (R/P) or state domestic product per capita (Y). The number of observations is shown in brackets.

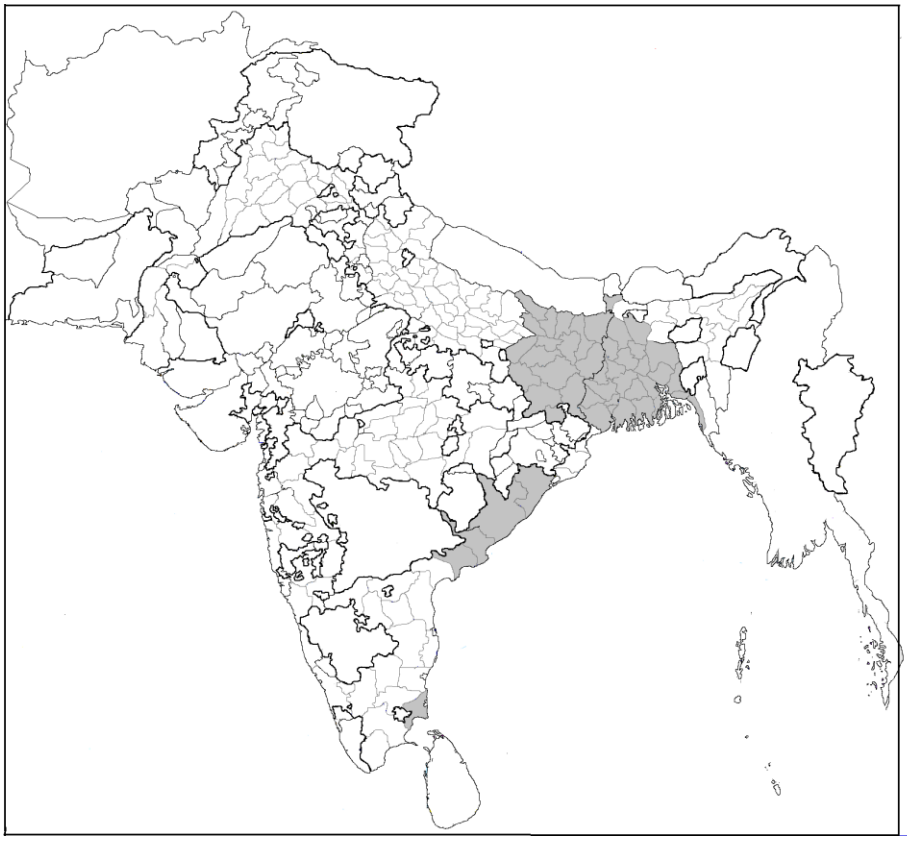
Sources: For 1850, Anon. (1853) and Thornton (1853); for 1908, India (1908); for 1950 and 1964, Mahajan (1973) and Tiwari (1973) respectively.



