Economic Shocks and Temple Desecrations in Medieval India*

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Abstract

Economic downturns can create conditions for mass uprisings that threaten an authoritarian ruler. Religious authority can provide the ideological force needed to solve the collective action problem that hinders a revolution. When co-option is infeasible, the ruler can respond to economic shocks by suppressing the religious authority of the popular religion. In this paper we provide empirical evidence of this response in medieval India. Using centuries of geo-referenced data we document a positive relationship between weather fluctuations and the destruction of Hindu temples under Muslim rule. Specifically, during periods of large weather fluctuations the likelihood of a Muslim State desecrating a Hindu temple increases by about 1 percentage point (relative to the baseline of 0.7%). We explore various mechanisms that could drive the ruler's response and show that regime stability is the likely explanation for this relationship. The paper contributes to understanding the behaviour of authoritarian regimes in diverse societies.

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

JEL Classification: D74; N35; N45.

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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 (1190-1730 AD). 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 from possible revolt due to the economic shocks caused by 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. First, we rule out that destruction of temples in Muslim States was due to scapegoating of Hindu minorities during adverse weather shocks. This is because Muslim States ruled over majority Hindu populations in medieval India and minority repression is not a likely channel in our context. Next we show that Muslim States were no more likely to desecrate wealthier temples under their rule during periods of large weather anomalies. This result casts doubt on the explanation that Muslim States plundered Hindu temples under their rule for their wealth, following a loss of tax revenue due to the weather shocks.

We also show that weather fluctuations did not increase the likelihood of temple desecration through inter-state conflict. We rule out that weather fluctuations resulted in higher collateral damage in the form of temple desecration by increasing the intensity of Hindu Muslim battles (Iyigun, Nunn, and Qian, 2017). We also 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 proposed by some historians that Muslim States were more likely to desecrate temples during state expansion through battle victory against a 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; Belloc, Drago, and Galbiati, 2016; 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 or her religious beliefs from the masses.[1]

We contribute to the climate-economy literature (Dell, Jones, and Olken, 2014), particularly on the relationship between weather and conflict or political instability across different time periods (Brückner and Ciccone, 2011; Dell, Jones, and Olken, 2012; Fenske and Kala, 2015; Iyigun, Nunn, and Qian, 2017). A subset of these studies focus on weather induced political instability and repression of religious minorities in pre-modern societies (Anderson, Johnson, and Koyama, 2017; Grosfeld, Sakalli, and Zhuravskaya, 2017; Johnson and Koyama, 2019). 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. To the best of our knowledge, we are first to draw a causal link between weather

[1] All Muslim rulers in medieval India were men with one exception. Razia Sultana ruled Delhi from 1236 to 1240 CE making her the only woman to ever rule Delhi.

shocks and repression of the religion of the majority population by a ruling elite that is a religious minority. This is an important case that applies to many other historical contexts, for example the cases of *colonization*.

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; Bentzen, 2015; Iyigun, 2008; Michalopoulos, Naghavi, and Prarolo, 2017; Mitra and Ray, 2014). We contribute to the empirical literature on the economic and political history of South Asia, 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). We compile a new dataset to systematically address the question of inter-religious competition in pre-colonial South Asia.[2] 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

[2] In contrast to our study, Jha (2013) uses inter-ethnic competition in medieval India as a determinant of riots in the 19th century and onwards.

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 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 and conceptual framework in Section 2 and Section 3 respectively. We introduce the dataset in Section 4 followed by the empirical specification and the baseline findings in Section 5. We address the plausible explanations of the results in Section 6, and perform a battery of robustness checks in Section 7. Section 8 concludes.

2 Historical Backround

2.1 Origins and Expansion of Muslim Rule in Medieval India

Islam was introduced to India by the Arab traders in early eighth century, forging small Muslim communities by the southern seacoasts (Metcalf, 2009). These traders performed key economic roles and were patronized by local non-Muslim kings. For three centuries thereafter the political influence of Islam stayed limited to the North-West of Indian subcontinent, where the Muslim armies annexed a small region now known as Sindh (Metcalf, 2009).[3]

The process of Islamic expansion in India began in earnest in the eleventh century with the onslaught of Central Asian raiders into the subcontinent (Gommans, 1998). Devoid of territorial aims these forays were initially restricted to looting expeditions.[4] The landscape changed by the end of the twelfth century when a wave of fresh conquests by the Persianised Turks established the first Muslim State in North India.[5] With its base in Delhi, the earliest State of Turkic slaves rapidly extended its control over the entire North India. By the time of its collapse at the end of fourteenth century the Turkic Slave dynasty had extended its control over the South-West India and had made forays even deep into South India.

