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Reading, Writing, and Religion: Institutions and Human Capital Formation

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Reading, Writing, and Religion: Institutions and Human Capital Formation

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Reading, Writing, and Religion:
Institutions and Human Capital Formation

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Abstract

In this paper, we empirically test the role that religious and political institutions play in the accumulation of human capital. Using a new data set on literacy in colonial India, we find that Muslim literacy is negatively correlated with the proportion of Muslims in the district, although we find no similar result for Hindu literacy. We employ a theoretical model which suggests that districts which experienced a more recent collapse of Muslim political authority had more powerful and better funded religious authorities, who established religious schools which were less effective at promoting literacy on the margin than state schools. We test this hypothesis econometrically, finding that the period of Muslim political collapse has a statistically significant effect on Muslim literacy while controlling for it eliminates the significance of the proportion of Muslims on Muslim literacy. This suggests that the "long hand of history" has played some role in subsequent differences in human capital formation through the persistence of institutions discouraging literacy.

I. INTRODUCTION

Social scientists have long recognized the important relationship between education and economic growth. More educated societies often have higher worker productivity, greater life expectancy and are also quicker to adopt new technologies (Schultz 1983; Becker 1964; Drèze and Sen 1998).[1] Despite the numerous social and private benefits of education, enrollment and literacy, however, vary dramatically across countries, religions and social groups. A large majority of the citizens of developed countries acquired functional literacy by the early 20th century, while citizens of developing countries such as Chad and India are still struggling with literacy rates of 48% and 52% respectively. Even within countries, there are significant differences in human capital accumulation between groups such as blacks and whites in the Unites States (Margo 1990; Hanushek, Kaln, and Rivkin 2004; Fryer and Austen-Smith 2005).

To account for differences in educational development, some scholars note the role of government policies (Fernandez and Rodrik 1991; Lindert 2004; Galor and Moav 2006; Rajan 2009), while a more recent literature emphasizes the historical importance of religion and religious norms that either constrain or encourage religious groups to acquire literacy at a higher rate relative to other religious groups living in the same region (Becker and Woessmann 2008, 2009; Botticini and Eckstein 2005, 2007). Our paper relates to this broader literature by studying historical differences in educational attainment between the two main religious groups of India— Hindus and Muslims.[2]

Average Muslim literacy was slightly below average Hindu literacy in the colonial period and the variance in Muslim literacy was also lower than Hindu literacy (in 1911, the male Hindu literacy rate was 12.8% and the male Muslim literacy rate was 12.0%). However, there was

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[1] There is vast literature on human capital, growth and development such as Lucas (1988), Barro (1991), Mankiw, and Romer and Weil (1992) among many others.
[2] Ghurye (1961), Srinivas (1998) and Borooah and Iyer (2005) have also commented on literacy differences in India.

tremendous heterogeneity between provinces. For example, in Bengal 21.1% of Hindu males were able to read and write in any language as compared to only 10.9% of Muslim males. But, in provinces such as Madras and the United Provinces, Muslims enjoyed comparable or even higher literacy than Hindus. Female literacy was very low for both religious groups, but the provincial patterns are similar to those for male literacy.

This paper uses the earliest reliable data on literacy and a theoretical model to explore why Hindus and Muslims had different literacy rates under the British. The difference in literacy is a puzzle, because it appears to be a function not only of demographics and economic conditions, but also of the share of Muslims in a district.[3] Using data from the 1911 and 1921 census, we find that districts with more Muslims had lower literacy rates. The British were keenly aware of the differences and actually devoted more resources to education in Muslim districts, yet seemingly to no avail.

Our model explains this pattern by examining the incentives of Muslim religious authorities, political authorities and the citizens. Specifically, we argue that where Muslim rule in India collapsed more recently, Muslim religious authorities were stronger vis-à-vis the British. This is due to the legitimizing role that religious authorities have historically played for Muslim political authorities, a relationship that is an *exogenous* remnant of the birth of Islam and the type of institutions that it encouraged (for more, see Rubin 2009). The model suggests that areas where Muslim political authorities collapsed more recently had stronger religious authorities that were better able to compete for Muslim students with the British. These authorities attracted

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[3] Our results bear a striking resemblance to other studies that have found similar negative effects on the educational attainment of minority groups living in areas heavily populated by their own group such as blacks in the United States (Margo 1990; Hanushek, Kaln, and Rivkin 2004). While the explanations for some of these findings in US studies are related to differences in the supply of schooling, it could also be related to differential preferences within minority groups living in non-minority versus minority areas (Fryer and Austen-Smith 2005). We concentrate primarily on the former type of explanation in this paper.

more Muslims to schools with religious curricula that, on the margin, were less effective at promoting literacy.

Our model thus implies that the share of Muslims in a district may merely proxy for the historical situation in which certain Muslim-dominant regions established institutions that discouraged literacy. If this is true, then areas where Muslim rule collapsed a longer time ago should have more Muslim students attending secular (public) schools and thus the fraction of Muslims should contribute less (if at all) to lower literacy in these districts. We test this hypothesis by controlling for the period of Muslim collapse using three dummy variables: districts where Muslim rule collapsed prior to 1765, when Muslim rule fell in parts of the northern and eastern areas of India; 1765 to 1805, when Muslim rule collapsed in some of the southern and northern regions; and post-1805, when Muslim rule collapsed in the northern and western areas (Robinson 1982).

Though this is admittedly a noisy proxy, we find that a more recent collapse has a negative and statistically significant effect on Muslim literacy. Moreover, once we control for the period of Muslim collapse, the presence of other Muslims has *no* statistically significant effect on Muslim literacy. This more nuanced approach which incorporates the effects of institutions on actions and outcomes thus provides a more complete picture of both the relationship between Hindu and Muslim literacy in this period and, more generally, the relationship between institutions and differences in human capital formation between groups.

II. HISTORICAL BACKGROUND: EDUCATION, COLONIZATION, AND LITERACY

Beginning in the mid-19th century, the former indigenous system of Indian schooling was largely replaced by a new state system of schooling introduced by the East India Company and developed further by the colonial government after the East India Company's rule came to an

end in 1857. Schools were of two types under the former indigenous system: elite religious schools for students interested in a lifetime of higher education and local elementary schools where village boys were taught the 3 R's in the vernacular medium. The religious schools were differentiated by religion (Hindu or Muslim) with upper caste Brahman teachers and pupils dominating the Hindu (i.e. Sanskrit) religious schools, although Hindus did occasionally teach at some of the Muslim schools (madrassas). The local schools also encompassed Qur'an schools (i.e. maktabs) where Muslim boys learned to read the Qur'an. Some historians suggest that 8 to 12 percent of the male population was literate, but we interpret the estimates with caution, as a systematic enumeration of literacy did not begin until the early 20th century.[4]

Under the British system, publicly financed and managed schools (government and local board schools) functioned alongside privately managed aided and unaided schools. Private aided schools received public subsidies despite being privately managed, while private unaided schools did not receive any public money.[5] Privately managed schools came under the authority of the state school system because they conformed to official education standards and their students were allowed to take public examinations.

At the primary level, a smaller proportion of the schools were pure public schools as compared to the hybrid public-private aided schools and private unaided schools. The proportion, however, varied significantly across provinces with Bombay having a large number of pure public schools and Bengal having a large number of aided and unaided schools (Chaudhary 2009b). Although many of the former indigenous schools disappeared over this period, some were successfully converted into public aided schools and the remaining were classified as

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[4] See Nurullah and Naik (1951) and Basu (1982) for details. Basu (1982) suggests that literacy was more commonplace among Brahmans and other upper caste males. Unfortunately, there is no systematic data available to gauge the spread of schooling or estimate the degree of literacy in the population.
[5] See Progress of Education, Quinquennial Reviews (volumes 1897-1927). See Nurullah and Naik (1951), Basu (1974), and Ghosh (2000) for a historical examination of colonial Indian education.

private unrecognized schools. According to one British official, competition with state schools hastened the decline of better quality indigenous schools, especially the Muslim religious maktabs and madrassas (Leitner 1991).

The emphasis on both public and private schools is also reflected in the composition of educational spending in this period. Public sources of revenues represented 50 percent of total spending on education, increasing to 60 percent by the 1940s, while fees and private contributions accounted for the remaining 50 percent. Differences in land revenues were primarily responsible for differences in public revenues both across and within provinces. In general, the eastern provinces of Bengal and Bihar had lower public spending compared to other provinces because they received lower land revenues due to the Permanent Settlement of 1793 that fixed land revenues in cash for perpetuity (Chaudhary 2009b).

Beginning in the 1880s, primary education was decentralized to local district councils, who levied an additional tax on land revenues (known as the land cess or local cess) to cover spending on local public services such as education, infrastructure and medical services. Despite the decentralization, district councils had limited fiscal independence to set new taxes or alter the existing tax rates on land revenues. The tax rate was fixed for districts within the same province (6.25% on average), but did vary across provinces. Moreover, the revenues were fairly inelastic because land revenue assessments were revised every 20 to 30 years in non-Permanent Settlement districts. Over time provincial governments also distributed grants to district councils especially targeted toward improving the quality and quantity of rural primary schools. Both public and private primary schools relied heavily on fees, although public school fees decreased over time as more public money became available.[6]

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[6] See Chaudhary (2009a, 2009b) for details on the provision of education in British India.