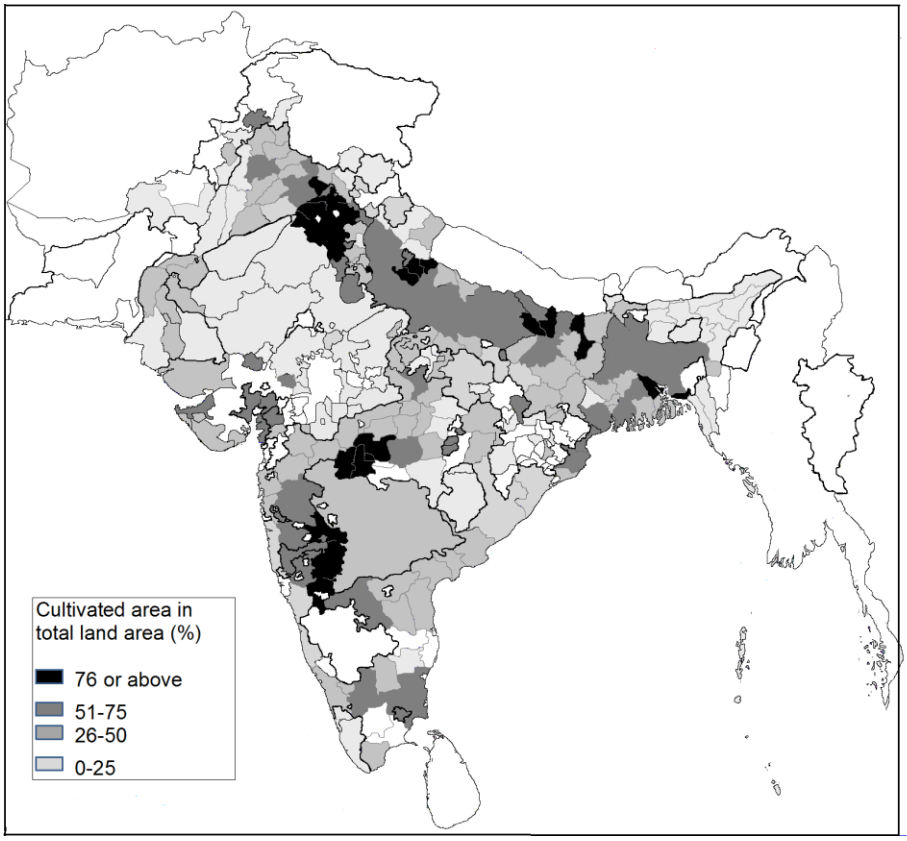
Map 1. Rainfall and topography, 1908



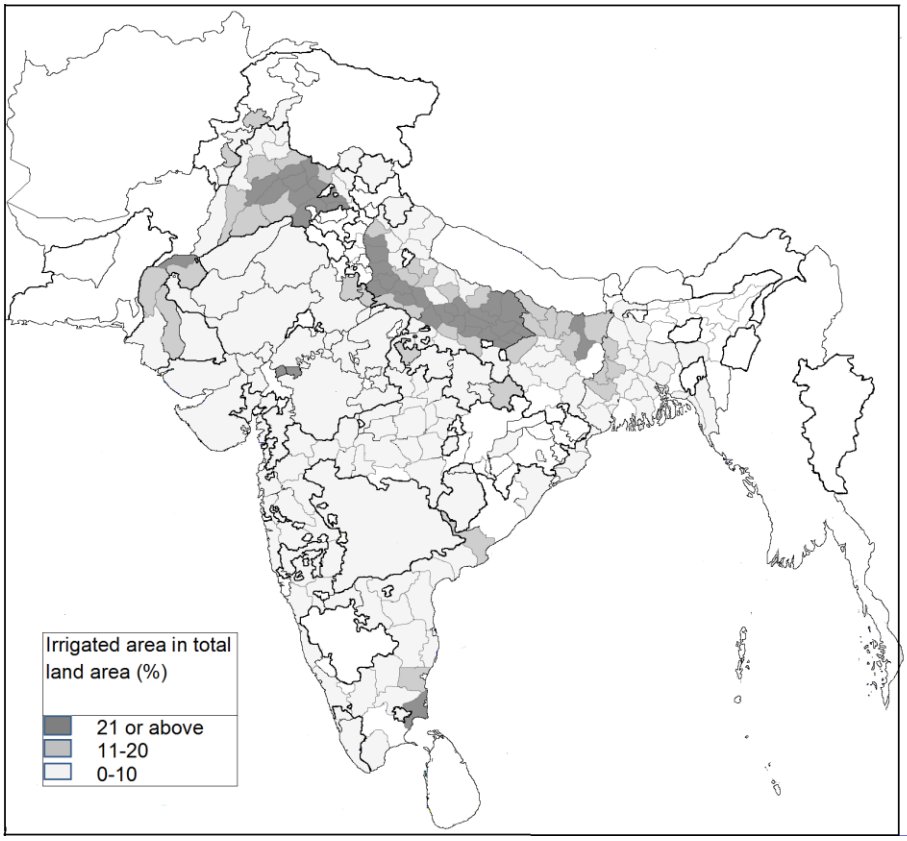
Map 2. India, c. 1908 (princely states and autonomous areas shown in darker shade) Legends (only the major states): (a) West-central: 1. Bahawalpur, 2. Bikaner, 3. Jaisalmer, 4. Jodhpur, 5. Khairpur, 6. Jaipur, 7. Gwalior and Datia, 8. Bhopal, 9. Indore, Gwalior estates, Dhar, Ratlam, Jhabua, Alirajpur, Raigarh, Narsinghgarh, 10. Cutch, 11. Porbandar, Palanpur, Jhalawar, Navanagar and other Kathiawar states, 12. Udaipur, 13. Baroda, 14. Kotah, 15. Bundi, 16. Alwar, 17. Bharatpur, Dholpur, Karauli, 18. Banswara, Dungarpur, Partabgarh, Tonk, and others; (b) East-central: 19. Orchha, 20. Ajaigarh, Charkhari, Maihar, Bijawar, Chhatarpur, Panna, 21. Korea, Changbhakhar, 22. Surguja, 23. Jashpur, 24. Gangpur, 25. Mayurbhanj, 26. Keonjhar, 27. Baud, Athmalik, Dhenkanal, Bamra, Sonpur, Bonai, 28. Patna, 29. Kalahandi, 30. Kanker, 31. Nandgaon; (c) Western: 32. Kolhapur, Miraj, Sangli, and others; (d) Southern: 33. Travancore, Cochin, 34. Pudukottai.



