UNIVERSITY OF CAMBRIDGE
Faculty of Economics

Institute for New Economic Thinking

Cambridge-INET Institute

Cambridge-INET Working Paper Series No: 2018/16

Cambridge Working Papers in Economics: 1862

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Economic Shocks and Temple Desecrations in Medieval India*

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October 2018

Abstract

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Keywords: Religious repression, Regime stability, Weather shocks, Temple desecration.

JEL Classification: D74; N35; N45.

*We thank Emmanuelle Auriol, Nicolas Berman, Theresa Finley, Julia Cajal Grossi, Larry Iannaccone, Rahul Mukherjee, Jared Rubin, Julia Seiermann, Lore Vandewalle, Carolyn Warner and the participants at the Association for the Study of Economics Religion and Culture (ASREC) conference, Economic History Association (EHA) meeting, Institute for the Study of Religion, Economics and Society (IRES) graduate workshop, the Political Economy workshop at the Indian Institute of Management Bangalore, and The Graduate Institute seminars for their useful suggestions. Any errors are attributable to the authors.

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1 Introduction

Economic downturns can threaten an authoritarian ruler's hold over power by creating conditions for mass uprising (Acemoglu and Robinson, 2001, 2005; Brückner and Ciccone, 2011). A number of studies find that adverse weather shocks can create economic downturns that in turn lead to political instability. Aidt and Leon (2016) show that drought increased the intensity of riots in sub-Saharan Africa forcing the elite to extend democratic concessions. Berger and Spoerer (2001) point out the strong link between poor economic conditions and the European revolutions of 1848.

When such a negative economic shock hits a society, religious authority becomes crucial as it can provide the ideological force to solve the collective action problem that hinders a revolution (Aldashev, Platteau, and Sekeris, 2013; Auriol and Platteau, 2017a). Hence, during economic downturns the ruler has an incentive to co-opt the religious authority to avoid a successful revolt (Chaney, 2013; Rubin, 2017). The cost of co-option however increases with the distance between the religion of the ruler and that of the religious authority of the masses (Auriol and Platteau, 2017b). When the cost of co-option is too high the ruler is more likely to engage in religious repression to prevent a successful rebellion. While there is empirical evidence of co-option strategies (Chaney, 2013), we lack empirical evidence on the use of religious repression as a state maintenance strategy.

This paper examines these interactions in the case of medieval South Asia. We show a positive relationship between weather fluctuation and the destruction of Hindu temples under Muslim rule, using a newly compiled dataset on medieval India that spans over five centuries. The probability of temple desecration under Muslim rule more than doubled during the period of large weather fluctuations. Our results suggest that these desecrations could be the rulers' response to a perceived threat to regime stability due to the possibility of a revolt resulting from the economic shocks caused by these weather fluctuations.

For example, we show that the likelihood of temple desecration was diminished in locations with high soil fertility during periods of large weather fluctuation. This is in line with evidence that better soil quality reduces the negative effect of weather fluctuations on agricultural productivity (Malik and Temple, 2009; Porter and Semenov, 2005). Locations with better soil quality would therefore be less likely to observe social unrest during periods of large weather fluctuations, and hence would be less likely to be a target for temple desecration.

Next, we show that older Muslim States were less likely to desecrate a Hindu temple during periods of large weather fluctuations. This is plausibly because older Muslim States had stronger military capacity and therefore were less vulnerable to mass uprising. Older States were also more likely to possess the fiscal capacity to offer policy concessions during low harvest periods (Moreland, 2011), thereby reducing the threat of mass rebellion. A Muslim ruler's duration in power was also negatively related to the likelihood of temple desecration during periods of large weather anomalies. This is in line with historical evidence that Indo-Muslim rulers were more likely to experience challenges to their authority at the onset of their tenure (Faruqui, 2012).

Our research also weighs in against some of the alternative explanations. For example, we show that Muslim States were no more likely to desecrate wealthier temples under their rule. This result casts doubt on the explanation that Muslim States plundered Hindu temples for their wealth, following a shock to their tax revenue. We also show that weather fluctuations did not increase the intensity of Hindu-Muslim battles. This weighs against the explanation that weather fluctuations increased the intensity of inter-state conflict (Iyigun, Nunn, and Qian, 2017), which resulted in higher collateral damage in the form of temple desecration.

Finally, we show that a Muslim State's battle victory over a Hindu State did not affect the likelihood of temple desecration. This weighs against the hypothesis that Muslim States were more likely to desecrate temples during state expansion through battle victory against the Hindu State (Eaton, 2000). Instead, we find that a Muslim State was more likely to desecrate a temple in a newly conquered territory, when the likelihood of mass upheaval was particularly high due to large weather fluctuations.

This study contributes to different strands of literature. Our primary contribution is to the literature on the economic origins of regime transition (Acemoglu and Robinson, 2001, 2005). A growing subset of this literature has focused on the role of religion in maintaining authoritarian rule (Aldashev, Platteau, and Sekeris, 2013; Auriol and Platteau, 2017a,b; Chaney, 2013; Rubin, 2011, 2017). Our study is closest to Chaney (2013) who documents an increase in the political influence of the head judge (religious authority) as well as higher spending on religious structures (co-option) following Nile shocks in medieval Egypt. The relationship is however predicated on the ruler and the masses having a common religious preference. Our work is different because we provide empirical evidence on the use of religious repression as a state maintenance strategy when the ruler *differs* in his religious beliefs to the masses.

We add to the literature that assesses the role of economic shocks on weather and conflict in pre-modern societies (Anderson, Johnson, and Koyama, 2017; Fenske and Kala, 2015; Oster, 2004; Waldinger, 2015). Anderson, Johnson, and Koyama (2017) in particular show that weather shocks increased the persecution of Jews in medieval Europe by dampening agricultural productivity. In their framework, an extractive society maintains a weak tolerance for its minorities. Negative economic shocks lead to an unraveling of this tolerance, leading to greater persecution of the minority. In their analysis repression can be carried out either by the state or the majority group. In contrast, our findings focus exclusively on state repression in response to negative weather shocks.

We add to a small but upcoming literature that studies religion, politics and conflict in historical or contemporary setting (Iyer, 2016, 2018). These studies provide a conceptual framework to understand the salience of religion across different time periods (Becker and Woessmann, 2009; Iyigun, 2008; Michalopoulos, Naghavi, and Prarolo, 2017). We contribute to the empirical literature on the economic and political history of India, which has mainly focused on the institutional aspects of the colonial era (Banerjee and Iyer, 2005; Broadberry, Custodis, and

Gupta, 2015; Chaudhary, 2009; Chaudhary, Gupta, Roy, and Swamy, 2015; Kuran and Singh, 2013; Roy, 2016; Verghese, 2016). This is primarily because pre-colonial history suffers from a dearth of systematic event records (Bayly, 1985). Our study uses a newly compiled dataset to systematically address the question of inter-religious competition in pre-colonial South Asia.[1] To that end, our work is also a new contribution to the economics of religion in medieval South Asia.

Finally, our work adds new insight to studies of the destruction of cultural or religious sites, a phenomena that is observed across cultures and at different time periods. A subset of this literature focuses on the cultural explanations for such conflict (Huntington, 1997). According to the cultural hypothesis, religious affiliations have stable characteristics that might be in conflict, leading to outcomes such as the destruction of religious or cultural sites. Religious scholarship widely attributes the desecration of sacred sites to the aversion for imagery among the Abrahamic traditions (Morgan, 2003). The practice of 'iconoclasm' or image-breaking assumes greater significance in Islam as it is often connected to the removal of idols from the Ka'ba in Mecca. Recent incidents ranging from the desecration of the Bamiyan Buddhas by the Taliban in 2001, to the ravaging of several religious and cultural sites by the Islamic State in Iraq and Syria, are presented to highlight this connection.

Another set of studies focus on political drivers and argue that such desecrations have been observed at various times in history and committed by regimes with various ideological moorings. For every site that was destroyed during the Calvinist reformation in Switzerland or during the Wahhabi attacks on the early Islamic heritage in the 18th century, we have examples of iconoclasm carried out by the secular regimes during the French revolution or during the Cultural Revolution in China (Noyes, 2013; Reinders, 2004). A common thread running through all these cases is that the destruction of incumbent religious and cultural institutions goes hand in hand with the process of state building (Noyes, 2013). Desecration of religious or cultural

[1] In contrast to our study, Jha (2013) uses inter-ethnic competition in medieval India as a determinant of modern day outcomes.

sites is therefore a part of the coercive process through which states emerge (Olson, 1993; Tilly, 1985; Weber, 1965). We bring new intuition to this literature by showing that economic shocks can disrupt the political equilibria which leads to the destruction of sites of cultural or religious significance.

The rest of the paper is organized as follows. We present the historical background in Section 2. We discuss the dataset in Section 3 followed by the empirical specification and results in Section 4. We address the plausible explanations of the results in Section 5 and discuss our main findings in Section 6. We perform a battery of robustness checks in Section 7. Section 8 concludes.