As the new system of education developed over the 19th and 20th centuries, there was a dramatic increase in spending, number of schools per-capita, and enrollment rates (Chaudhary 2009b). Per-capita spending increased ten-fold between 1881 and 1931 from 95 to 1000 rupees per 1000 persons and enrollment rates increased to 30 percent of the school age population by 1931. The improvements in spending and enrollment, however, did not translate into literacy gains and less than 10 percent of the population of British India could read and write by 1931.[7]

Yet, the averages for British India mask the substantial heterogeneity across regions and across religions. Among Hindus, literacy patterns generally followed the social hierarchy of the caste system with Brahmans (the traditional upper castes) enjoying above average literacy compared to the lower castes. There were also significant differences in enrollment and literacy between Hindus and Muslims. Muslim literacy was lower on average than Hindu literacy and Hindu-Muslim enrollment differentials were large at the secondary and post-secondary level. Official reports often point to religion and poverty to account for the relative educational backwardness of Muslims. For example, the Fifth Quinquennial review (p. 282) states,

> the backwardness [of Muslims] is attributable partly to poverty, partly to indifference, and partly to their educational wants not being the same as those of the remainder of the population amongst whom they live. They require their children to learn the Koran by rote at an age when other children are beginning to make progress in secular education, and they have a preference for the use of Urdu as a medium of instruction, even when it is not the vernacular language of the locality. Both these causes operate to make the common schools less attractive to Muhammadans than to members of other creeds and also to make it more difficult for Government to provide schools suited to their special needs.

Colonial policies tried to bridge the gap between the two religions by offering scholarships to Muslim students and public subsidies to indigenous Muslim religious schools that were willing to introduce secular education. But, they often faced heavy resistance from local

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[7] To account for this discrepancy between enrollment and literacy, British officials frequently noted the general wastage and inefficiency of the Indian education system. See Progress of Education, Tenth Quinquennial Review (1927-32).

Muslim communities that did not view the new state schools in the same positive light as Hindus. A small minority of British officials blamed colonial educational policies themselves, suggesting that they may have inadvertently reduced the quality of indigenous religious schools. In this view, increased competition from state schools diminished the quality of indigenous schools because there was no comparable state alternative for Muslim families seeking to educate their children in Urdu and the local vernacular (Leitner 1991). Although later colonial efforts were partially successful in raising Muslim primary school enrollment, Hindu-Muslim differences in both secondary school enrollment and literacy persisted till the end of the Raj.

Why did these differences in enrollment and literacy exist and continue to persist over the colonial period? Were the British correct in attributing the differences to the relative poverty of Muslims as well as a difference in "educational wants"? Numerous factors may have caused these differences. In the following sections we attempt to isolate these factors, employing a unique data set of Hindu and Muslim literacy in the early twentieth century.

III. DATA DESCRIPTION

For the empirical analysis, we assemble a new dataset merging information from the Indian censuses of 1911 and 1921 to data reported in the Indian District Gazetteers. The data cover all districts in the provinces of Assam, Bengal, Bihar and Orissa, Bombay, Central Province and Berar, Madras, Punjab and United Provinces.[8] These provinces jointly account for more than 95 percent of the population of British India. We extract data on the social, educational, occupational, and developmental structure of each district from the colonial censuses and rely on the Indian district gazetteers for the number of schools, pupils, income and land tax revenues, and public spending on rural primary education.

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[8] The analysis excludes the pure urban cities of Bombay, Calcutta and Madras because they were so different socially and economically from the largely rural districts of British India. We also exclude the remote North Western Frontier Province, Baluchistan, and Burma.

Although literacy was enumerated in earlier censuses, we begin in 1911 because the

definition and enumeration of literates in previous censuses was inconsistent across provinces.

Beginning in 1911, a uniform definition of literacy was adopted whereby an individual that could

both read and write in any language was enumerated as literate. Official discussions suggest that

the definition was clearly understood by the enumerators and the literacy data are considered

reasonably accurate.[9] However, the censuses do note that Muslims were occasionally frustrated

by this definition because even though they could read certain passages from the Qur'an, the

enumerators recorded them as illiterate because they could not write.[10] We focus on measures of

total literacy in 1911 and 1921 disaggregated for Hindus and Muslims.[11]

In addition to literacy, we use the 1911 and 1921 census to construct measures of

development such as urban population share, population density, and the district occupational

structure. Scholars have suggested that some of the smaller occupational categories may be

inaccurate, and hence we focus on broader categories: the share of the population supported by

agriculture, commerce, industry, and professionals. Although the census does not report district-

level occupation data by religion, we used the provincial breakdown of occupational categories

by religion to construct crude district-level measures of the share of Muslims and Hindus

supported by the four main occupations. This assigns each district within the province the same

religion-occupation share and we use these controls for robustness checks. We also extracted

information on the population share of important caste and religious groups: Muslims,

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[9] In the pre-1911 censuses no specific guidelines were given to enumerators to test for literacy, which led to substantial variation in the methods adopted across provinces. Although officials point to certain problems with the post-1911 enumeration such as enumerators on occasion adopting school standards, they do indicate, "the simple criterion laid down was easily understood and sensibly interpreted" (Census of India 1921, Volume I – Report, Chapter VIII).

[10] Although this may lead to measurement error in the Muslim literacy rate data, there is no reason to believe that this error would differ in high-Muslim versus low-Muslim districts. If anything, measurement error of this type should make it more difficult to find a negative effect of Muslims on Muslim literacy because districts with more Muslims were more likely to have Muslim census enumerators that may have been sympathetic to this argument.

[11] We also do robustness checks using gender specific and cohort specific literacy (population aged 10 to 20).

Christians, and tribes. Moreover, we constructed a measure of caste and religious fragmentation to capture the level of diversity that has been linked to an under-provision of public goods in a variety of contexts including British India (Chaudhary 2009a).

From the district gazetteers, we extracted data on public educational spending by rural district boards and income tax revenues.[12] Income taxes and district board expenditures were missing for several districts in the 1921 cross-section. We used the 1911 income taxes for the 1921 cross-section in provinces where this data was missing since the variation within provinces is similar although the levels may have increased between 1911 and 1921.[13] Income taxes are a crude proxy of district income and should be interpreted with caution because these taxes were levied on a small share of individuals working in the formal sector of the economy. Nonetheless, this is the best available local measure of historical income.

Table 1 reports the summary statistics of the main variables. Hindu and Muslim literacy rates as well as the population share of each religion are shown separately by province in the top half of the table, while the different socio-economic variables are shown by year in the bottom half. Overall literacy was very low in British India both among Hindus and Muslims averaging around 7 percent across districts and religions. The variance in literacy, however, was lower among Muslims than Hindus. The literacy averages mask the substantial regional variation with Muslim literacy ranging from as high as 12 percent in the southern province of Madras to as low as 2.6 percent in the northern province of Punjab. Some of this variation is related to the Muslim population share. For example, Muslims enjoy above average literacy in provinces where they

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[12] Rural districts boards were constituted in the early 1880s and managed the provision of local public goods such as infrastructure, education, and medical services at the district level.
[13] Likewise, we only use 1911 district board expenditures in the analysis, because public spending changed in this decade due to the Montague Chelmsford reforms, which ushered in the period of Dyarchy under which British administrators worked alongside elected Indian ministers in provincial legislatures. See Kumar (1982) for an overview of the colonial fiscal system.

form a smaller share of the population such as Madras and Central Provinces (4.2 and 6.7 percent respectively) versus provinces such as Bengal and Punjab where they comprise almost fifty percent of the population. We explore this relationship between Hindu-Muslim literacy and their respective population shares in more detail in the next section.[14]

IV. LITERACY RATES AND RELIGIOUS POPULATION

The summary statistics shown in Table 1 suggest that the Muslim population share may influence Hindu and Muslim literacy. To examine this relationship, we run a baseline regression relating the share of the Hindu and Muslim population to Hindu and Muslim literacy in 1911 and 1921. Table 2 reports the findings for 1911 in the top panel and for 1921 in the bottom panel. It is evident that the Muslim population is strongly correlated with the educational performance of both Hindus and Muslims. Columns 1 and 2 suggest that a larger proportion of Muslims has a positive and statistically significant impact on Hindu literacy but a negative impact on Muslim literacy in both cross-sections. A 10 percentage point increase in fraction Muslim is associated with a 1 percentage point increase in 1911 Hindu literacy and a 1.4 percentage point decrease in 1911 Muslim literacy.[15] Indeed, Figure 1 suggests that a strong negative relationship exists between Muslim literacy and the presence of Muslims.

To test whether positive regional selection is driving the results on fraction Muslim, columns 3 and 4 control for province fixed effects to focus on the within province variation. The correlation between fraction Muslim and both Hindu and Muslim literacy remains negative and

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[14] Similar to literacy, other socio-economic indicators such as urbanization and the share of the commercial population are relatively stagnant between 1911 and 1921. Moreover, the low levels of urbanization and commercialization highlight the remarkable dominance of agriculture in the early 20th century Indian economy (agriculture is the omitted occupational group in the table).
[15] Our results are robust to using negative binomial regressions. We also tested for non-linearity in the relationship between literacy and religious population share and found that there is indeed a significant amount of non-linearity – the coefficient on the fraction Muslim squared term is frequently positive and significant in regressions where Muslim literacy is the dependent variable. We decided not to include these regressions, which are available upon request, because they provide a less straight-forward interpretation of the effect of Muslim population on Muslim literacy.

statistically significant at the 1 percent level. We find similar patterns on age and gender-specific literacy.[16]

Why does the presence of Muslims affect literacy? The decision to invest in literacy at an individual level involves a simple cost and benefit calculation. If the monetary and non-monetary benefits or returns to literacy (higher wages, social status, and so forth) exceed the costs (opportunity cost of time, school fees, and the like), then an individual will invest in literacy. This decision-making process is a function of individual characteristics such as ability, family background, parental education, and social and religious affiliation as well as community or district characteristics such as economic conditions and public educational investments. Literacy rates at the district-level are thus a function of the aggregate costs and benefits of literacy.