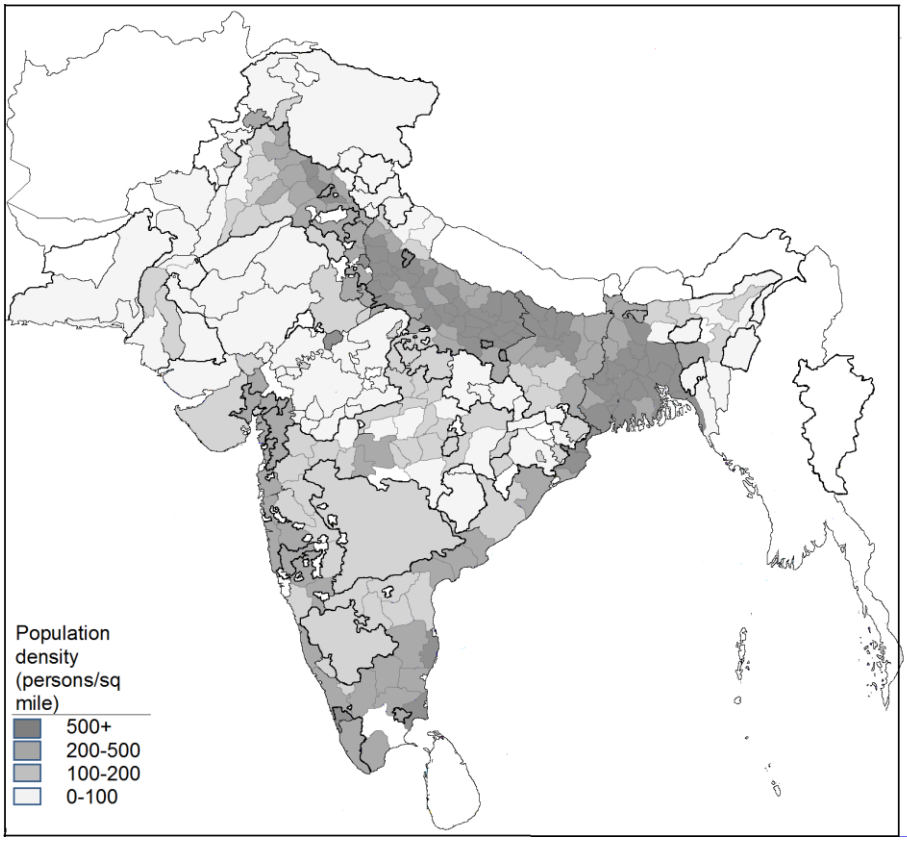
Map 3. Landlord (zamindari) areas.