2 Historical Backround

2.1 Agrarian System under Medieval Muslim Rule

The emergence of medieval Muslim polities in the 12th century created a new ruling class and changed the pattern of surplus extraction (Habib, 1983).[2] The center shifted from the countryside to the town, which was driven by Islam's urban orientation (Habib, 1983). Urban growth rested mainly on the ruling elite's capacity to extract agrarian surplus. To maximize rent extraction the early Muslim States introduced a consolidated land-tax system (Kharaj) which replaced a host of taxes and cesses claimed by the previous Hindu aristocracy.

The state however preserved the inherited structure of rural society and used it for collecting land taxes. This was a sort of compromise where the erstwhile Hindu aristocracy (this class came to be known formally as Zamindars in the Mughal period) were accorded certain hereditary rights over the territory they controlled and allowed to maintain armed retainers. In return these erstwhile aristocrats were obliged to collect taxes on behalf of the king and provide military assistance when needed (Habib, 1983).

[2]Nobility records from the reign of Mughal king Akbar, who is famous for building alliances with Hindu Rajput kings, suggest that their religious and ethnic composition was pre-dominantly Muslim and particularly of non-Indian descent (Khan, 1968).

The Zamindar was not the only type of intermediate class to emerge. In areas where the Zamindari class did not exist (raiyati), the state mobilized caste driven social stratification among the peasants.[3] In these cases the village headman (Chaudhary) would act as a local representative of imperial authority (Rana, 1981).

The medieval Muslim States essentially operated as a "decentralized polity" where the military as well as economic strength of the regime progressed from the bottom to the top (Gupta, Ma, and Roy, 2016). There was always a threat of rural resistance to the imposition of state power (Richards, 2004). The peasants were armed and ready to abandon cultivation and fight when necessary. Their warriors responded to the calls for resistance from the Zamindars for common defense against external threats. Perhaps, the greatest threat to the state came from the Zamindars, who often fought against imperial agents seeking to collect taxes or tribute (Richards, 2004). The state maintained this tenuous control over rural society through a sound intelligence system, efficient bureaucracy and a crushing response to rebellion (Gupta, Ma, and Roy, 2016).

2.2 The Political and Economic Salience of Temples

The building of monumental temples in stone for congregational worship had become a characteristic feature across the Indian subcontinent before the emergence of medieval Muslim States (Bakker, 1992). The rise of these temple establishments went hand in hand with the growth of regional polities. In competition with rivals, Hindu rulers sought to erect the most splendid structures, the dimensions of which would reflect their political ambitions. Rulers, great and small, shared their sovereignty with the deities installed in the temple, the community of worship overlapping with the political community.

In addition to monumental temple building, the royal cult involved gift-giving, in monetary

[3]This absence of Zamindari could be due to the destruction of older aristocracy or its inability to transform into the new intermediate class. It is also plausible that in some areas the class with the hereditary rights did not exist even in the pre-medieval period (Habib, 1983).

form and land endowments, as a medium to acquire religious merit (Bakker, 1992). The cult of sacred places also became prominent, creating centers of pilgrimage where religious rites such as sacred bathing or religious penance were performed (Bakker, 1992).

Having possession of large grants made the temple influential in the economic sphere. Temples initiated agricultural activity on the endowed land (Stein, 1960). Lands were leased out to cultivators in return for a share of their income. Monetary endowments were also funneled back into the economy. The temples regularly made loans to the villages for developmental work, such as irrigation investments and extended loans for commercial activity (Stein, 1960).

2.3 State Maintenance and Temple Desecrations

Medieval Muslim polities thus emerged with a system of monumental temples and royal patronage in the background. Their emergence broke the intimate relationship between the ruler and the divine, and construction of grand temple complexes came to a halt in the areas that were conquered. According to historian André Wink, "if the temples were not destroyed, patronage dried up, and few great temples were built in North India after thirteenth century".

Another historian Richard Eaton suggests that the Muslim states pursued a policy of pragmatism towards the temples that lay in their annexed territories. The temples were treated as state property, generally protected, and on occasion resources were spent for their maintenance. For example, a Sanskrit inscription records that Muslim king Muhammad Bin Tughluq appointed Muslim officials to carry out repairs of a Shiva temples in 1326, thirteen years after having conquered that territory. Similarly, there is an example of Kashmiri ruler Sultan Shihab al-Din (1355-73) dissuading his minister from destroying Hindu and Buddhist temples to obtain sudden wealth.

However, this relationship of general tolerance and occasional patronage of temples was broken during periods of social conflict. The Indo-Muslim rulers were aware of the political salience of temples in according legitimacy to their patrons. Even when former Hindu aristocrats or their descendants were assimilated into the Indo-Muslim State apparatus, there was always a threat that the temple's authority would be used for political mobilization (Eaton, 2000). Therefore, when a non-Muslim officer engaged in open rebellion the state often desecrated the temple which was closely associated with that officer. For example, in 1478, when a garrison on the Andhra coast mutinied and killed the Governor the Sultan personally stormed the fort and destroyed its temple (Eaton, 2000). Similarly, a widespread Zamindar led peasant uprising broke out in Mathura in 1669. After the leader of these rebellions was captured in 1670 the Mughal king ordered the destruction of the city's Keshava Deva temple and built an Islamic prayer structure on the site (Eaton, 2000).

The evidence presented in this section suggests that the threat from political mobilization by temples increased during periods of social conflict. The Indo-Muslim State's equilibrium policy of tolerance towards temples was affected, increasing the probability of temple desecration. In the following sections, we investigate whether the data is consistent with this hypothesis.

3 Data and Descriptive Statistics

We embarked on a challenging data collection exercise to enable the empirical analysis. We began with the temple desecration dataset assembled by Eaton (2000) for the period 1192-1720 AD. However, we did not know all the temple locations that were considered by Eaton (2000) in compiling the data. We address this by creating a universe of medieval temple locations using maps of religious and cultural sites by Schwartzberg, Bajpai, and Mathur (1992). We also identified the territorial boundaries of various political units in this period using maps on medieval dynasties by Schwartzberg, Bajpai, and Mathur (1992). In addition we compiled data on medieval battles in India using two different chronological sources. Identification of exact location was done using Google API wherever necessary. In what follows we explain the data collection and describe the main variables.

3.1 Temple Locations and Temple Desecrations

Temple locations were obtained from maps on key religious sites by Schwartzberg, Bajpai, and Mathur (1992). Two maps were available as reference for the given period. The first map cites key religious and cultural sites between 1200 and 1525 AD. The second map cites key religious and cultural sites from 1526 to 1707 AD. Superimposing these maps on the territorial maps of modern day India we were able to identify the temple locations and their coordinates. Overall, we were able to identify 140 temple locations for the first period and 75 temple locations for the second period.

Desecration events were coded from the dataset compiled by Eaton (2000). Relying on contemporary or near-contemporary epigraphic and literary sources, Eaton identifies eighty incidents of desecrations "whose historicity is reasonably certain". The dataset provides information on the location and year of the desecration, as well as the characteristics of the perpetrator. Our sample of temple desecrations should be a lower bound for the actual number of desecrations. Eaton strictly relies on evidence recorded in contemporary or near-contemporary epigraphic and literary evidence. Desecration instances codified at a later date are thus excluded. It is also plausible that some acts of desecrations were never recorded or their records did not survive (Eaton, 2000).

We were able to match half of the desecrated temples with our sample of historical temple locations. To avoid losing observations we added the remaining half of the desecrated temples to the dataset of temple locations. We are thus able to have a more complete set of temples that were desecrated. But we cannot complete the set of temples that were not desecrated, which could bias our results upwards. To address this concern we will exclude the subset of temple desecrations that were not matched with the temple locations data in a robustness check in Table A-3.

3.2 Temperature Deviation

The temperature data is obtained from Mann et al. (2009). The construction combines data from different paleoclimatic studies that calculated historical temperatures using data from different proxy indicators. These include tree rings, coral, ice core and other long instrumental records. The data have a global coverage and report the average annual temperature for five degree latitude by five degree longitude grids, and are available for each year from 500 to 1959 CE. The data accurately estimate decadal temperature averages but not for finer time periods (Iyigun, Nunn, and Qian, 2017). Historical temperature data are reported as deviations, measured in degrees Celsius, from the 1961–1990 mean temperature. Using GIS we match the yearly temperature data for each temple location and then take the decadal deviation average.

3.3 Polities

Polities data was obtained from eleven maps on medieval polities, covering different time periods and regions from Schwartzberg, Bajpai, and Mathur (1992). We identified 51 polities which existed at some point during the medieval period in India. The polity maps were superimposed on the modern territorial map of India to identify their approximate political borders. By merging the geo-coded maps of polities and temple locations we were able to approximately identify the polity where a temple was located in a given decade.

We could not identify the corresponding polity for every temple location in a given period. This is partially due to the approximate matching of medieval maps with the modern day territorial map of India. Second, some of temple locations could have been within the confines of small polities that were not identified by Schwartzberg, Bajpai, and Mathur (1992). Finally, some Hindu temples were also located in remote locations such as mountain tops which could have been outside the territorial control of any State (Eck, 2012).

Finally, we also collected supplementary information such as the religion of the State, the capital location, Muslim ruler characteristics such as the tenure of the ruler as well as the year when the polity collapsed.