Given this framework, one obvious explanation of our findings on Muslim literacy is that fraction Muslim is capturing some aspect of lower returns to literacy for Muslims. For example, if Muslims lived in less developed or poorer districts, then fraction Muslim may just be capturing the negative effects of poverty on education. To test whether fraction Muslim is simply a proxy for lower returns to Muslim literacy, we include a variety of variables to capture differences in the costs and benefits of literacy such as district occupational structure, social heterogeneity, income and development.

Another potential explanation for these patterns is the interaction between colonial policies and fraction Muslim. British officials were cognizant of the substantial differences between Hindu and Muslim educational outcomes, and they adopted a variety of policies to increase enrollment rates and literacy in Muslim dominant districts. As part of these policies, Muslim students were eligible for scholarships and reduced fees in public schools, and the colonial government established a number of schools in Muslim majority districts (Progress of

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[16] These results are available upon request.

Education in India, Quinquennial Reviews, 1897-1927). This suggests that colonial policies would make it less likely to find a negative coefficient on the fraction Muslim variable in the Muslim literacy regressions because of the larger presence of public schools.

Table 3 includes our measures of income, development and per-capita public educational expenditures by rural district boards as control variables in the regressions. Including these controls reduces the coefficient on fraction Muslim by almost 40% in the inter-province comparisons, but the magnitudes are not very different in the within province comparisons. The results on fraction Muslim also hold for literacy rates disaggregated by gender and the 10 to 20 aged cohort (available upon request). In other unreported regressions, we controlled for crude demographic and occupational differences by religion, and the result relating the presence of Muslims to lower literacy remained robust.[17]

VI. LITERACY AND LEGITIMACY: THE LASTING EFFECTS OF INSTITUTIONS

We can draw two important conclusions from the evidence presented thus far. First, a larger presence of Muslims negatively influences Muslim literacy but there is no comparable effect of Hindus on Hindu literacy. Second, differences in private returns or differences in public spending by the colonial government alone are not completely driving these patterns because fraction Muslim is negative and statistically significant even after we include public spending and various proxies for returns. How then can we explain these patterns?

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[17] Other than Bengal, the occupational breakdown of Hindus and Muslims is very similar to their share in the population. In Bengal, Muslims formed a larger share of agricultural laborers but our results are robust to excluding Bengal. Bengal's occupational differences relate to the historical conversion of Hindus into Islam, which began in the early medieval period, with the vast majority of Indian Muslims being converts and not immigrants. Although scholars have offered several explanations for the conversions, there is no consensus on the dominant reason for conversion (Eaton 2003). For our purpose, negative selection into Islam could bias our results but we address the possibility of negative selection into Islam by controlling for province fixed effects and occupational differences across districts. Although the regressions do not completely rule out negative selection or low returns as an explanation, it appears unlikely that returns or selection alone are driving the fraction Muslim result.

In this section, we draw on the institutional history of the rise and fall of Muslim political power in India to provide an alternative explanation for the observed patterns. We present a theoretical model supported by historical evidence which suggests that Muslim religious authorities were stronger and better funded in areas where Muslim political authority had recently collapsed, allowing them to better compete with British state schools despite a curriculum that was more religious in nature and perhaps less focused on the type of skills that promote literacy.

The poor quality of indigenous religious schools, both Hindu and Muslim, in the early 20th century is often discussed in the official documents but the specific reasons for their poor quality are often debated (Nurullah and Naik 1961). Religious schools may have declined in quality due to increased competition for resources (teachers, for example) from the new British state schools or perhaps their religious nature rendered them less effective at promoting basic literacy. We do not assume that the religious schools were less effective at teaching literacy, but instead show that this is an equilibrium *outcome*.

An implication of our argument is that there was a strong disincentive for Muslims to attain skills that promote literacy in regions where Muslim political collapse happened more recently. In these regions, Muslim religious authorities had more influence over the choices of the population, and thus the religious schools were on the margin more attractive. In the model, we suggest that going to religious school provides some benefit which is increasing in the influence of the religious authority. Hence, we suggest that Muslims attained lower literacy in areas that collapsed more recently for three reasons: i) religious schools, which were worse at promoting literacy than public schools, were more attractive due to the higher level of religious capital attained by the religious authorities; ii) religious schools were better funded (via private

donations) in areas where religious authorities had more religious capital (namely, those that collapsed more recently); iii) religious authorities could increase the portion of the curriculum that was religious in these areas – implicitly decreasing the effectiveness of the school with regards to literacy – without losing as many students. We suggest that this explains Kozlowski's (1985, p. 64-65) observation:

> In the second half of the nineteenth century … Hindus began to abandon some of the traditions of the Mughal elite and enrol (sic) in schools established on the British model which concentrated on learning English. … [D]espite the competition from "modern" schools, many Muslims continued to send their sons to schools which taught the old curriculum by the old methods of recitation and memorization.

To shed more light on the causal connections, we model the interactions between the relevant players over the period encompassing the height of the Mughal Empire through the arrival of the British. Consider a game played between four types of players over many periods. The players are a local Muslim religious authority, a Muslim political authority, N local citizenry (who are both Hindu and Muslim), and a British authority. The game is played over many periods and has five fundamental features:

1) The Muslim political authority depends on religious authorities for legitimacy

2) Muslim religious authorities offer education to Muslim citizens

3) The Muslim political authority stops playing the game in an exogenously determined period t_1

4) In period $t_2 (> t_1)$, the British authority enters the game and offers educational services which compete with those offered by the religious authority. The religious authority has a local monopoly on educational services in all periods before t_2

5) Investments in education map onto a probability of attaining literacy based on some production function, whose inputs are the degree to which the curriculum is religious, the expenditure per student, and the socio-economic conditions of the citizenry

Play Before the Collapse of the Political Authority

The political authority, religious authority, and citizens play the game for t_1 periods. The religious authority purchases legitimacy, L, from the religious authority for a transfer T_t, where periods are denoted with subscript t. This reflects the fact that Muslim rulers in India, especially the Mughals, had roots closely tied to previous Middle Eastern empires, sharing institutions, learned languages, ideology, and ruling personnel (Metcalf 1982; Eaton 1993; Kozlowski 1995). Like other Islamic rulers, Mughal leadership was based on what Greif (2002) calls "faith-based legitimacy", whereby political rule was legitimate only when it complied with Islamic dictates.[18] This entailed a situation in which Muslim religious authorities had some power vis-à-vis political authorities, though the latter dominated for much of the Mughal reign.

One way that this dynamic manifested itself was through significant grants given to religious authorities and institutions by political authorities in order to legitimize their power (Habib 1963; Kozlowski 1985, 1995; Eaton 1993). The funding of religious schools has always been a legitimizing force in Islam (Kozlowski 1995; Berkey 2007).[19] The religious leaders who ran these institutions were the primary grantees of the state, and the bestowal of grants (*madad-i ma'āsh*) to religious authorities was so ubiquitous that the grants were eventually named *a'imma*,

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[18] Anderson (1993) and Eaton (1993) stress the importance of abiding by Muslim dictates for maintaining legitimacy amongst Islamic leaders in India. For more on the role that religious authority has played in legitimizing the state in the Islamic world, see Greif (2002), Rubin (2009), Coşgel, Miceli, and Ahmed (2009), and Coşgel, Miceli, and Rubin (2009). For more on Hinduism as a legitimizing force in India in Colonial India, see Buultjens (1986).

[19] In addition to mosques, Mughal authorities also supported sufis and shrines, in turn encouraging donations by the nobility, gentry, and merchants (Kozlowski 1985).

or religious leader. In turn, religious authorities were expected to be the state's most ardent apologists (Habib 1963).[20] Kozlowski (1985, p. 22) suggests that Mughal rulers supported mosques so that "the name of the sultan was invoked during the Friday prayers, [meaning that] Muslims heard weekly a proclamation of their ruler's piety." Indeed, the emperor Jahangir (1605-1627) called the religious leaders the "Army of Prayer" and reportedly believed that this army was as important as his real army (Habib 1963).

In the model, the political authority also purchases legitimacy from other, un-modeled sources such as the military or nobility. Hence, the return from religious legitimacy is a function of the fraction of Muslims, m, living in the area – where there are more Muslims, religious legitimacy is more effective. In each period, the political authority chooses a transfer T_t to maximize its utility:

(1) $$U^P = L(T_t, m) - T_t,$$

where $L_1 > 0$, $L_{11} < 0$, $L_2 > 0$, and $L_{12} > 0$. It is straight-forward to see that the optimal transfer, T^*, is an increasing function of the fraction of Muslims (m).

Assume that the amount the religious authority spends on educating Muslims is increasing in the transfer. The transfer gives the religious authority the ability to accumulate "religious capital", R_t, in the community – by allowing it to provide education, build shrines and mosques, engage in conspicuous religious consumption, and the like – which is formally defined as:[21]

(2) $$R_t = \sum_{j=1}^{t} \delta^{t-j} T_t,$$

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[20] The bestowal of grants varied from emperor to emperor. Akbar significantly reduced the grants available to religious authorities, but his successors – Jahangir and more notably Aurangzeb – restored and even expanded many of these grants (Habib 1963).