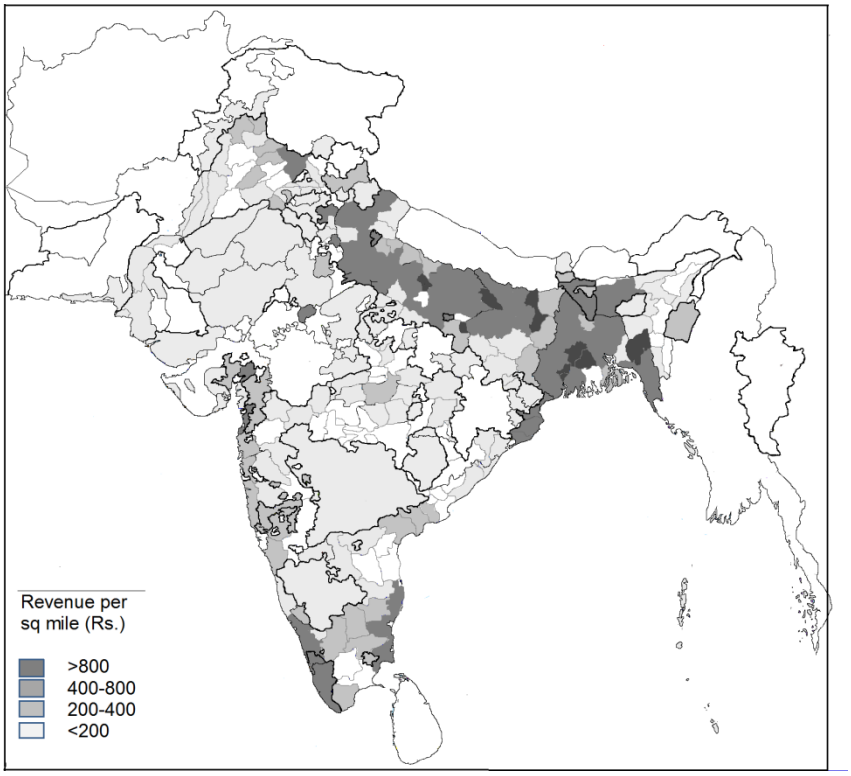
Map 4. Cultivated area in total area, 1908.



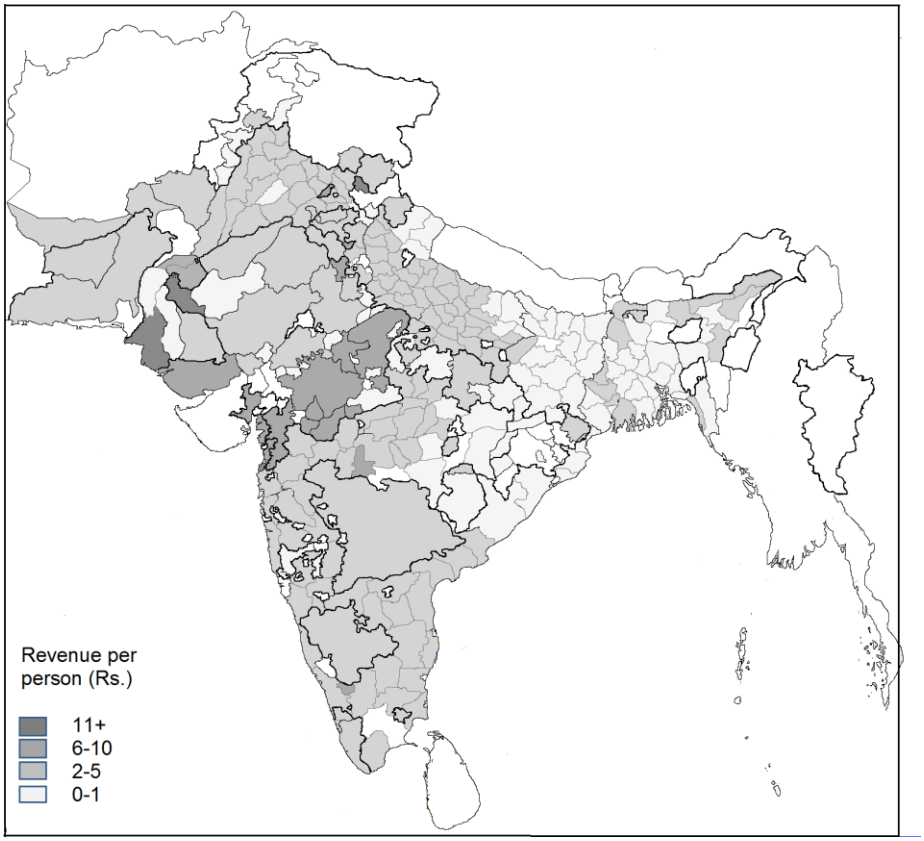
Map 5. Irrigated area in total area, 1908.