The fall of the Turkic Slave dynasty was followed by a fractured regional polity where smaller polities competed for territorial sway in the North and North-West of India (Metcalf, 2009). The South-West region, which had seceded from the Delhi based Sultans, also split into smaller Muslim kingdoms. The southern most part of India remained the last bastion of prominent Hindu kingship under the Vijaynagara empire. The Muslim kingdoms in the South-West fought against each other and clashed, as well as sometime aligned, with the Vijaynagara empire for regional supremacy (Metcalf, 2009).

The period of regional attrition came to an end after the establishment of the Mughal dynasty in early sixteenth century. For the next two centuries the Mughals held sway over an empire which, at its pinnacle, exceeded in wealth and might any contemporaneous state in the Islamic world (Metcalf, 2009). Mughal power started to wane by the beginning of eighteenth century, ceding space to many regional states. The most prominent among these regional polities were the Rajputs in the North-West, the Marathas in the South-West, the Sikhs in the Punjab and Jats to the south east of Delhi (Metcalf, 2009). Political arithmetic once again seems to override any religious differences in this period. The non-Muslim states engaged in strategic

[3] The Sindh region is in modern day Pakistan.

[4] Mahmud of Ghazni (998-1030 AD), pivotal among these raiders, is famous for carrying out multiple looting expeditions into India during the course of which he desecrated Hindu temples.

[5] The Persianized Turks under the leadership of Muhammad of Ghor began the conquests in Punjab, annexed Delhi, and subsequently the two eminent Hindu kingdoms of that time, Ajmer and Kannauj.

cooperation with Muslim rulers, as well as fought against each other (Metcalf, 2009).

2.2 Temples as the Source of Political Legitimacy for Hindu Rulers

The building of monumental temples in stone for congregational worship had become a characteristic of Indian subcontinent before the emergence of medieval Muslim States in twelfth century (Bakker, 1992).[6] The rise of these temple establishments went hand in hand with the military expansion of regional Hindu polities. The newly acquired territories came to be ruled through a system of subjugated princes (*Samantachakra*) that were obliged to pay a regular tribute and serve the king loyally (Kulke and Rothermund, 2016). The system was however inherently unstable. As soon as the political center's authority weakened, the princes would assert to reclaim their independence (Kulke and Rothermund, 2016).

In such a milieu the cult of royal temples developed in order to reinforce the political legitimacy of the ruler. Paintings inside the temple or sculptures outside often depicted the king like a god and the gods in turn were embellished with royal features (Kulke and Rothermund, 2016). Some kings enhanced their legitimation by ruling as the god's representative or as his son (*putra*). Thus the kings used temples as the instruments of governance and could threaten the defiant princes (*Samanta*) with the wrath of god if they flouted the king's orders (Kulke and Rothermund, 2016).

In addition to monumental temple building, the new royal cult involved gift-giving, both in the form of monetary and land endowment, as a medium to acquire religious merit (Bakker, 1992). This system of patronage was replicated by elites at different level of power that would mirror their sphere of influence.[7] 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). The royal observence of religious rituals at these pilgrimage centers

[6]While the kingship ideology in the first millenia relied on the direct relationship between the king and the *Brahman* (priest), the legitimacy of medieval Hindu kingship became associated with a network of holy sites (Bakker, 1992).

[7]For example, village level leaders would patronize the temple of their village god (*gramdevta*), while the local princes would patronize the cults of sub-regional deities (Kulke and Rothermund, 2016).

became instruments for public display of legitimacy to the masses.[8]

Even after Muslim States emerged and established their pre-eminence in South Asia, the cult of royal temples continued to accord legitimacy within contemporary Hindu States. By the fourteenth century, generous gifts to temples and their priests (*Brahmanas*) had become synonymous with Hindu kingship or the *rajadharma* (Rao, 2016). Under the rule of Vijaynagara empire (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).[9]

2.3 Economic and Religious Conditions Under Muslim Rule

2.3.1 Agrarian System under Muslim Rule

With the rise of medieval Muslim polities a new ruling class emerged that changed the pattern of surplus extraction (Habib, 1983).[10] 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

[8]For example, the royal service of ritual cleaning of the three large chariots of the *Jagannatha* trinity became the most important ritual privilege for the kings of Puri (Bakker, 1992).

[9]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 foci of religious and cultural influence (Bakker, 1992).

[10]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).

rights over the territory they controlled and allowed to maintain armed retainers. The aristocrats retained a part of land taxes while transfering the rest to imperial coffers, and provided military assistance to the king when needed (Habib, 1983). 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.[11] 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).