[21] Our definition of religious capital is different than the one employed in Iannaccone (1990), who analyzes religious capital in the context of congregations and religious participation. We are concerned with the "capital" accumulated by religious authorities as a result of political sponsorship and its provision of educational services.

where $\delta \in (0,1)$ is a depreciation rate.[22]

The religious authority derives utility from two different sources: offering religious education and attaining religious capital. Its utility from offering schooling is increasing in both the number of students choosing the religious school (N_t^R) and the degree to which the curriculum is religious (r_t). When $r_t = 1$, the curriculum is entirely religious, when $r_t = 0$, the curriculum is entirely secular, and the curriculum is increasingly religious when $r_t \in (0,1)$. Meanwhile, the utility the religious authority receives from religious capital is greater when the curriculum is more religious, as a more religious curriculum improves its power vis-à-vis the citizenry and the political authority in the present and in the future. In other words, the religious authority chooses a curriculum r_t to optimize the following:

(3) $$U^R = u(r_t, N_t^R) + w(r_t, R_t).$$

Where $u_1 > 0$, $u_2 > 0$, $u_{11} < 0$, $u_{12} > 0$, $w_1 > 0$, $w_2 > 0$, and $w_{12} > 0$.

The inputs into the literacy production function are the amount spent on education per citizen, the economic opportunities available to each citizen, and the degree to which the curriculum is religious, r_t.[23] The literacy production function differs for each citizen. Each citizen i has economic opportunity, $x_{i,t}$, which is distributed over some smooth, continuous cdf $G(\cdot)$. The return to education is increasing in $x_{i,t}$. That is, $x_{i,t}$ can be thought of as the socio-economic conditions faced by citizen i. The literacy production function, whose inputs are the religiosity of the school, the per-student transfer, and the economic opportunities of the citizen, is represented

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[22] It is possible that religious capital does not always erode over time. Indeed, events such as the Iranian Revolution and the contemporary rise of Islamist power in Turkey challenge this idea. However, such events are generally the result of *investment* in religious capital, not some process whereby religious capital accumulates over time independent of investment. Our assumption merely entails that, *all else being equal*, religious capital deteriorates over time.

[23] Our model is based on standard assumptions used in the literature on education production functions except for the religious curriculum parameter. See Glewwe (2002) for an overview of the education production literature pertaining to developing countries.

by $F\left(r_t, \dfrac{T_t}{N_t^R}; x_{i,t}\right)$, where $F_1 < 0$, $F_{11} < 0$, $F_2 > 0$, $F_3 > 0$, and $F_{13} < 0$. The latter condition

means that people with better socio-economic opportunities receive a greater marginal return

from a more secular education.[24]

Meanwhile, each citizen j chooses a school, $k \in \{B, R\}$, to maximize an economic return

(the literacy production function) and a religious return, $v(\cdot)$. B denotes the British school, which

is not available before period t_2, and R is the religious school. That is, citizens choose school k to

optimize:

(4)
$$F\left(r_t^k, \dfrac{f_t^k}{N_t^k}; x_{i,t}\right) + v\left(r_t^k, R_t^k\right),$$

where the superscript k denotes the school $k \in \{B, R\}$ in question, f represents the funding

available to school k (where $f = T$ for the religious school), $v_1 > 0$, $v_{11} < 0$, $v_2 > 0$, $v_{12} > 0$, $v(0, \cdot)$

$= 0$, and N_t^k is the number of students choosing school k. Assume that, given $\dfrac{f_t^k}{N_t^k}$ (per student

funding) and R_t^k (religious capital), there is some optimal offering of religious curriculum, r^*,

for each citizen. It follows that r^* is decreasing in socio-economic opportunity, $x_{i,t}$.

Solving this model for periods prior to t_1 is straight-forward. All N citizens choose the

religious school (which is their only option), the religious authority chooses a fully religious

curriculum $r^* = 1$ in all periods (since citizens choose the religious school no matter the choice

of the religious authority), and the political authority chooses transfer T^* as defined above. For

simplicity, we ignore the choices made by Hindu citizens through period t_2. The results are not

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[24] One could argue that the assumption that $F_{13} < 0$ is an Islam-specific one. Indeed, recent studies suggest that the spread of Protestantism (Becker and Woessmann 2008, 2009) and Judaism (Botticini and Eckstein 2005, 2007) improved human capital. However, our religious curriculum variable should be interpreted as the portion of the curriculum that is religious and thus not *directly* aimed at increasing non-religious human capital. Our model suggests that if this variable is greater in an Islamic setting, this is a *result* of endogenous processes stemming from the institutional setting, not an exogenous attribute of Islam.

affected if we were to assume that Hindus attend Muslim schools or they attend some other type of (unmodeled) school.

Play Between the Collapse of the Political Authority and the Arrival of the British

In period t_1 the political authority exits the game. In period t_2 (which is after t_1), the British enter the game. In between these two periods, only the religious authorities and the citizens play the game. After t_1, the religious authorities receive funding from a small group of unmodeled citizens. Indeed, following the collapse of Muslim rule in India some government aid was available to the religious authorities (especially princely grants), but these were often small and irregular. In response, religious authorities created networks of local donors whose contributions made up a majority of the authorities' funds (Metcalf 1982, ch. 3). This donor base also allowed the religious authorities to avoid British grant-in-aids, which would have carried the taint of a non-Muslim source and would have given the British control over curriculum (Metcalf 1982, ch.3). This permitted religious learning to remain the core of the curriculum, since the British policy of religious neutrality meant that formal religious study was supposed to be excluded from instruction in publicly funded schools (Zaman 1999).

The religious authority's ability to raise funds, w, from this group of citizens is increasing in its religious capital, R_t. Assume that $w < T$ for all values of w; that is, the religious authority was better funded by the political authority than from the group of citizens. This reflects the fact that

> Muslim princes of state …patronize[d] learning…[and] large landlords in the United Provinces did dispense some of their wealth for religious causes. But such contributions could never be as substantial as those of the days of Mughal rule, nor could they be as certain in a period of economic, social, and administrative flux…Instead they created a network of donors who formed a base … for financial support (Metcalf 1982, p. 96-97).

The religious capital accrued by the religious authority in these periods is:

(5)
$$R_t = \delta^{t-t_1} R_{t_1} + \sum_{j=t_1+1}^{t} \delta^{t-j} w(R_j).$$

The literacy production function of the religious school is $F\left(r_t, \dfrac{w(R_t)}{N_t^R}; x_{i,t}\right)$. In equilibrium, all

Muslim citizens choose the religious school and the religious authority chooses $r* = 1$ in all

periods. Again, we ignore the school choice of Hindus in these periods.

Play After the Arrival of the British

In period t_2 the British enter the game, which is played until some end period $\bar{t}$. The

British offer a secular school that competes with the religious school, which still receives

funding $w(R_t)$. That is, the British offer a school where $r_t = 0$. The British provide b_t funds to

support the school. Although this is a simplifying assumption since purely public state schools

funded by the British functioned alongside public-private schools (i.e. aided schools), the public-

private schools did receive public grants to cover up to half of their operating expenditure. This

entails that the literacy production function of the British school is $F\left(0, \dfrac{b_t}{N_t^B}; x_{i,t}\right)$, where N_t^B is

the number of students attending the British school.

For simplicity, assume that all Hindu citizens (fraction $1 - m$) attend the British school.[25]

Muslim citizens choose between attending the British school and the religious school. The utility

derived by Muslims from attending the British school is merely the production function

$F\left(0, \dfrac{b_t}{N_t^B}; x_{i,t}\right)$, since there is no religious return, and $N_t^B = (1-m)N + N_t^{B,M}$ where $N_t^{B,M}$

denotes the number of Muslims choosing the British school. On the other hand, the return for

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[25] This is merely a simplifying assumption. Clearly, not all Hindus attended school and some Hindus attended private schools. Incorporating these facts does not change the implications of the model.

Muslims from attending the religious school is $F\left(r_t, \frac{w(R_t)}{N_t^R}; x_{i,t}\right) + v(r_t, R_t)$. That is, for a given

level of r_t, N_t^B, and N_t^R (assuming that N_t^B and N_t^R are large enough that citizens have an

infinitesimal effect on the production function), a Muslim citizen i chooses the British school if:

(6)
$$F\left(0, \frac{b_t}{N_t^B}; x_{i,t}\right) - F\left(r_t, \frac{w(R_t)}{N_t^R}; x_{i,t}\right) > v(r_t, R_t).$$

Assume that an internal equilibrium exists; that is, $N_t^B > 0$ and $N_t^R > 0$. In equilibrium,

the production function condition $F_{13} < 0$ entails that there must be some threshold socio-

economic value x^* such that all citizens with $x_{i,t} \geq x^*$ choose the British school and all citizens

with $x_{i,t} < x^*$ choose the religious school. This entails that for the marginal citizen (defined as the

citizen whose socio-economic condition is $x_{i,t} = x^*$), the left-hand side of (6) equals the right

hand side. The equilibrium condition is $NG(x^*) = N_t^R = N - N_t^B$, where $G(\cdot)$ is the cdf over which

$x_{i,t}$ is distributed.

It is clear that x^* is decreasing in the amount of funds provided by the British, b_t. The

relationship between x^* and r_t (the religiosity of the curriculum) is a little more complicated. At

sufficiently small levels of r_t, x^* is increasing in r_t; an increase in r_t means that the religious

school becomes more attractive since the increase in the religious return, $v(r_t, R_t)$, is greater than

the decrease in the literacy production function. This is the case when r_t is smaller than r^* (the

optimal offering of religious curriculum) for the marginal citizen. On the other hand, when $r_t >$

r^* for the marginal citizen, x^* is decreasing in r_t. Finally, the relationship between x^* and

fraction of Muslims in the population (m) depends on the level of m, as an increase in m

decreases the number of Hindus attending British schools (thus increasing the returns for

Muslims) but also increases R_t (the religious capital) and thus increase the returns for Muslims from attending religious schools.