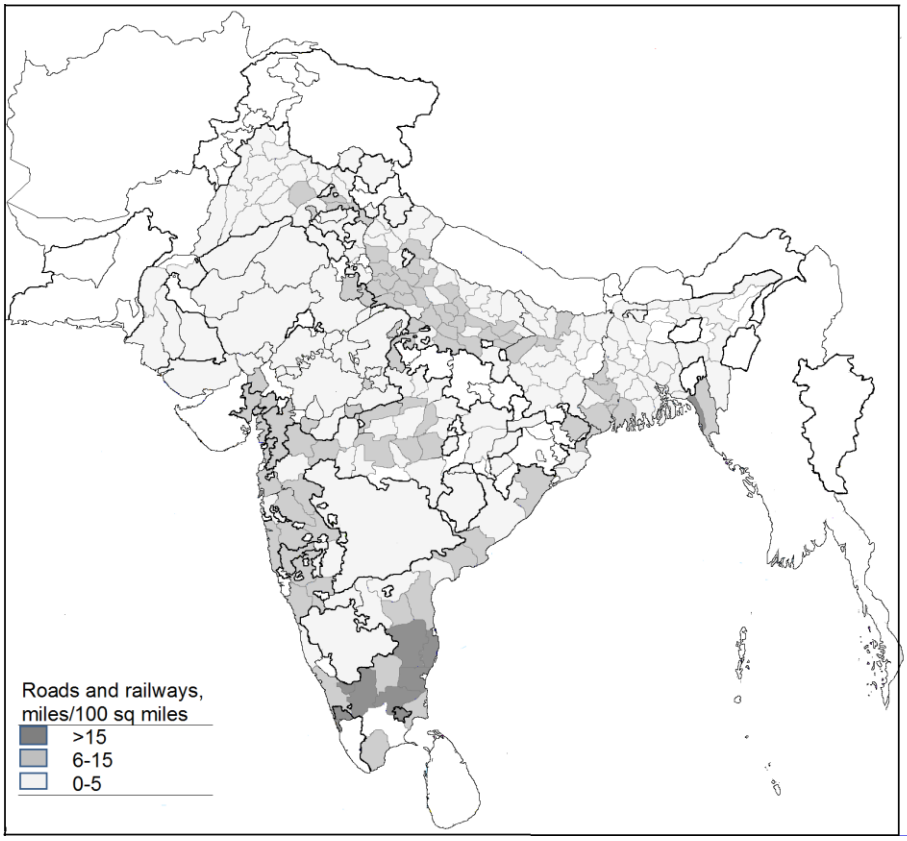
Map 6. Population density, 1908.