3.4 Battles

The battles dataset is compiled from two different sources. Our primary source is Jaques (2007) which provides a description of about 8,500 battles across the world from antiquity till the 21st century. Jaques (2007) covers battles ranging from epic engagement that lasted weeks to skirmishes with a few dozen men to a side. From their descriptions we collated information such as the year and location of the battle, and identity of the battle participants. We supplemented this information by collecting data on the religion of each participant. To crosscheck our data we relied on another resource, Narvane (1996), which lists key battles in medieval India, particularly between the 15th and the 18th centuries.

Overall, we identified 223 battles for the given period. About 80% of these battles were identified in our primary, or primary as well as a secondary source. The remaining battle events were identified only in the secondary source. Of these battles about 60% involved at least one Muslim polity as a participant. Clearly, the medieval period was the pinnacle of Muslim state expansion.

We present the summary statistics in Table 1. In our baseline sample the probability of temple desecration in all periods is 0.7%. The probability of desecration is 0.8% for temple locations that were under Muslim rule during this period. The probability of temple desecration under Muslim rule increases to 1% when we restrict the sample to periods with large temperature deviations.[4]

[4] We define a temperature deviation as large if it occurred in the top or bottom quartile of temple location i's sample.

Table 1: Summary Statistics- Probability of Temple Desecration

Sample Type	Mean	Standard Deviation	N
All	0.007	0.08	6750
Muslim Rule	0.008	0.089	3580
Muslim Rule and Temperature Deviation	0.010	0.10	1751

Notes: The averages correspond to the baseline regression with controls in Column (2) in Table 2. Temperature Deviation is a dummy variable equal to 1 if the temperature deviation recorded in period *t* was either in the top or bottom quartile of temple location *i*'s sample.

4 Empirical Specification

4.1 Baseline Model

We formally estimate the relationship between temple desecrations under Muslim rule and weather fluctuations using the following specification:

$$D_{ikt} = \beta_1 M_{ikt} + \beta_2 T_{ikt} + \beta_3 M_{ikt} \times T_{ikt} + \gamma^{'} \mathbf{X}_{ikt} + \mathbf{FE}_i + \mathbf{FE}_t + \mathbf{FE}_k + e_{ikt} \tag{4.1}$$

D_{ikt} is a dummy equal to 1 if a desecration event was recorded at temple location *i* in polity *k* in period *t*. M_{ikt} is a dummy that equals 1 if location *i* was under Muslim rule in period *t*. T_{ikt} is a dummy that equals 1 if temperature deviation recorded in period *t* was either in the top or bottom quartile the temperature deviations in location *i*. This definition of the variable is preferred as it is simple and allows for a non-linear relationship between temperature variation and agricultural productivity as observed in data on modern day India (Blakeslee and Fishman, 2014). Our approach is also similar to Chaney (2013) who estimates the effect of large deviations in historical Nile floods on the power of incumbent religious authority. β_3 is the coefficient of interest that measures the increase in the probability of temple desecration under Muslim rule during a period of large temperature fluctuations.

X_{ikt} is the vector of other control variables. We use the distance of temple location *i* to the capital *t* as a proxy for its political and economic relevance. Geographical proximity allowed centers of religious authority to extend influence over the political leadership (Iannaccone, Haight, and Rubin, 2011). In return for supernatural mandate these centers received *quid pro quo* from the political authority in the form of material benefits (Iannaccone, Haight, and Rubin, 2011). Temple locations that were in proximity to the capital of a medieval state k were likely to be both economically and politically more salient.

We also control for whether the duration Muslim polity k had been in power in period t. Older polities were likely to have established a stronger state and hence have less incentive to desecrate in response to an adverse shock.

FE_i controls for unobserved location characteristics that could affect the likelihood of temple desecration. For example, proximity to trading ports would increase the economic importance of certain temple locations and make them a likely candidate for plunder (Jha, 2013).

FE_t accounts for changes that affect temple desecrations that are common across time such as broad political trends like consolidation of states, changes in military or agricultural technologies (Iyigun, Nunn, and Qian, 2017). FE_k control for unobserved polity characteristics, such as the type of Islamic jurisprudence followed by a Muslim polity, that could have influenced the likelihood of desecration.[5]

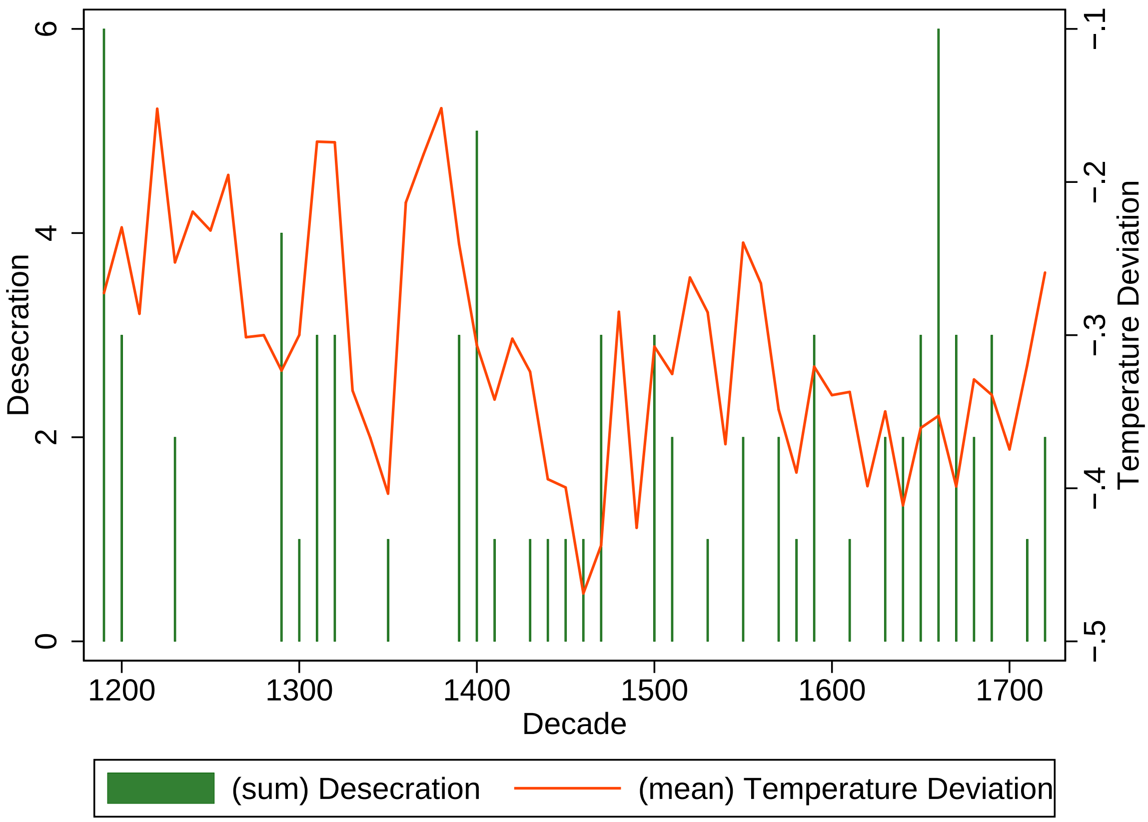
The time dimension in our model is set at the decade level. Desecration of a temple, as shown in Figure 1, is a rare event and it is reasonable to aggregate them by decade. Estimating at the decade level also reduces the measurement error if event years were not recorded accurately. Moreover, the reconstructed climate data is less reliable at finer frequencies than a decade (Iyigun, Nunn, and Qian, 2017).

We estimate Equation 4.1 using a linear probability model (LPM). LPM has an advantage over an ordinary logit model in that its statistical properties are invariant to the rare event bias. The problem of estimating rare events in a logit model is particularly exacerbated with the inclusion of fixed effects. Such a model yields inaccurate (often inflated) estimates of the

[5]For example, traditions of Sunni jurisprudence differ in their prescribed treatment of religious minorities (Friedmann, 1975).

predictor effects (Cook, Hays, and Franzese Jr., 2018).[6]

Figure 1: Weather Fluctuation and Temple Desecration



4.2 Results

Column (1) of Panel (a) in Table 2 presents the baseline results without controls or fixed effects. Robust standard errors clustered at the temple location level are reported in parentheses. In Column (2) we report the results with controls but no fixed effects. Here the coefficient of the interaction term, β_3, is positive and statistically significant at 10% significance level. The positive sign of β_3 suggests that a Muslim State was more likely to desecrate a Hindu temple under its rule in periods of large temperature fluctuations. The coefficient implies that the likelihood of temple desecration under Muslim rule increased by 0.8 percentage points during

[6]The corresponding non-linear estimates are reported in a robustness check in Table A-5.

periods of large temperature fluctuations. The results are robust to the inclusion of location and time fixed effects in Column (3) and (4), as well as the inclusion of dynasty fixed effects in Column (5) and (6). The coefficient is more precisely estimated at 0.9 percentage points in the fixed effects specification. The likelihood of temple desecration is more than doubled during the period of large weather fluctuation (the sample probability is 0.7%).