Under reasonable assumptions on $G(\cdot)$ and $F(\cdot)$, there is an internal optimal choice of religiosity of the curriculum (r_t) for the religious authority, call it r^{**}. This optimal choice is less than in previous periods (where the religious authority chose a fully religious curriculum at $r^* = 1$), meaning that competition from British schools improves the quality of the religious schools with respect to literacy, although the religious schools do offer a differentiated, more religious, product. Finally, after taking into account the religious authority's decision, it is clear that x^* is increasing in R_t.

Analysis and Testable Predictions

What does this model tell us in the context of colonial India? We are concerned with how the interactions between the players affect literacy outcomes in the final period of the model, $\bar{t}$, which can interpreted as the period our data covers (1911 and 1921). These interactions provide testable predictions spelled out below.

Before summarizing the predictions, note that in equilibrium the British schools *must be* more effective at promoting literacy than the Muslim schools. To see this, consider the case where this is not true. If Muslim schools were more effective at promoting literacy, then all Muslims would choose the religious school. This cannot be an equilibrium, however, because if all Muslims choose the religious schools, then the religious authority has incentive to increase the religiosity of the curriculum (r_t) at least up to the point where the Muslim with the best socio-economic opportunity ($x_{i,t}$) is indifferent between the religious and the British school. At this point, the British school must be more effective at promoting literacy, since the indifferent citizen receives a religious return from attending the religious school. Moreover, this logic must

also hold at greater levels of r_t, since citizens do not view their decision as affecting the literacy production function of the schools.

In other words, the outcome that British schools promoted literacy to a greater extent than religious schools is *endogenously* derived in the model, following from the assumption that religious citizens place some positive weight on a religious curriculum. And indeed, although in reality the curriculum of the religious schools varied widely throughout India, anecdotal evidence suggests that these schools encouraged the ability to read and write to a lesser extent than the public schools established by colonial authorities. One reason commonly given for this is the significance of oral transmission in Islamic history (the most important means by which religious scholars maintained their monopoly on knowledge [Eaton 1993; Berkey 2007]), which encouraged many of these schools to promote Qur'an memorization and recitation of other religious sciences instead of skills associated with literacy (Kozlowski 1985).[26] In fact, Eaton (1993, p. 296) provides anecdotal evidence that many Indian mullas themselves could not read, but that they were understood by the villagers to be tapping into a deeper, otherworldly source of power.

The following predictions thus arise from the model:

Prediction #1: All else being equal, if the education expenditure by the British (b_t) is sufficiently larger than the funding of the religious schools (w), then the fraction of Muslims in the population (m) is negatively correlated with the Muslim literacy rate.

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[26] This by no means entails that all Islamic schools discouraged literacy or even those that did never offered anything in the curriculum which would promote literacy. Indeed, Metcalf (1982), Kozlowski (1985), and Zaman (1999) show instances of Islamic schools which promoted literacy. However, on the margin, the probability of a student becoming literate who attended a public funded school must have been greater than one who attended an Islamic school, for reasons provided above. For example, the British formed the ill-fated Delhi College in 1825 because the private madrasahs spent too much time on the Qur'an and there was no regular system of attendance (Metcalf 1982). The British did sponsor some madrasahs, as long as the content of the curriculum was deemed sufficiently "useful" (Zaman 1999).

Intuition: A sufficient condition for this prediction to hold is that the British school is better funded than the religious school. Indeed, state schools on average were of much higher quality with respect to infrastructure and instructors. Although there were informal public aided and unaided schools run out of teachers' houses or local temples, many of the pure public schools had buildings. Moreover, many teachers in the public schools attended special training schools before entry into teaching. The state schools were regularly reviewed to ensure they met some satisfactory standards. In comparison, the indigenous schools were never reviewed and official authorities had a difficult time even getting basic statistics on enrollment. By the early 20th century, less than 10 percent of total pupils were enrolled in any of these schools. Both official accounts and the historical literature suggest that by the early 20th century, religious schools were of poor quality relative to the state schools (Quinquennial Reviews of Education, 1887-1927; Nurullah and Naik 1961; Ghosh 2000).

To see why Prediction #1 holds, consider what happens to the equilibrium actions when the fraction of Muslims (m) is increased by an infinitesimal amount. The direct effect is that the funding for the religious school, $w(R_t)$, and the citizens' "religious return", $v(r_t, R_t)$, increase, thus increasing the attractiveness and the productivity (with respect to literacy) of the religious school. Meanwhile, the fraction of Hindus decreases, so the British schools spend more per citizen and are hence more productive.

The religious authority, however, has incentive to increase the degree to which the curriculum is religious (r_t) to a point where the religious school is worse for literacy than it was before the increase in the fraction Muslim, m. To see this, consider the situation in which the religious authority increases r_t to the point where literacy is the same before and after the increase in m. When British funding (b_t) is sufficiently large, the increase in fraction Muslim

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entails that the religious return to attending the religious school, $v(r_t, R_t)$, increases by more than the return from attending the British school. Thus, more students attend the religious school and the religious authority has incentive to increase r_t further, and both of these factors result in the religious schools being worse for literacy after the increase in m (since there is less funding per student and the curriculum is more religious). Although Muslim citizens who remain in the British school after the increase in m have a higher probability of becoming literate, the rest of the Muslim citizens have a lower probability of becoming literate – both those who switch from the British to the religious school and those who were in the religious school before and after the change in m. If the education expenditure by the British is sufficiently large, then the latter effect outweighs the former and m is negatively correlated with the Muslim literacy rate. In other words, this prediction entails that "fraction Muslim" should be negatively correlated with Muslim literacy, but not necessarily due to any cultural reason of anything to do with the "nature of Islam".[27] Instead, the correlation between fraction Muslim and Muslim literacy may be spurious, as they may be related through the presence of historical Muslim educational institutions and the collapse of Muslim rule.

Prediction #2: All else being equal, if the education expenditure by the British (b_t) is sufficiently larger than the funding of the religious schools (w), then the Muslim literacy rate is positively correlated with the years (periods) since the collapse of the Muslim political authority ($\bar{t}$ - t_1).

Intuition: Where Muslim collapse happens more distantly in the past, it is longer since Muslim religious authorities played a legitimizing role. This, in turn, decreases the religious authority's

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[27] It should be noted that the model cannot rule out culture as a determining factor in differential literacy rates. However, as we suggest below, a purely cultural argument is tough to reconcile with regression results indicating that the coefficient on "fraction Muslim" is greatly weakened and often insignificant after the period of Muslim collapse is controlled for.

capital within the district as well as the funding bestowed on it by political authorities. As a result, religious schools should be weaker in these areas and less able to compete with British schools, which provided a stronger secular, but not religious, curriculum.

In terms of the model, religious capital (R_t) is decreasing in the number of periods since the collapse of the political authority under the assumption that the transfer given by the political authority, T_t, is greater than that given by the citizenry, $w(R_t)$. Moreover, the degree of depreciation of religious capital is increasing in the number of periods since the collapse of political authority.

A decrease in religious capital (R_t) has a few effects related to literacy. First, it encourages some Muslims to choose the British school, as the religious schools are now less funded and the religious return, $v(r_t, R_t)$, is lower. Literacy for these citizens is thus increased. However, Muslims who were already in the British school now get less funding, so their probability of becoming literate decreases. Meanwhile, the Muslims who remain in the Muslim school have a more poorly funded school, and thus have a lower probability of literacy. The positive effects on literacy outweigh the negative effects when the British school is sufficiently well-funded, as those already in the British school will not have their probability of becoming literate greatly reduced but those moving to the British school have a significant increase in their probability of becoming literate. This entails that the Muslim literacy rate is positively associated with the number of periods since the collapse of the Muslim political authority.

In sum, this model proposes that the share of Muslims in the population may be spuriously correlated with Muslim literacy. Instead of relying on a purely cultural argument, the model suggests the possibility that religious schools were more attractive in regions where religious authorities accumulated more religious capital in the past. These regions are often ones

with a greater portion of Muslims (since this enticed Muslim rulers to purchase more legitimacy

from religious authorities) and a more recent collapse of Muslim political authority (since

religious authorities received more funding in such regions). It follows that religious authorities

may have been able to increase the degree to which the religious school's curriculum was based

on religion in these areas, thus diminishing the productivity of religious schools in promoting

literacy. It also encouraged more Muslims to enter the religious schools instead of the British

schools – diminishing Muslim literacy.[28]

Empirical Analysis

The argument presented in the model may help explain the finding that the Muslim

literacy rate is negatively associated with the presence of other Muslims. First, there is evidence

that regions with a more recent collapse of Mughal rule had larger Muslim populations. Districts

where Muslim rule collapsed before 1765 had a mean Muslim proportion of 21.3%, those where

Muslim rule collapsed between 1765-1805 had a mean Muslim proportion of 21.7%, while those

with a post-1805 collapse had a mean Muslim proportion of 34.2%. This suggests the possibility

that the coefficient on fraction Muslim in our previous regressions is merely a proxy for the

historical circumstance in which a recent collapse of Muslim rule entailed worse literacy for

Muslims.