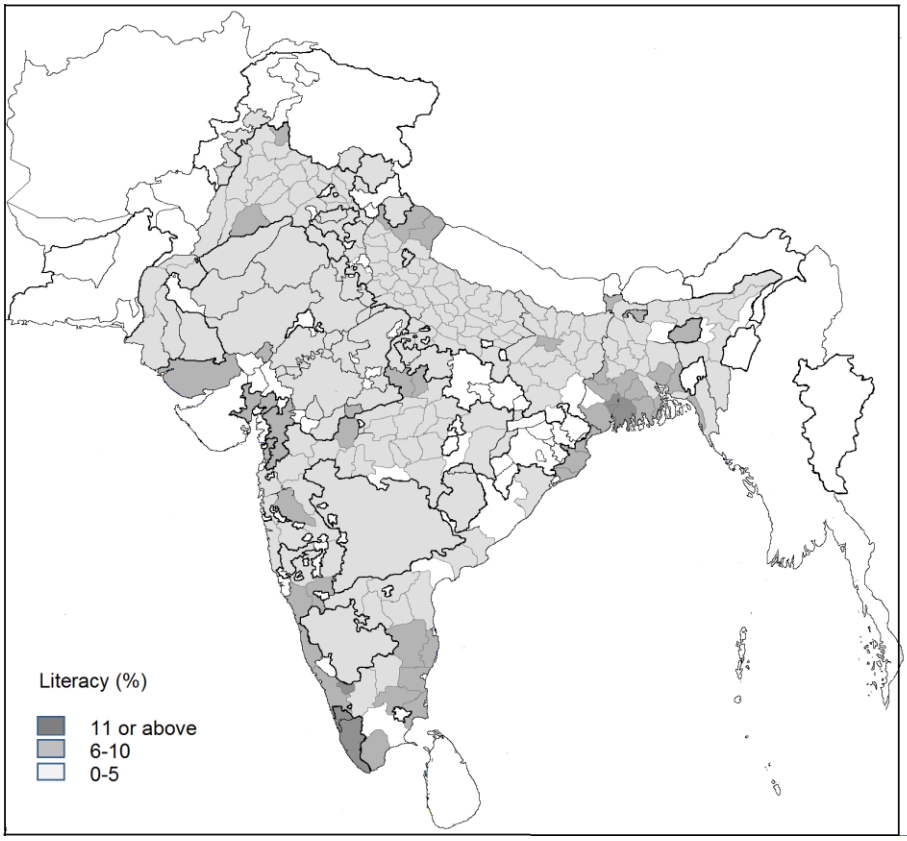
Map 7. Revenue per square mile, 1908.



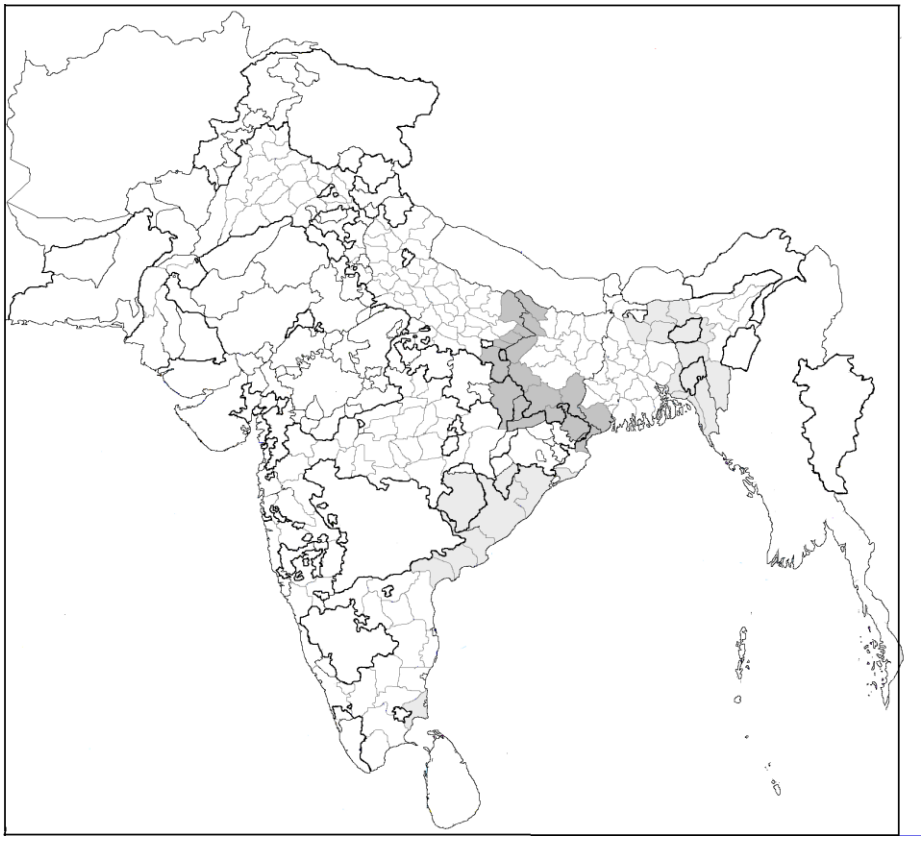
Map 8. Revenue per person, 1908.