Panel (b) presents the results after excluding Muslim rulers who were known for their iconoclastic beliefs. For example, Mughal king Aurangzeb was known for his puritanical approach towards the practice of Islam (Platteau, 2017; Sarkar, 1912). Similarly Sultan Sikander, a 14th century ruler of Kashmir, was renowned for serially desecrating temples and is famously known as Sikander *the Iconoclast* (Kaw, 2004).

The two rulers also stand out for desecrating Hindu temples in our dataset. Aurangzeb and his commanders alone were responsible for 10 out of 80 desecrations recorded in the sample, while Sikander was responsible for desecrating 3 temples. β_3 is robust and slightly larger when we exclude the tenure of these two rulers. It is also statistically significant at 5% level. This suggests that we are not capturing a spurious relationship driven by the reign of particular rulers.

The results in Table 2 provide empirical support for our main hypothesis that weather fluctuations disrupted the political equilibria and led the minority Muslim rulers to repress the Hindu religious authority. In the following section we investigate the economic and political channels that connect weather fluctuations to temple desecrations.

Table 2: Baseline Results in LPM

Dependent variable: Desecration

Panel (a). Full Sample	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	-0.001	0.004	0.015	-0.001	-0.001	-0.007
	(0.003)	(0.009)	(0.011)	(0.012)	(0.019)	(0.021)
Temperature Deviation	-0.003	-0.004	-0.004	-0.004	-0.004	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.006	0.008*	0.009**	0.009*	0.009*	0.009*
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Log Own Capital Distance		-0.001	-0.001	-0.000	-0.002	-0.002
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length		-0.001	-0.002*	-0.000	-0.004***	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	N	Y	Y
Observations	6,980	6,750	6,750	6,750	6,750	6,750
Panel (b). Excluding Iconclast Rulers	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Muslim Rule	-0.003	0.003	0.016	-0.000	0.002	-0.006
	(0.003)	(0.009)	(0.010)	(0.012)	(0.018)	(0.021)
Temperature Deviation	-0.003	-0.004	-0.004	-0.004	-0.004	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.009**	0.010**	0.011**	0.012**	0.011**	0.011**
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance		-0.000	-0.001	-0.001	-0.002*	-0.002
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length		-0.001	-0.002**	-0.000	-0.004***	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	N	Y	Y
Observations	6,493	6,275	6,275	6,275	6,275	6,275

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. The results correspond to equation 4.1. Desecration is a dummy equal to 1 if a desecration event was recorded at temple location i in polity k in period t. Temperature Deviation is a dummy that equals 1 if temperature deviation recorded in period t was either in the top or bottom quartile the temperature deviations in location i. Muslim rule is a dummy that equals 1 if location i was under Muslim rule in period t. Own Capital Distance is the distance of temple location i to the state capital in period t. Muslim dynasty length is the number of decades a Muslim State was in power in period t. In Panel (b) we exclude the rule of known iconoclasts like Mughal king Aurangzeb and Sultan Sikander of Kashmir.

5 Causal Mechanism

5.1 Agricultural Productivity

The literature on authoritarian rule and religious authority predicts that weather fluctuations would increase the relative power of religious authority (Chaney, 2013; Rubin, 2017). The mechanism is that weather fluctuations dampen agricultural productivity and therefore increase the likelihood of rebellion against the ruler. The religious authority becomes more powerful in such scenario as it is capable of coordinating the revolt. It is plausible that the Muslim ruler perceived an increased threat of rebellion during periods of large weather fluctuations, and hence desecrated Hindu temples, the seat of Hindu religious authority.

Ideally, we would like to have data on agricultural production, and successful and unsuccessful revolts to see if these were correlated with desecrations. In absence of data to construct such metrics, we propose an alternative way to test if weather fluctuations increased the likelihood of temple desecration by hampering agricultural productivity. There is evidence that better soil quality reduces the negative effect of weather fluctuations on agricultural productivity (Malik and Temple, 2009; Porter and Semenov, 2005). Locations with better soil quality would thus be less likely to observe social unrest during periods of weather fluctuation. These locations would therefore also be less likely to experience a Muslim ruler repressing the Hindu religious authority through temple desecrations in response to weather shocks.

We test this mechanism in Table 3. We use two different measures of soil quality - the soil's nitrogen and carbon content respectively- which are used as metrics for soil quality assessment (Ge, Xu, Ji, and Jiang, 2013). The data is taken from EarthDATA Spatial Data Access Tool (SDAT). The data has a spatial resolution of 0.08 degree × 0.08 degree (or roughly 10 × 10 kilometers). The gridded soil quality data is matched with temple locations using a geospatial software, which we use to construct the average nitrogen and carbon density level for temple location (i). The two proxies are interacted with temperature deviation (T_{ikt}).

We interact the location soil quality with our main effect $(M_{ikt} \times T_{ikt})$. Columns 1-6 of Table 3 show the coefficients of the triple interaction term for both proxies of soil quality. In all specifications soil quality has a negative and statistically significant effect, meaning that better soil quality dampens the impact of weather fluctuations on temple desecration under Muslim rule.

Table 3: Mechanism- Agricultural Productivity

Dependent variable: Desecration

Panel (a). Nitrogen Density as proxy for soil quality	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.012	0.014	-0.006	0.032	0.019
	(0.035)	(0.047)	(0.050)	(0.064)	(0.066)
Temperature Deviation	-0.002	-0.007	-0.006	-0.009	-0.011
	(0.027)	(0.029)	(0.031)	(0.029)	(0.030)
Muslim Rule × Temperature Deviation	0.184**	0.200**	0.203**	0.190**	0.193**
	(0.085)	(0.091)	(0.091)	(0.092)	(0.090)
Log Soil Nitrogen Density	0.004				
	(0.004)				
Log Soil Nitrogen Density × Muslim Rule	-0.001	0.000	0.001	-0.005	-0.004
	(0.005)	(0.007)	(0.007)	(0.009)	(0.009)
Log Soil Nitrogen Density × Temperature Deviation	-0.000	0.000	0.000	0.001	0.001
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Log Soil Nitrogen Density × Muslim Rule × Temperature Deviation	-0.025**	-0.027**	-0.028**	-0.026**	-0.026**
	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)
Log Own Capital Distance	-0.000	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	-0.000	-0.004***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Temple location trend					
Observations	6,750	6,750	6,750	6,750	6,750
Panel (b). Carbon Density as proxy for soil quality	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Muslim Rule	-0.000	0.017	-0.000	0.023	0.014
	(0.016)	(0.020)	(0.022)	(0.031)	(0.034)
Temperature Deviation	-0.002	-0.004	-0.003	-0.005	-0.006
	(0.011)	(0.012)	(0.012)	(0.011)	(0.012)
Muslim Rule × Temperature Deviation	0.069**	0.075**	0.077**	0.070**	0.073**
	(0.028)	(0.030)	(0.030)	(0.031)	(0.030)
Log Soil Carbon Density	0.004				
	(0.005)				
Log Soil Carbon Density × Muslim Rule	0.002	-0.001	-0.001	-0.009	-0.008
	(0.006)	(0.009)	(0.009)	(0.012)	(0.012)
Log Soil Carbon Density × Temperature Deviation	-0.001	-0.000	-0.001	0.000	0.000
	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)
Log Soil Carbon Density × Muslim Rule × Temperature Deviation	-0.027**	-0.030**	-0.031**	-0.028**	-0.029**
	(0.013)	(0.014)	(0.013)	(0.014)	(0.013)
Log Own Capital Distance	-0.001	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	-0.000	-0.004***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. Soil Nitrogen density and Soil Carbon density are proxies for soil fertility around the temple location *i*.

5.2 Looting

Hindu temples would often accumulate wealth and Muslim rulers are known to have plundered medieval Hindu temples for their wealth. It is said of Mahmud of Ghazni's sacking of the Somnath temple in 1024 AD that "not a hundredth part of the gold and precious stones he obtained were found in the treasury of any king of Hindustan." (Habib, 1981). It is plausible that weather fluctuations and the subsequent negative shock to agricultural productivity reduced tax revenues of Muslim rulers and increased their economic incentive for looting a Hindu temple.

An alternative explanation weighs against this possibility. Muslim rulers often contested over a temple location to control the pilgrimage economy. For instance, in the 16th century the Muslim Subahdars of Cuttack engaged in a protracted struggle with the Hindu Raja of Khurda to control the pilgrimage center Puri (Bakker, 1992). For a Muslim ruler the economic cost of destroying an asset (pilgrimage revenue) under his control would have weighed against its sacking during the period of economic distress. In other words, the ruler's probability of religious repression should be decreasing in the cost of repression (Acemoglu and Robinson, 2005). A strategic ruler would be more likely to plunder a temple outside his territorial control for wealth. This is also in line with historical evidence that temples were mainly looted for wealth during the course of distant military operations to finance these campaigns (Eaton, 2000).

We test the looting channel in Table 4. We first want to check if temples that are more wealthy are more likely to be desecrated as a result of a weather shock. We use the distance of temple location i from a major medieval port as a proxy for its economic importance.[7] We create a dummy that equals 1 if temple location i's distance to the nearest medieval port was above the median value and interact it with the temperature deviation dummy. Our hypothesis is that a temple location in the vicinity of a major port would have been wealthier from the trading activity,[8] and hence more likely to be looted for wealth during a period of large weather

[7] The data on the medieval ports is taken from Jha (2013). Figure 3 shows the distribution of temple locations and medieval ports.