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[28] Concerns with this model may include the number of years (or periods) before Muslim collapse is not endogenous or that the fraction of Muslims in the population is not endogenous. The former may be endogenous because Muslim political authorities were stronger where there were more Muslims and thus had a lower probability of collapse where m was large. The latter may be endogenous because poor socio-economic opportunities ($x_{i,t}$) may have convinced some poor Hindus to convert to Islam, which was not encumbered by the rigid caste system. However, endogenizing either of these phenomena would merely exacerbate the results enumerated above. The model predicts that the fraction of Muslims in the population and "late collapse" are both negatively correlated with the Muslim literacy rate. Hence, making the collapse date (t_1) an increasing function of the fraction of Muslims in the population (m) would merely strengthen Predictions #1 and #2. Moreover, if Hindus in poor socio-economic conditions converted to Islam, then this should exacerbate prediction #1, since poor socio-economic conditions are assumed to be negatively correlated with literacy ($F_3 > 0$). That is, if the distribution of socio-economic conditions is more skewed to the left for Muslims than Hindus, this means that we should see worse literacy rates where there are more Muslims, although for a different reason than the one proposed in the model. On the other hand, if Hindus with good socio-economic conditions converted to Islam, then the results of the model may change under some parameter sets. However, our data shows little evidence of this type of selection.

Can the differential timing in the collapse of Muslim rule across different parts of India pick up any variation that we are not already picking up in the previous regressions? Throughout the eighteenth and into the nineteenth century, Muslim power collapsed in different places in the subcontinent. The Mughal Empire was greatly weakened by the early eighteenth century (especially after the death of Aurangzeb in 1707) and by the mid-eighteenth century was replaced by a combination of Muslim successor states, Hindu kingdoms (most prominently the Marathas) and the British East India Company.[29] The first watershed event of British intrusion occurred at the Battle of Plessey (1757), which was followed by the formal secession of Mughal lands to the East India Company in Bengal and Bihar in 1765 (Datta 2003; Banerjee and Iyer 2005). Prior to 1765, Muslim rule collapsed not only in Bengal and Bihar but also to the Maratha kingdom in parts of the northern and eastern areas of India (in parts of Orissa, Central Provinces, Bombay, and Punjab).

The British expanded little in the decades following the accession of Bengal and Bihar. From 1790-1805, however, the British nearly doubled their holdings in India, especially under the aggressive tenure of Richard Wellesley (1798-1805), attaining much of Madras, Orissa, and the United Provinces (Ward 1994; Datta 2003). In 1765-1805, Muslim rule also collapsed in Punjab, falling under Sikh rule. Following British expansion under Wellesley, the British did not gain more territory for over a decade (Banerjee and Iyer 2005), but by the mid-19th century Muslim rule collapsed in the northern and western areas, including the United Provinces, Central Provinces, and Sind (which would become a part of northwestern Bombay province in 1843) (Robinson 1982). The map presented in Figure 2 details when and where Muslim rule collapsed throughout the subcontinent.

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[29] There is a substantial literature speculating on the reasons underlying the decline of the Mughal Empire. We have no intention on entering this debate. For more, see Habib (1963), Pearson (1976), and Leonard (1979).

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We exploit the significant variation in the date of collapse both *within* and *across* provinces to test the implications of the argument spelled out above. We construct a dummy variable for the three periods of Muslim collapse associated with different periods of British intrusion, as delineated by Robinson (1982, p. 59, 113): pre-1765, 1765-1805, and post-1805.[30] Table 4 reports the findings on Hindu and Muslim literacy controlling for the collapse dummies and the set of socio-economic variables used in Table 3. The omitted collapse dummy is the pre-1765 dummy, so all coefficients should be interpreted relative to districts in which Mughal power collapsed prior to 1765.

A number of patterns emerge in Table 4. First, the fraction Muslim coefficient is insignificant in *all* of the regressions in Table 4 where Muslim literacy is the dependent variable, indicating that including controls for the period of Muslim collapse may pick up what fraction Muslim picked up in previous regressions. Second, the coefficients on the dummies for our Muslim collapse variables are negative and significant in all Muslim literacy regressions and the post-1805 collapse dummy is *always* more negative than the 1765-1805 dummy. This suggests that a *more recent* collapse is negatively associated with Muslim literacy. All else being equal, a post-1805 collapse of Muslim power entails between a 1.4 and 3.8 percentage point drop in Muslim literacy (relative to a pre-1765 collapse). This difference is far from trivial, as mean literacy rates hovered around six to seven percent in this period. The collapse dummies, however, are rarely significant in regressions on Hindu literacy, especially when province fixed effects are employed. This result suggests that the effect of late collapse does not simply hurt all

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[30] These breakpoints separate dates of major British intrusion into India. It is possible that the British expanded to the most economically profitable areas first, meaning that the collapse dummies are also proxying for income instead of just the institutional relationship suggested by the model. However, this potential problem should not affect our results. Stokes (1973) argues that the British expanded after 1765 to gain control and increase the efficiency of the tax system, which was defunct in much of the continent. Moreover, another exogenous source of heterogeneity is that the British were not the only non-Muslim group taking Muslim lands – Hindus and Sikhs also siphoned off much of what has once been the Mughal Empire.

types of literacy (through some mechanism not controlled for), but *only* Muslim literacy (as predicted by the model).

Our model suggests that the effects of Muslim collapse operated through a larger presence of religious schools in districts where Muslim rule collapsed more recently and a smaller presence of state schools created under colonial authority. Although the censuses do not provide any information on the number of schools in a district, we have pieced together some data from the Indian district gazetteers on total schools, state schools established under the new British education system (namely public, aided and unaided schools), and indigenous private schools. Most of the Muslim religious schools were enumerated under the indigenous schools but unfortunately the data on religious indigenous schools is not differentiated by religion, which introduces significant measurement error. Moreover, we only have this data for districts of Bengal, Bihar and Orissa, Bombay, Madras, and Punjab in 1911.

Using this crude data, Table 5 provides some suggestive evidence that districts where Muslim rule collapsed in the early 19th century (late collapse) had fewer total schools, especially fewer schools established under colonial authority (state schools). This result arises in spite of the result that, as colonial policy dictated, areas with more Muslims had more public schools and more total schools. There is also mild evidence that areas with a later collapse had a larger number of unrecognized religious schools but the effects are not precisely estimated (columns 5 and 6). Since we have limited variation in the timing of collapse within provinces – most of the intra-province variation on collapse occurs within Punjab, Bombay, Central Provinces, and United Provinces, and we only have data for the former two – the effects of collapse are imprecisely estimated in the province fixed effects regressions although the signs on the coefficients are generally in the direction we expect.

The collapse dummies are an admittedly crude proxy for the pathway by which the legitimizing relationship between religious and political authorities ultimately culminated in the propagation of religious schools, which discouraged literacy. There are numerous cultural, economic, religious, and military phenomena associated with the collapse of Muslim power that are not associated with the pathway proposed in the model. Yet, for such phenomena to have had a salient impact on Muslim literacy, one would have to explain why it affected only Muslim literacy and not Hindu literacy, as is suggested by Table 4. We view the use of this proxy as a successful first-order attempt at showing that broader, institutional features may underlie the diverging paths of human capital accumulation between groups rather than purely cultural factors. Though there are other ways that "Muslim collapse" may have affected literacy rates in the early 20th century, we believe that the institutional pathway that we propose in the model is the most reasonable one.

VII. BROADER SIGNIFICANCE

Although our analysis focuses on the colonial period, differences in Hindu and Muslim literacy have continued to persist into the post-independence period. As of the 2001 census, Muslim literacy averaged 59% compared to an all-India average of 65% (Government of India, 2006).[31] Moreover, states with a larger share of Muslims appear to have lower Muslim literacy as compared to states with smaller Muslim populations. Of course, the Indian subcontinent witnessed numerous changes over the 20th century including independence from colonial rule in 1947, the Partition of India and creation of Pakistan, and the large-scale migration of Muslims from India to Pakistan. On account of these changes, we are hesitant to completely attribute the differential literacy patterns observed in post-independent India to institutional channels dating

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[31] Estimates from the National Sample Survey Organization (NSSO) find larger differences in 2004-05: Muslim literacy rate of 60% compared to 80% for Hindus.

to the collapse of Muslim rule. Our institutional pathway, however, may be one of many factors responsible for the observed variation in Muslim literacy within post-independence India.

While our focus in this paper has been on the Indian experience, we believe our findings and model may also be relevant beyond India. A crude examination of literacy rates across the world reveals a very small negative correlation between the proportion of Muslims and total literacy rates (Appendix Table 1). But, when we break up countries by regions, the correlation is negative and larger in magnitude for Asia and Africa but not for the Middle East. The correlation is also sensitive to whether we break up the sample according to the Muslim population share. Ideally, we would like to compare Muslim literacy rates to the proportion of Muslims across countries. However, there are no systematic data on Muslim literacy by country making it difficult to say whether Muslims or some other group are contributing to the higher total literacy rate in countries with smaller shares of Muslims. Nonetheless, we believe our model and mechanism could explain inter-group literacy differences in other countries in Asia or Africa, where colonial rule supplanted existing political institutions that relied on religious authorities for legitimacy.

VIII. CONCLUSION

Differences in human capital accumulation are vital components of differences in broader economic outcomes both across countries and across different groups within the same country. In this paper, we attempt to shed light on the conditions under which Muslims (a minority group) attained less human capital than Hindus (the majority group) in early 20th century India. Are the factors leading to these differences cultural, institutional, demographic, or something else?

Our baseline specifications suggest that Muslim literacy rates are negatively associated with the presence of other Muslims in the district. This result is robust to social, economic, and

educational controls, although adding these controls slightly weakens the result. We argue that the institutional history of the region played a role in discouraging literacy amongst Muslims. Our analysis suggests that this history did indeed play a salient role in determining literacy rates, and that the difference between Hindu and Muslim literacy in the early 20th century may have been an unintended result of the differential timing of the collapse of Muslim political power.