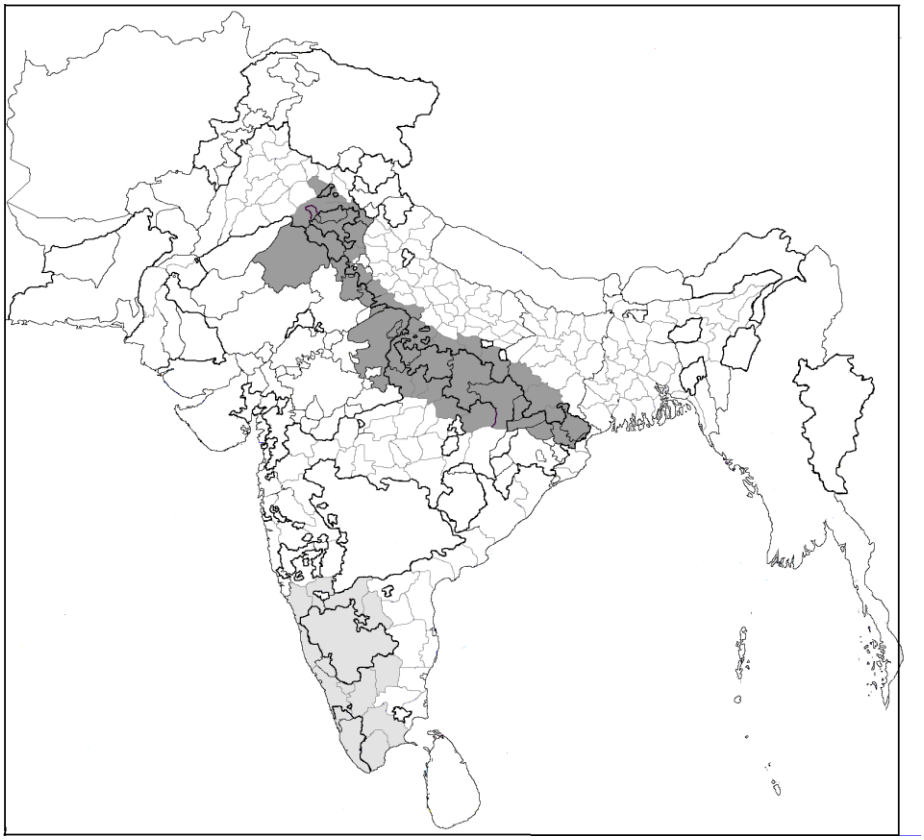
Map 9. Roads and railways, miles per 100 square miles, 1908.



Map 10. Literacy, 1908.



Map 11. Contiguous Landlord and non-landlord territories.



Map 12. Contiguous British Indian districts and princely states.