[8] The economic growth and urban expansion in medieval Western Europe was facilitated in part by new trading opportunities in the Atlantic ports (Acemoglu, Johnson, and Robinson, 2005). Jha (2013) suggests that congenial

fluctuations.

Columns 1-6 of Panel (a) in Table 4 show the coefficients of the interaction term. In all specifications the distance to the medieval port has a negative and statistically significant effect, meaning that proximity to a medieval port increased the likelihood of temple desecration during the period of weather fluctuation. These effects are significant- during the period of large weather fluctuations proximity to a medieval port increases the likelihood of temple desecration by as much as having a temple under Muslim rule.

Does the looting channel also explain the desecrations that happen under Muslim rule? To test this we interact the distance to nearest port with our main effect ($M_{ikt} \times T_{ikt}$). The temples within Muslim rule are much farther from ports (median 526 kms compared to the overall median of 303 kms). As we are testing for the decision of a Muslim ruler, we use the median temple-port distance of temples under Muslim rule to define the dummy variable.[9]

The results are presented in Panel (b). The triple interaction term has a positive but statistically insignificant coefficient. If we interpret it as saying that this coefficient is zero then it would imply that being under Muslim rule makes no difference and the wealth of the temple always increases its probability of desecration. But, if we contend that the point estimate is positive and that the high standard errors are because of low power, then this can be interpreted as showing that being under Muslim rule reduced the looting channel, probably because it would be costly to destroy a source of revenue as discussed earlier.

geography of medieval Indian ports increased opportunities for subsequent wealth. It is perhaps no coincidence that Somnath temple, which was plundered on many occassions by medieval Muslim rulers, was located in a major port town of the period.

[9]The results in Panel (a) do not change significantly if this new definition is used.

Table 4: Mechanism- Looting

Dependent variable: Desecration

Panel (a). Distance to nearest port	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.003	0.011	-0.005	-0.005	-0.013
	(0.010)	(0.011)	(0.012)	(0.019)	(0.021)
Temperature Deviation	-0.000	-0.000	0.001	0.000	0.000
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.013**	0.015***	0.016***	0.015***	0.015***
	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)
Log Own Capital Distance	-0.001	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002	0.000	-0.004***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Distance to port	0.004				
	(0.003)				
Distance to port × Temperature Deviation	-0.013**	-0.016***	-0.017***	-0.016***	-0.017***
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

Panel (b). Distance to nearest port for temple under Muslim rule	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.008	0.016	0.001	-0.002	-0.009
	(0.010)	(0.011)	(0.012)	(0.019)	(0.021)
Temperature Deviation	-0.002	-0.002	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.011*	0.012*	0.011*	0.012*	0.011*
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)
Log Own Capital Distance	-0.000	-0.001	-0.001	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	-0.000	-0.004***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Distance to Port	0.006				
	(0.007)				
Distance to Port × Muslim Rule	0.001	0.004	0.006	0.004	0.007
	(0.009)	(0.010)	(0.010)	(0.011)	(0.011)
Distance to port × Temperature Deviation	-0.011	-0.015*	-0.017**	-0.017*	-0.019**
	(0.007)	(0.009)	(0.009)	(0.010)	(0.009)
Muslim Rule × Distance to Port × Temperature Deviation	0.001	0.004	0.006	0.004	0.007
	(0.009)	(0.010)	(0.010)	(0.011)	(0.011)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. In Panel (a) Distance to port is a dummy that equals 1 if temple location *i*'s distance to the nearest medieval port was above the median. In Panel (b) Distance to port is a dummy that equals 1 if temple location *i*'s distance to the nearest medieval port was above the median for temple locations under Muslim rule.

5.3 State Capacity

Guided by the historical literature, we assess the regime characteristics that could mediate the relationship between weather fluctuations and temple desecrations. First we test the mediating effect of state capacity on temple desecration under Muslim rule during periods of weather fluctuation. A Muslim polity that was in power for longer duration was likely to have stronger military and hence be less vulnerable to the threat of social conflict.

Furthermore, a state could diversify its fiscal system over time and therefore be able to give tax concessions during low harvest periods, thus dampening the likelihood of rebellion. There is evidence of tax concessions given by Mughals, the longest running Muslim dynasty in medieval India, to ameliorate negative price shocks induced by exceptional harvests in the 16th century (Moreland, 2011). The Mughal State is also said to have a system in place for tax concessions in case of crop failures (Moreland, 2011).

We test this mechanism in Panel (a) of Table 5. We use the length that a Muslim dynasty was in power (in period *t*) as a proxy for State capacity. The coefficient on the interaction between Muslim dynasty length and weather fluctuation is negative and statistically significant in all Columns. This supports our prediction that a Muslim State with greater state capacity is likely to experience social uprising and therefore less likely to repress Hindu religious authority during periods of large weather fluctuations.

5.4 Muslim Ruler Tenure

Next we analyze the mediating relationship between a Muslim ruler's tenure length and temple desecration during a period of weather fluctuation. This follows from the intuition that a newly designated Muslim ruler would be in the process of consolidating his authority and hence susceptible to mass rebellion. The historical literature suggests that consolidating authority was particularly challenging for Muslim rulers at the onset of their tenure, since absence of fixed rules of succession often resulted in a violent transition period for the new ruler (Hurewitz, 1968; Kokkonen and Sundell, 2014).[10] The transition from one ruler to another invariably led to slackening of imperial administration and political control, during which all types of actors created mayhem (Faruqui, 2012).

We test this relationship in Panel (b) of Table 5. We interact the Muslim ruler's tenure length (at period t) with temperature fluctuation. Our hypothesis is that a Muslim ruler at the beginning of his tenure would be particularly vulnerable to the threat of social conflict and hence more likely to repress Hindu religious authority during periods of large weather fluctuation. The results presented in Panel (b) show that a Muslim ruler's likelihood of desecrating a Hindu temple during a period of weather fluctuation decreases with his tenure length. This further attests that the threat of social uprising induced by weather fluctuation was a key driver of religious repression.

[10] In our dataset about 70% of the Muslim rulers who were assassinated were killed within the first five years of their tenure.

Table 5: Mechanism- State Capacity and Ruler Tenure

Dependent variable: Desecration

Panel (a). Dynasty Length	(1)	(2)	(3)	(4)	(5)
Muslim Rule	-0.009	0.003	-0.010	-0.014	-0.018
	(0.006)	(0.009)	(0.011)	(0.018)	(0.020)
Temperature Deviation	-0.027*	-0.028**	-0.023*	-0.029**	-0.025**
	(0.014)	(0.013)	(0.012)	(0.013)	(0.012)
Muslim Rule × Temperature Deviation	0.045*	0.047**	0.040**	0.050**	0.042**
	(0.023)	(0.022)	(0.019)	(0.022)	(0.019)
Log Own Capital Distance	-0.001	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	0.001	-0.001	0.001	-0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Log Muslim Dynasty Length × Temperature Deviation	-0.005*	-0.005*	-0.004*	-0.005*	-0.004*
	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750
Panel (b). Ruler Tenure	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Muslim Rule	-0.005	0.003	-0.011	-0.010	-0.015
	(0.009)	(0.010)	(0.012)	(0.019)	(0.021)
Temperature Deviation	-0.034***	-0.034***	-0.031***	-0.031***	-0.028***
	(0.009)	(0.009)	(0.008)	(0.009)	(0.008)
Muslim Rule × Temperature Deviation	0.036***	0.035***	0.033***	0.033***	0.029***
	(0.010)	(0.009)	(0.009)	(0.009)	(0.008)
Log Own Capital Distance	-0.001	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.000	-0.001	0.001	-0.003**	0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Log Muslim Ruler Tenure	0.002*	0.001	0.000	0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Ruler Tenure × Temperature Deviation	-0.007***	-0.006***	-0.006***	-0.006***	-0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. Muslim dynasty length is the number of decades a Muslim State was in power in period t. Muslim Ruler tenure is the number of decades a ruler of Muslim State k was in power in period t.

5.5 Battles

Climate shocks can also intensify inter-state conflict.[11] For example, decline in agricultural productivity can increase the demand for land which escalates the competition over its control.

[11] Using data on conflicts in Europe, North Africa and Near East between 1400 and 1900 AD, Iyigun, Nunn, and Qian (2017) find that cooling is associated with increased conflict.

Similarly, decline in agricultural wages can increase the labor supply for military recruitment. On the other hand, rising food prices can also increase the cost of maintaining an army. It is plausible that weather fluctuation affected the intensity of conflict between Hindu and Muslim States. The collateral damage from these battles can affect the probability of temple desecration.

Table 6 tests for the mediating effect of weather fluctuation on temple desecration through Hindu Muslim battle intensity. We control for the interaction between number of Hindu Muslim battles, that occurred in the proximity of temple location i in period t, and the weather flucation dummy.[12] The effect of the interaction term in all columns is positive but statistically not different from zero. We do not find evidence that weather fluctuation affects temple desecration by increasing the frequency of Hindu Muslim battles.