In sum, we view our paper as a first step in understanding the factors which affect human capital accumulation across different groups. We offer an alternative to cultural explanations that rely on the argument, "where there are more Muslims, there are worse economic outcomes." We show that controlling for socio-economic variables and particularly institutional variables helps eliminate the effect of the presence of Muslims on Muslim literacy. More broadly, this analysis suggests that the "long hand of history" has played some role in subsequent differences in literacy rates through the persistence of institutions discouraging literacy.

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TABLES

TABLE 1: SUMMARY STATISTICS

Variable	Hindu			Muslim		
	Obs.	Mean	Std Dev	Obs	Mean	Std Dev
Literacy Rate	**410**	**7.4%**	**5.6%**	**396**	**6.8%**	**5.2%**
Assam	16	7.0%	2.0%	13	5.2%	3.2%
Bengal	54	11.9%	3.5%	52	5.8%	2.8%
Bihar and Orissa	42	4.5%	1.4%	38	5.9%	3.8%
Bombay and Sind	49	9.2%	5.6%	49	8.3%	5.7%
Central Provinces	44	4.3%	1.4%	39	11.9%	4.2%
Madras	50	8.3%	4.7%	50	12.3%	6.1%
Punjab	59	11.5%	9.1%	59	2.6%	3.4%
United Provinces	96	3.6%	1.5%	96	4.6%	2.8%
Population Share	**410**	**69.7%**	**27.3%**	**410**	**23.6%**	**26.2%**
Assam	16	64.9%	13.3%	16	20.4%	18.9%
Bengal	54	46.0%	23.1%	54	47.4%	26.5%
Bihar and Orissa	42	81.2%	17.3%	42	9.0%	8.5%
Bombay and Sind	49	71.1%	29.3%	49	25.9%	30.3%
Central Provinces	44	80.7%	13.2%	44	4.2%	2.7%
Madras	50	89.0%	7.6%	50	6.7%	6.3%
Punjab	59	33.1%	26.5%	59	55.8%	26.7%
United Provinces	96	85.3%	8.6%	96	13.7%	8.0%

	1911			1921		
Hindu Literacy Rate	204	7.1%	6.2%	206	7.7%	5.0%
Muslim Literacy Rate	195	6.2%	4.8%	201	7.3%	5.6%
Fraction Hindu	204	69.9%	27.2%	206	69.4%	27.4%
Fraction Brahman	204	5.0%	4.3%	206	5.0%	4.3%
Fraction Low Castes	204	15.8%	8.1%	206	14.5%	8.3%
Fraction Muslim	204	23.2%	26.2%	206	23.9%	26.3%
Fraction Christian	204	1.0%	2.0%	206	1.2%	2.2%
Fraction Tribes	204	3.7%	9.5%	206	3.3%	8.5%
Caste and Religious Fragmentation	204	0.74	0.18	206	0.73	0.19
Fraction Urban	204	9.9%	10.5%	206	10.9%	11.5%
Fraction Commercial	204	7.0%	3.6%	206	6.7%	3.2%
Fraction Industry	204	12.2%	6.3%	206	11.6%	6.4%
Fraction Professionals	204	1.6%	0.9%	206	1.6%	1.2%
Income Tax Revenues per-capita	200	0.06	0.10	200	0.20	0.64

Source: Census of India (1911 and 1921) and Imperial District Gazetteer Series (income tax revenues per-capita variable).
See text for more details on dataset.

TABLE 2: TOTAL LITERACY RATES

	(1)	(2)	(3)	(4)
	Hindu	Muslim	Hindu	Muslim
1911 CROSS-SECTION				
Fraction Hindu	-0.056*	-0.047	-0.054*	-0.036
	[0.030]	[0.032]	[0.028]	[0.030]
Fraction Muslim	0.095***	-0.141***	0.085***	-0.126***
	[0.020]	[0.033]	[0.023]	[0.028]
Province FE	No	No	Yes	Yes
Observations	204	195	204	195
Adj. R-squared	0.39	0.28	0.45	0.50
1921 CROSS-SECTION				
Fraction Hindu	0.001	-0.073*	0.009	-0.025
	[0.013]	[0.037]	[0.015]	[0.030]
Fraction Muslim	0.127***	-0.184***	0.124***	-0.135***
	[0.015]	[0.038]	[0.017]	[0.028]
Province FE	No	No	Yes	Yes
Observations	206	201	206	201
Adj. R-squared	0.43	0.30	0.59	0.52

Robust standard errors in brackets, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 3: CAN LOW RETURNS OR COLONIAL POLICIES EXPLAIN THE PATTERNS?

TOTAL LITERACY RATES

	(1)	(2)	(3)	(4)
	Hindu	Muslim	Hindu	Muslim
1911 CROSS-SECTION				
Fraction Hindu	-0.047	0.079***	-0.049	-0.003
	[0.175]	[0.029]	[0.177]	[0.035]
Fraction Muslim	0.015	-0.077*	0.011	-0.141***
	[0.161]	[0.042]	[0.169]	[0.049]
Observations	189	185	189	185
Adj. R-squared	0.52	0.56	0.51	0.66
1921 CROSS-SECTION				
Fraction Hindu	0.051	0.039	0.018	-0.015
	[0.055]	[0.029]	[0.051]	[0.040]
Fraction Muslim	0.116*	-0.135***	0.072	-0.180***
	[0.064]	[0.047]	[0.059]	[0.054]
Observations	187	186	187	186
Adj. R-squared	0.75	0.58	0.80	0.68
Province FE	No	No	Yes	Yes
Education Expenditures	Yes	Yes	Yes	Yes
Social Controls	Yes	Yes	Yes	Yes
Development Controls	Yes	Yes	Yes	Yes

Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1
Social controls include the population share of christians, tribes, buddhists and CRFI. Development controls include income taxes per-capita, urbanization rate, a dummy for coastal districts, population share supported by commerce, population share supported by industry and population share supported by professionals. We control for public educational expenditures per-capita incurred by the rural district boards in all the specifications.

TABLE 4: DOES YEARS SINCE MUGHAL COLLAPSE AFFECT LITERACY?

	(1)	(2)	(3)	(4)
	Hindu	Muslim	Hindu	Muslim
1911 CROSS-SECTION				
Fraction Hindu	-0.059	0.106***	-0.091	0.045
	[0.183]	[0.030]	[0.206]	[0.043]
Fraction Muslim	0.003	-0.042	-0.042	-0.080
	[0.168]	[0.042]	[0.202]	[0.059]
1765-1805 Collapse	0.008	-0.015**	0.016	-0.014*
	[0.010]	[0.006]	[0.018]	[0.007]
Post-1805 Collapse	0.003	-0.025***	0.014	-0.023***
	[0.007]	[0.005]	[0.011]	[0.008]
Observations	186	182	186	182
Adj. R-squared	0.52	0.59	0.51	0.67
1921 CROSS-SECTION				
Fraction Hindu	0.074	0.102***	0.007	0.061
	[0.057]	[0.033]	[0.053]	[0.043]
Fraction Muslim	0.150**	-0.052	0.059	-0.077
	[0.066]	[0.049]	[0.063]	[0.061]
1765-1805 Collapse	-0.011**	-0.024***	0.001	-0.022***
	[0.005]	[0.006]	[0.006]	[0.008]
Post-1805 Collapse	-0.013***	-0.035***	0.005	-0.038***
	[0.005]	[0.006]	[0.006]	[0.009]
Observations	184	183	184	183
Adj. R-squared	0.78	0.64	0.81	0.70
Province FE	No	No	Yes	Yes
Education Expenditures	Yes	Yes	Yes	Yes
Social Controls	Yes	Yes	Yes	Yes
Development Controls	Yes	Yes	Yes	Yes

Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1
Social and development controls are same as in table 3. Collapse dummies equal one if Mughal rule
collapsed in the period.

TABLE 5: FEWER STATE SCHOOLS AND MUSLIM COLLAPSE

	(1)	(2)	(3)	(4)	(5)	(6)
	Total Schools		All State Schools (Public, Aided and Unaided)		Unrecognized Indigeneous Schools	
Fraction Hindu	2.184***	0.849**	1.940***	0.427	0.244	0.422***
	[0.441]	[0.374]	[0.464]	[0.324]	[0.155]	[0.145]
Fraction Muslim	1.677***	0.274	1.525**	-0.269	0.152	0.542***
	[0.598]	[0.556]	[0.607]	[0.505]	[0.186]	[0.170]
1765-1805 Collapse	-0.107*	-0.037	-0.154***	-0.047	0.047**	0.011
	[0.060]	[0.063]	[0.056]	[0.056]	[0.021]	[0.021]
Post-1805 Collapse	-0.266***	-0.036	-0.313***	-0.016	0.047	-0.020
	[0.087]	[0.088]	[0.074]	[0.078]	[0.039]	[0.036]
Province FE	No	Yes	No	Yes	No	Yes
Social Controls	Yes	Yes	Yes	Yes	Yes	Yes
Income Controls	Yes	Yes	Yes	Yes	Yes	Yes
Development Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	120	120	120	120	120	120
Adjusted R-squared	0.42	0.57	0.45	0.63	0.28	0.46

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

Source: Data for 1911 cross-section only. Specifications on public schools and recognized private schools are for districts in Bengal, Bihar and Orissa, Bombay, Madras and Punjab. This data was unreported for the other provinces. Social controls include the population share of christians, tribes, buddhists and CRFI. Development controls include income taxes per-capita, urbanization rate, a dummy for coastal districts, population share supported by commerce, population share supported by industry and population share supported by professionals.