2.3.2 Religious Policy of Muslim Rulers

The attitudes and policies of Muslim rulers towards their predominantly Hindu subjects underwent two phases. The rule of Mughal king Akbar (1556-1605 AD) acts as the dividing line between the systems of governance. The rulers before Akbar mainly ruled through military strength. The system of governance was based on a distinction between Hindu and Muslim subjects regarding their religious practices (Sharma, 1972). The Hindu subjects were required to pay a poll tax (*jizya*) as well as a pilgrimage tax in lieu for participating in Hindu religious fairs. The payment of pilgrimage tax acted as a compromise between strict prescription of Muslim

[11] 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).

law not to tolerate public expression of non-Muslim practices and the desire of majority Hindu subjects to perform their religious rituals (Sharma, 1972).

Public performance of religious rituals was only allowed in places that were sanctified by centuries of religious tradition (Sharma, 1972). This meant that construction of new temples was generally forbidden in this period (Sharma, 1972). However, very few Muslim rulers actively engaged in religious persecution and forcible conversion of their Hindu subjects (Sharma, 1972). These select cases include Sikander Butshikan of Kashmir (1389-1413), who conducted waves of persecution, desecrated temples and forcibly converted thousands of Hindus to Islam. Similarly, Jalal-ud-Din of Bengal (1414-1430), a convert himself, converted hundreds of Hindus to Islam and persecuted the rest.

The tenure of Mughal king Akbar marked a departure from the religious policies of his predecessors. His tenure saw the abolition of both poll tax and the pilgrimage tax. Akbar further removed all restrictions on the building of Hindu temples (Sharma, 1972). Akbar's Hindu officials built new temples at famous places of Hindu pilgrimage.[12] There is also evidence that Akbar tried to co-opt Hindu religious authority by making donations at select Hindu shrines.[13]

The policy of religious toleration and occasional co-option of Hindu temples was largely pursued by Akbar's successors, Jahangir (1605–1627) and to a less extent by Shah Jahan (1628–1658).[14] The tenure of Akbar's great grandson, Aurangzeb (1658-1707), however, brought an end to the period of religious tolerance. Shortly after coming to the throne, he issued an edict in 1659 that banned any new construction of Hindu temples (Sharma, 1972). He reimposed the poll-tax on Hindus in 1679. Orders were also issued to the provincial governers to destroy Hindu temples and schools and put and end to the educational activity and religious practices of the *infidel*. Nicolaas De Graaf, a European surgeon and traveler, who was in Bengal in 1670, heard of these orders and reported:

[12] This highlights the continued importance of temples in according legitimacy to the Hindu elite.

[13] For example, local tradition ascribes Akbar with the presentation of a golden umbrella to the shrine of Hindu fire goddess (*Jwala Mukhi*) in modern day Punjab. The implication of Akbar's actions was however not lost on Muslim orthodoxy that "spread tales of his fall from the true path throughout the empire." (Sharma, 1972).

[14] Shah Jahan did not reimpose the poll tax on Hindus, however the pilgrimage tax was revived under his tenure.

"In the month of January, all the governers and native officers received an order from the Great Mughal prohibiting the practice of Pagan religion throughout the country and closing down all the temples and sanctuaries of the Idol worshippers...in the hope that some Pagans would embrace the Muslim religion."(Orme, 1805).

2.4 Temple Desecrations and State Maintenance Under Muslim Rule

In two centuries prior to the establishment of first Muslim State in North India in 1192 AD, Persianized Turks from their base in Afghanistan systematically attacked urban centers of South Asia and razed its temples. These attacks were motivated for material reasons, the looted wealth from Indian cities and its materially endowed temples was used to finance military conquests in Central Asia (Eaton, 2000). However, as Muslim States established their footprint in the Indian subcontinent, attacks on temples became infrequent and came to be by specific political objectives. Between 1192 and 1720 AD, which is the period of our study and roughly coincides with Muslim States ruling over large parts of medieval India, 80 events of temple desecration are established with historical certainty (Eaton, 2000).[15] These desecrations are almost uniformally distributed across the three distinct phases of Muslim rule in medieval India. The desecrations were carried out at the behest of a Muslim ruler or high ranking official of a Muslim State. Some Muslim rulers stood out in systematically destroying temples, which was probably linked to their religious zeal.

The overview of religious conditions under Muslim rule and the data on temple desecrations suggest that barring few rulers the Muslim States generally pursued a policy of pragmatism towards the temples that already lay in their annexed territories. The temples were treated as state property, generally protected, and on occasion resources were spent for their maintenance.[16]

[15] Eaton (2000) defines temple desecration as an act in which a "temple was normally looted, redefined or destroyed". Going through individual events we find that different tactics were used in desecrating temples. These tactics ranged from sacking the stone image of god as in the case of temple desecration in Puri in 1359, to complete destruction of the temple as was the case of great temple in Orchha in 1635, to conversion of the temple into a mosque in Mathura in 1670. For a complete list of temple desecrations see Table B-2.