Table 6: Mechanism- Collateral Damage

Dependent variable: Desecration

Panel (a). Battle Intensity	(1) HM Battle	(2) HM Battle	(3) HM Battle	(4) HM Battle	(5) HM Battle
Muslim Rule	0.005	0.015	-0.001	0.001	-0.005
	(0.009)	(0.010)	(0.012)	(0.019)	(0.021)
Temperature Deviation	-0.004	-0.005*	-0.005	-0.005	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.008**	0.009**	0.009*	0.009**	0.009*
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Muslim Hindu Battle	-0.003***	-0.002*	-0.003	-0.002	-0.004
	(0.001)	(0.001)	(0.003)	(0.001)	(0.003)
Muslim Hindu Battle × Temperature Deviation	0.022	0.019	0.017	0.019	0.018
	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)
Log Own Capital Distance	-0.000	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	-0.000	-0.004***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. Hindu Muslim battle is the number of battles between Hindu and Muslim States that occured within a 200km radius of temple location i in period t.

Historians of medieval India propose another mechanism through which Hindu Muslim

[12] We consider those battles that occurred within 200 km of a temple location as proximate.

battles can determine temple desecration. According to this hypothesis temple desecrations typically occurred when Muslim States expanded into the territories of Hindu States through battle victories (Eaton, 2000). The underlying intuition is that royal temples acted as a legitimizing agent for the Hindu kingship. The invading Muslim State undertook destruction of these temples to delegitimize the political authority of the incumbent Hindu ruler and suppress the religious authority's likely support for mass rebellion (Eaton, 2000).

We test this mechanism in Table 7. In Panel (a) we control for the number of battles won by a Muslim State against a Hindu State within 200 kilometer radius of temple location i in period t. In all columns the effect of the Muslim State's battle victory on the desecration outcome is positive but statistically not different from zero. As noted earlier, the revenue from Hindu pilgrimage was a useful source for imperial economy, and Muslim States often contested to control these locations. Once under his control, a strategic ruler would avoid destroying an asset.

However, the equilibrium could be disrupted when the condition for social upheaval was particularly high in the newly conquered territory. In Panel (b) of Table 7 we include the interaction between Muslim battle victory and weather fluctuation. Our hypothesis is that a Muslim State was more likely to desecrate Hindu temple in a newly conquered territory when the likelihood of mass upheaval was higher due to weather fluctuation.

The results are informative- the coefficient of the battle victory variable is negative and statistically significant, which suggests that a Muslim State was less likely to desecrate a temple when it conquered the territory in a time with normal weather conditions. This supports the historical narrative that a Muslim State was more likely to engage in looting temples that were outside its sphere of political influence. The coefficient on the interaction term is positive and statistically significant in all columns. The size of the coefficient is four times larger than the effect of weather fluctuation in a territory that was already under the Muslim rule. This suggests that Muslim States were more sensitive to social unrest in newly conquered territories and therefore more likely to engage in religious repression.

Table 7: Mechanism- Battle Victories

Dependent variable: Desecration

Panel (a). Battle Victories	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.004	0.015	-0.001	-0.001	-0.008
	(0.009)	(0.011)	(0.012)	(0.019)	(0.021)
Temperature Deviation	-0.004	-0.004	-0.004	-0.004	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.008*	0.009**	0.009*	0.009**	0.009*
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Muslim Win Against Hindu	0.009	0.006	0.004	0.004	0.002
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)
Log Own Capital Distance	-0.000	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	0.000	-0.004***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750
Panel (b). Battle Victories and Weather Fluctuation	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Muslim Rule	0.004	0.015	-0.001	0.003	-0.004
	(0.009)	(0.010)	(0.012)	(0.019)	(0.022)
Temperature Deviation	-0.005*	-0.006*	-0.005	-0.005*	-0.006*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.009**	0.009**	0.009**	0.009**	0.009*
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Muslim Win Against Hindu	-0.005***	-0.008***	-0.009***	-0.010***	-0.011***
	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)
Muslim Win Against Hindu × Temperature Deviation	0.040*	0.042*	0.039*	0.042*	0.039*
	(0.023)	(0.023)	(0.023)	(0.022)	(0.022)
Log Own Capital Distance	-0.000	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	-0.000	-0.004***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. Muslim Win against Hindu is the number of battles won by a Muslim State against a Hindu State within a 200km radius of temple location i in period t.

6 Discussion

Our interpretation of the results is related to the theoretical framework developed by Acemoglu and Robinson (2005). In their framework economic distress creates conditions for social conflict that threaten the elite's hold over power. The religious authority's role becomes pivotal under these circumstances as it can provide the ideological force to solve the collective action problem that hinders a revolution. The ruler can dampen the probability of revolt by co-opting the religious authority (Aldashev, Platteau, and Sekeris, 2013; Auriol and Platteau, 2017b; Chaney, 2013). This can take the form of material inducements or implementing policies favored by the religious authority, such as the increased construction of religious structures during the period of Nile shocks in medieval Egypt (Chaney, 2013).

The cost of co-option however increases with the distance between the values of the ruler and that of the religious authority (Auriol and Platteau, 2017b) that the population follows. When the ruler's religious beliefs are distinct from that of the religious authority, the cost of co-option is likely to be prohibitively high. In such a scenario the ruler is likely to repress the religious authority to prevent a successful rebellion, and this could take the form of desecration of Hindu temples, which were the seat of Hindu religious authority, by Muslim rulers.

An interesting counterfactual would be to compare the treatment of temples under contemporary Hindu States. The historical literature provides some valuable insights on this. By the 14th century, generous gifts to the temples and religious authority (Brahmanas) had become a well established practice of the Hindu kingship or the *rajadharma* (Rao, 2016). During the Vijaynagara rule (1336-1646), a powerful medieval Hindu dynasty in Southern India, the construction of temples became a marker of the ruler's power. The Vijaynagara kings were strategic in using religious donations to reinforce imperial authority, at times when internal peace was necessary or in anticipation of an external threat (Rao, 2016).

The strategic nature of religious co-option is highlighted from the reign of Krishnadevaraya (1509–1529), who sought to undercut the power of territorial chiefs of his realm. Krishnadevaraya offered new opportunities for secular employment to Brahmins as administrators and fort commanders (Bakker, 1992). Furthermore, through generous endowments and complex ritual and pilgrimage systems he made the royal temple the focal of religious and cultural influence

(Bakker, 1992).

There have also been occasional instances of Muslim rulers, particularly under the Mughals, trying to co-opt Hindu religious authority through donation or endowments. For example, Mughal king Akbar allowed his high-ranking Rajput officials to build their own monuments in the provinces they managed (Eaton, 2000). It is perhaps when such co-option was not possible or too costly, repressing the religious authority through temple desecration would be chosen as an option.

7 Robustness Checks

Spatial and Serial Correlation.— Temperature variation can be spatially correlated. To ensure our baseline results are not being biased by spatial autocorrelation we estimate standard errors with spatial HAC correction which allows for both cross-sectional spatial correlation and location-specific serial correlation. The standard errors are estimated following the method developed by Conley (1999) and Hsiang, Meng, and Cane (2011). We use a radius of 500 km for the spatial kernel and assume that serial correlation decays over 500 years. The results are reported in Table A-1 and corroborate our baseline findings.[13]

Alternative definition of weather fluctuation.— In our baseline specification we use an arbitrary threshold to define our weather fluctuation dummy. To ensure the results are not being determined by a particular threshold we use three alternative cut-offs to define our dummy. In Table A-2 we estimate the baseline results with the alternative definitions. In Panel (a) the weather fluctuation dummy equals 1 for the top and bottom 20 percentile of temperature variation. Similarly, in Panel (b) and (c) the dummy equals 1 for for top and bottom 30 and 35 percentile of temperature variation respectively. The coefficient of interest (β_3) in different

[13] The spatial and serial autocorrelation test is implemented using a STATA routine developed by Berman, Couttenier, Rohner, and Thoenig (2017). The routine can only accomodate upto two dimension of fixed effects. We are therefore unable to estimate the baseline model with temple location, dynasty and decade fixed effects.

specifications is similar to our baseline result, although we lose statistical significance in some cases. These results alleviate the concern that our result is determined by a particular threshold to define the weather fluctuation dummy.

Excluding temples not in maps.— As discussed in the data section we could match about half of temple locations that experienced a desecration to the temple locations given in the historical maps. Out of the eighty temple desecrations recorded, six occurred at the end of the 12th century, while three more were recorded in the first decade of the 13th century. Our earliest reference map of historical temple locations only reports it for the period between the 13th and 16th centuries. It is plausible that some of the temples which had already been desecrated were not included in this map. However, to avoid any selection bias we drop the desecration events whose location could not be identified on the map of the historical temple sites. The coefficient of interest (β_3) in the restricted sample, shown in Table A-3, is similar to our baseline finding. We rule out that data construction strategy can bias the result.

Lagged effect of weather fluctuation.— Prolonged periods of weather fluctuation could fundamentally alter institutions or weaken social cohesion. Thus, Muslim States that experienced weather fluctuation over successive periods could have resorted to repressing the masses in a fundamentally different manner. To capture this possibility we interact a lagged term of the weather fluctuation dummy with the Muslim rule dummy. Table A-4 shows that the contemporaneous effect is similar to our baseline result. The lagged effect is negative but statistically not different from zero. We cannot confirm that successive decades of weather fluctuations could affect the likelihood of temple desecration under Muslim State through a plausibly different mechanism.