FIGURE 1: FRACTION MUSLIM VS. MUSLIM LITERACY RATE

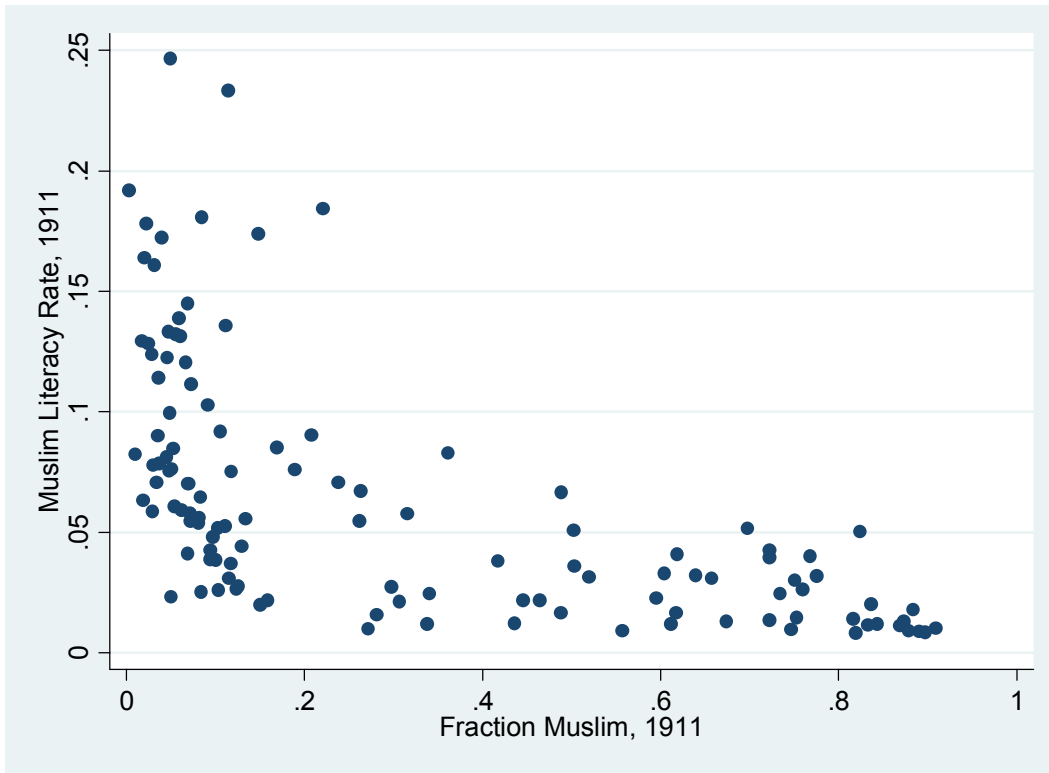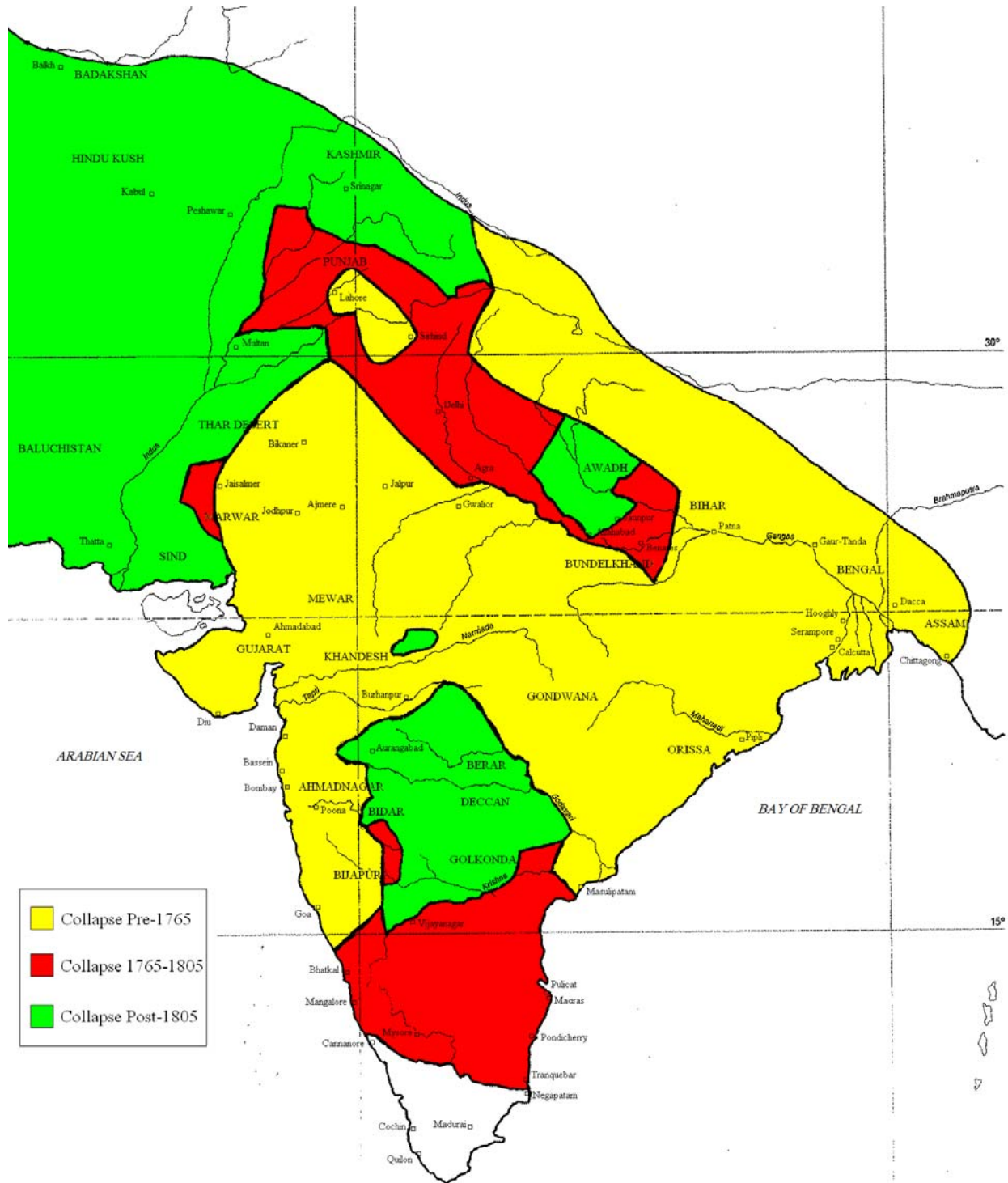# FIGURE 2: COLLAPSE OF MUSLIM RULE IN INDIA

Source: Robinson (1982)

Country	Literacy Rate	Fraction Muslim	Literacy Data Year
Africa (correlation = -0.17)			
Algeria	75.39	98.0	2007
Benin	40.54	24.4	2007
Burkina Faso	28.73	59.0	2007
Cameroon	67.90	17.9	2001
Central African Republic	48.57	8.9	2000
Chad	31.76	55.8	2007
Comoros	77.28	98.3	2007
Cote d'Ivoire	48.73	36.7	2000
Egypt	66.37	94.6	2006
Eritrea	52.51	36.5	2002
Ethiopia	35.90	33.9	2004
Gabon	86.17	9.5	2007
Ghana	65.03	15.9	2007
Guinea	29.48	84.4	2003
Kenya	73.61	7.0	2000
Liberia	55.55	12.2	2007
Libya	86.78	96.6	2007
Malawi	71.79	12.8	2007
Mali	26.18	92.5	2006
Mauritania	55.80	99.1	2007
Mauritius	87.41	16.6	2007
Morocco	55.58	99.0	2007
Mozambique	44.38	22.8	2007
Niger	28.67	98.6	2005
Nigeria	72.01	50.4	2007
Senegal	41.89	96.0	2006
Sierra Leone	38.10	71.3	2007
Sudan	60.93	71.3	2000
Tanzania	72.31	30.2	2007
Togo	53.16	12.2	2000
Tunisia	77.70	99.5	2007
Uganda	73.60	12.1	2007
Middle East (correlation = 0.09)			
Bahrain	88.8	81.2	2007
Iran	82.3	99.4	2006
Iraq	74.1	16.7	2000
Jordan	91.1	98.2	2005
Kuwait	94.5	95.0	2007
Lebanon	89.6	59.3	2007
Oman	84.4	87.7	2007
Qatar	93.1	77.5	2007
Saudi Arabia	85.0	97.0	2007
Syria	83.1	92.2	2007
United Arab Emirates	90.0	76.2	2005
Yemen	58.9	99.1	2007
Asia (correlation = -0.26)			
Afghanistan	28.00	99.7	2000
Azerbaijan	99.50	99.2	2007
Bangladesh	53.48	89.6	2007
Brunei	94.9	67.2	2007
India	66.02	13.4	2007
Indonesia	91.98	88.2	2006
Kazakhstan	99.62	56.4	2007
Kyrgyz Republic	99.30	86.3	2007
Mongolia	97.77	5.0	2007
Pakistan	54.15	96.3	2006
Philippines	93.57	5.1	2007
Russia	99.52	11.7	2007
Singapore	94.43	14.9	2007
Sri Lanka	90.81	8.5	2006
Tajikistan	99.64	84.1	2007
Thailand	94.15	5.8	2007
Turkey	88.7	98.0	2007
Turkmenistan	99.51	93.1	2007
Uzbekistan	96.90	96.3	2000

Source: Countries with at least 5% Muslim population (min 100,000); Population from Pew Research Center (2009); Literacy from World Bank (2009).