Non-linear estimation.— We allow for a non-linear functional form and estimate our baseline specification using a logit and conditional logit model respectively. Results presented in Table

A-5 show that the marginal effects in the logit model are similar to the linear probability model. However, the marginal effects are quite large in the conditional logit specifications. This is because such models only evaluate event experiencing units, which gives an inaccurate estimate of the baseline risk. This yields inaccurate and often inflated estimates of the marginal effects (Cook, Hays, and Franzese Jr., 2018).

8 Conclusion

Our study addresses the relationship between authoritarian rule and religious authority during economic downturns. The events of temple desecration in medieval India are the center piece of our analysis. Using a novel dataset on medieval States and temples, events of temple desecration and weather fluctuation, we show a positive relationship between weather fluctuation and temple desecration under Muslim rule. Additional evidence suggests that state maintenance is the likely explanation underlying this relationship.

We do not dismiss that certain Muslim rulers desecrated Hindu temples for purely ideological reasons. Instead, it appears that on average Muslim States maintained a tenuous equilibrium of tolerance towards the religion of the masses. The medieval history literature offers some explanation for this result. One explanation is that the conciliatory approach could have been politically most expedient as Muslims were vastly outnumbered by Hindu subjects. The Muslim elite also had to rely on mainly Hindu intermediaries for state functioning. A strict imposition of Islamic law could have affected this relationship and resulted in more frequent rebellions. Second, the Hanafi school of law, which is the most prominent school of Islamic jurisprudence in India, adopted a conciliatory approach towards the religious practices of Indic religions. It advocated concession of religious freedom for Hindus in lieu of a religious tax. In that sense Muslim polities in India were mainly guided by a conciliatory interpretation of Islamic law.

This type of study is vital in the current political milieu. The rise of modern fundamentalist Muslim quasi-States such as the Taliban or the Islamic State, and their association with iconoclastic events, have been ascribed by some to the presence of religious extremism amongst Islamic societies. Our findings tell a cautionary tale- that actions driven by seemingly religious motives could mask the political processes at play. The same caution needs to be extended when it comes to the discourse on past temple desecrations in India, which have been responsible for severe Hindu-Muslim riots in the recent past, causing a great deal of harm to life and property. We hope going forward that this study will better inform the narrative on medieval temple desecrations.

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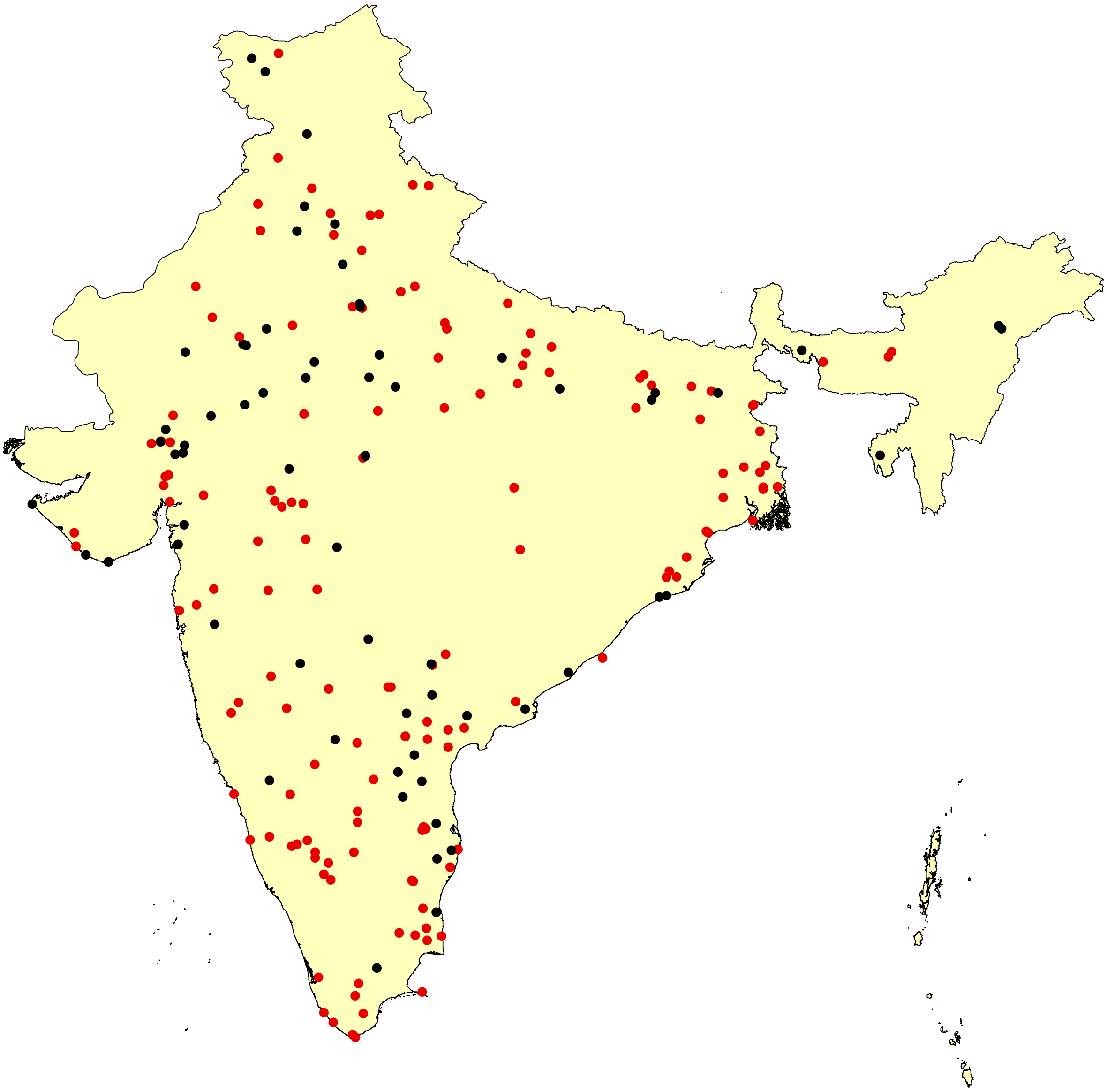
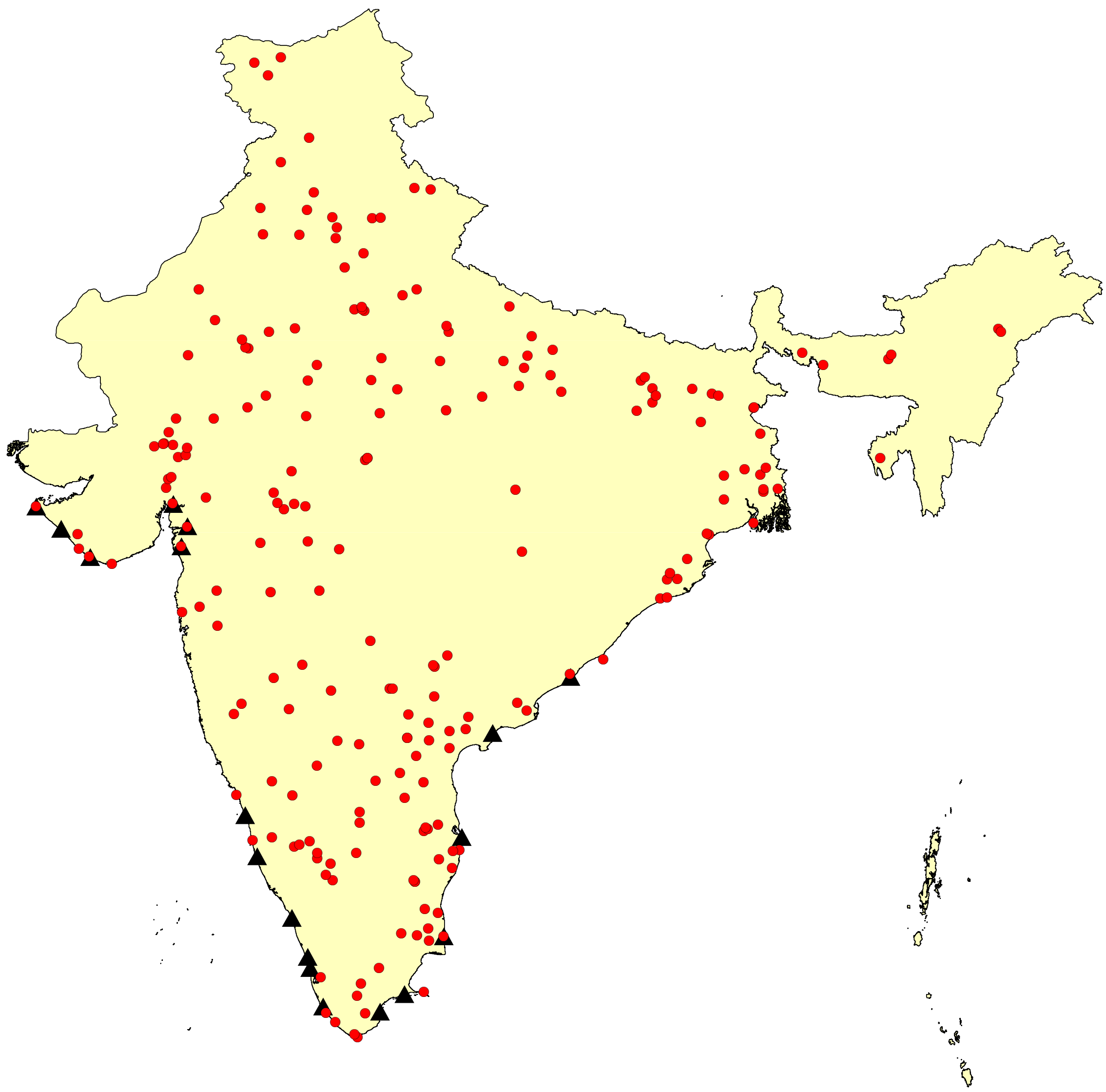
Tables and Figures

Figure 2: Temple Locations and Temple Desecrations



Notes: The dots represent medieval temple locations. Black dots represent temple locations that observed a temple desecration. Red dots represent temple locations where no desecration is recorded.

Figure 3: Temple Locations and Medieval Ports



Notes: Red dots represent medieval temple locations. Black triangles identify medieval ports.

Robustness Checks

Table A-1: Spatial and Serial Correlation

Dependent variable: Desecration

	(1)	(2)	(3)	(4)
Muslim Rule	0.011*	0.015	-0.001	
	(0.006)	(0.010)	(0.013)	
Temperature Deviation	-0.003	-0.004	-0.004	-0.004*
	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.007	0.009**	0.009*	0.009*
	(0.005)	(0.004)	(0.005)	(0.005)
Log Own Capital Distance	-0.000	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002*	-0.002*	-0.000	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)
Temple Fixed Effects	N	Y	Y	N
Decade Fixed Effects	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	Y
Observations	6,750	6,750	6,750	6,750

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are corrected for both spatial and serial correlation and are reported in parentheses. We use a radius of 500km for the spatial kernel and assume that serial correlation decays over 500 years.

Table A-2: Alternative Definition of Weather Fluctuation

Dependent variable: Desecration

Panel (a). Dummy equals 1 for top and bottom 20th percentile	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.006	0.017	0.001	0.002	-0.006
	(0.009)	(0.011)	(0.012)	(0.019)	(0.021)
Temperature Deviation	-0.001	-0.002	-0.000	-0.001	-0.000
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Muslim Rule × Temperature Deviation	0.006	0.007	0.006	0.006	0.006
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance	-0.001	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	-0.000	-0.004***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

Panel (b). Dummy equals 1 for top and bottom 30th percentile	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.003	0.015	-0.001	-0.000	-0.007
	(0.010)	(0.011)	(0.012)	(0.019)	(0.021)
Temperature Deviation	-0.005*	-0.006*	-0.005	-0.006*	-0.005
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
Muslim Rule × Temperature Deviation	0.008*	0.008*	0.008	0.007	0.007
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Log Own Capital Distance	-0.001	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	0.000	-0.004***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

Panel (c). Dummy equals 1 for top and bottom 35th percentile	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.002	0.014	-0.002	-0.001	-0.008
	(0.010)	(0.011)	(0.012)	(0.019)	(0.022)
Temperature Deviation	-0.007**	-0.008**	-0.007	-0.008**	-0.007
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Muslim Rule × Temperature Deviation	0.009*	0.008*	0.008	0.008*	0.008
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance	-0.001	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	-0.000	-0.004***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,750	6,750	6,750	6,750	6,750

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. We use alternative thresholds ranging between top and bottom 20th percentile to top and bottom 35th percentile of temperature deviation for temple location *i*, in order to define the temperature deviation dummy variable.

Table A-3: Excluding Temples Not In Maps

Dependent variable: Desecration

	(1)	(2)	(3)	(4)	(5)
Muslim Rule	-0.001	0.008	-0.007	0.006	-0.001
	(0.006)	(0.005)	(0.011)	(0.004)	(0.009)
Temperature Deviation	-0.002	-0.003	-0.003*	-0.002	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Muslim Rule × Temperature Deviation	0.007**	0.008**	0.008**	0.008**	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Log Own Capital Distance	-0.000	-0.001	-0.001	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.000	-0.001	0.001	-0.001*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	5,287	5,287	5,287	5,287	5,287

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. We exclude temple locations that are recorded in the desecration sample but are not reported in the medieval maps of key religious sites.

Table A-4: Lagged Effect of Weather Fluctuation

Dependent variable: Desecration

	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.011	0.027*	0.014	0.016	0.007
	(0.013)	(0.015)	(0.012)	(0.023)	(0.022)
Temperature Deviation	-0.004	-0.004	-0.005	-0.004	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Temperature Deviation (t-1)	0.005	0.005	0.007*	0.005	0.007*
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
Muslim Rule × Temperature Deviation	0.008*	0.009*	0.009*	0.008*	0.009*
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Muslim Rule × Temperature Deviation (t-1)	-0.004	-0.002	-0.003	-0.003	-0.004
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance	-0.000	-0.001	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.003*	-0.002	-0.007***	-0.004*
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Temple Fixed Effects	N	Y	Y	Y	Y
Decade Fixed Effects	N	N	Y	N	Y
Dynasty Fixed Effects	N	N	N	Y	Y
Observations	6,548	6,548	6,548	6,548	6,548

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level.

Table A-5: Non Linear Estimation

Dependent variable: Desecration

	(1)	(2)	(3)
Muslim Rule	0.003	0.474*	-0.010
	(0.006)	(0.246)	(0.072)
Temperature Deviation	-0.005	-0.173	-0.048
	(0.003)	(0.116)	(0.080)
Muslim Rule × Temperature Deviation	0.008*	0.300**	0.087
	(0.005)	(0.148)	(0.131)
Log Own Capital Distance	-0.000	-0.054	-0.014
	(0.001)	(0.048)	(0.015)
Log Muslim Dynasty Length	-0.001	-0.068***	-0.001
	(0.001)	(0.023)	(0.010)
Temple Fixed Effects	N	Y	Y
Decade Fixed Effects	N	N	Y
Dynasty Fixed Effects	N	N	N
Observations	6,750	1,675	1,675

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the temple location level. The coefficients show the marginal effects. The conditional logit model does not converge when we include the dynasty fixed effects. These results are therefore comparable to Columns 2 to 4 in Panel (a) of Table 2.

Appendix

Table B-1: Summary Statistics- All Variables

Variable	Mean	Median	Std Dev	Min	Max
ikt variables					
Temple Desecration	0.007	0	0.08	0	1
Muslim Rule	0.53	1	0.50	0	1
Temperature Deviation (degree Celsius)	-0.33	-0.32	0.32	-1.40	0.42
Own Capital Distance (km)	377.70	311.59	287.06	0	1453.33
Muslim Dynasty Length (decade)	12.76	4	14.70	0	43
Muslim Ruler Tenure (decade)	0.78	0	1.08	0	4.4
it variables					
Hindu Muslim Battle	0.10	0	0.45	0	8
Muslim Win Against Hindu	0.03	0	0.18	0.00	2
i variables					
Soil Nitrogen Density (g/cm^3)	1063.03	1129.83	246.68	58.31	1549.49
Soil Carbon Density (g/cm^3)	9.50	10.07	2.26	0.68	19
Distance to Major Medieval Port (km)	424.28	298.65	349.13	0	1560.72

Notes: In-sample summary statistics correspond to the baseline sample in Column (2) in Table 2.

Table B-2: Variables description

Variable	Description	Data source
ikt variables		
Temple Desecration	Dummy equals 1 if atleast one desecration occured in temple location (i) in decade (t).	Eaton (2000)
Muslim Rule	Dummy equals 1 if the temple location (i) was ruled by a Muslim State (k) in decade (t).	Schwartzberg, Bajpai, and Mathur (1992)
Temperature Deviation	Dummy equal to 1 if temperature deviation recorded in decade (t) was either in the top or bottom quartile of temple location (i)'s sample.	Mann et al. (2009)
Own Capital Distance	Distance of temple location i to the capital in decade (t).	Various Sources
Muslim Dynasty Length	Number of decaded a Muslim State was in power in period (t)	– "–
Muslim Ruler Tenure	Number of years Muslim ruler was in power in State (k) in decade (t).	– "–
it variables		
Hindu Muslim Battle	Number of battles fought between a Muslim and a Hindu State within 200 km of temple location (i) in decade (t).	Jaques (2007) and Narvane (1996)
Muslim Win Against Hindu	Number of battles won by a Muslim State against a Hindu State within 200 km of temple location (i) in decade. (t)	– "–
i variables		
Soil Nitrogen Density	Soil nitrogen content in temple location (i).	EarthDATA Spatial Data Access Tool (SDAT)
Soil Carbon Density	Soil carbon content in temple location. (i)	– "–
Distance to Major Medieval Port	Minimum distance of temple location (i) to a major medieval port.	Jha (2013)