[16] 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

Table 1: Pattern of Temple Desecrations (1192-1730)

a) Timing of Temple Desecrations	% Desecration
Imperialism of Delhi Sultanate (1192-1394)	30
Growth of Regional Sultanates (1394-1600)	38.75
Expansion and Consolidation of Mughal Authority (1600-1730)	31.25
b) Rank of Temple Desecrators	**% Desecration**
Emperor or Crown Prince	47.5
Governor or Nawab	11.25
Military Commander	33.75
Others	7.5
c) Most Desecrations Under a Ruler's Tenure	**% Desecration**
Aurangzeb (1658-1707)	12.5
Sultan Sikander (1389-1413)	5

However, this relationship of general tolerance and occasional patronage of temples was broken during periods of social turmoil. The Indo-Muslim rulers were well aware of the political salience of temples in according legitimacy to their patrons (Eaton, 2000). 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 showed sign of disloyalty and especially 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). In 1635, Mughal king Shah Jahan destroyed the temple at Orchha that had been patronized by the father of a high ranking officer who at that time was engaged in an open rebellion against the throne.

There is also evidence that agrarian distress due to adverse weather conditions created conditions for rebellion, and the state responded by desecrating the temple that was associated with its leader. For example, between 1660 to 1663 severe droughts were experienced in

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.

Northern India, that caused immense disruption to the agricultural production (Rana, 1981). A large number of peasants disbanded their land, which in turn put additional tax burden on the remaining cultivators. With agrarian crisis in the background a widespread peasant uprising broke out in Mathura, in which the city congregational mosque's patron was killed. After the leader of these rebellions was captured in 1670 the Mughal king Aurangzeb ordered the destruction of the city's Keshava Deva temple and built an Islamic prayer structure on the site (Eaton, 2000), perhaps to act as a reminder of the imperial power.

The evidence presented in this section suggests that the threat from political mobilization by temples increased during periods of social turmoil. The Indo-Muslim State's equilibrium policy of tolerance towards temples was affected, increasing the probability of temple desecration.

3 Conceptual Framework: From Weather Shocks to Temple Desecration

3.1 Agrarian Shocks, Religious Institutions and Threat of Rebellion

We develop a simple framework to explore the relationship between weather shocks, agricultural productivity and desecration of temples under Muslim rule. This would help to explain why Muslim rulers would destroy a valuable asset like temples that were under their rule and generated revenue in the form of pilgrimage taxes.

Consider the economy of a Muslim State in medieval India where tax on agricultural output is the primary source of state income. Agrarian output is dependent on weather conditions, soil quality and other inputs. The Muslim ruler uses a decentralized tax collection system to raises taxes from largely Hindu peasants. The local elite (such as *Zamindar* or *Chaudhary*) who also serve as tax collecting agents are also predominantly Hindu. These elites retain their authority over the agrarian society through the patronage of temples. In normal years the Muslim ruler raises additional revenue by charging a pilgrimage tax on visits to temple sites. In return for these taxes, the Hindu masses are allowed to practice their religion.

When a weather shock reduces agricultural productivity, the resulting economic distress can create conditions for social conflict that threatens the Muslim ruler's hold over power (Acemoglu and Robinson, 2005). Weather shocks create resentment amongst the Hindu peasants who are unable to pay the taxes,[17] as well as among the local Hindu elite who have to forego part of their share in taxes to make up for lost state revenue.[18] The religious authority of the masses become pivotal under these circumstances 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, 2017b; Chaney, 2013). In a society where the ruler and the masses have a common religion, the ruler can dampen the probability of revolt by co-opting the religious authority (Chaney, 2013; Rubin, 2017).[19]

The cost of co-option, however, increases with the distance between the preferences of the ruler and that of the religious authority that is followed by the population (Auriol and Platteau, 2017b). In case of an Indo-Muslim State where the ruler's religious beliefs are distinct from that of the religious authority of the masses, the cost of co-option is likely to be prohibitively high.[20] Fearing that local elite can use power of the temples to organize the peasants, the ruler destroys the Hindu temple to reduce the possibility of a widespread revolt. Hence, during periods of adverse weather shocks we expect a Muslim State to be more likely to desecrate a Hindu temple under its rule.

Proposition 1: *During the period of an adverse weather shock a Muslim State is more likely to desecrate a Hindu temple under its rule.*

Several other factors can mediate the relationship between weather shocks and desecration

[17]The taxes were determined according to size of the landholding and hence were independent of actual production (Habib, 1983).

[18]The local elite may also identify a "window of opportunity" in weather induced distress to extract concessions from the state (Aidt and Leon, 2016).

[19]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).

[20]This explains why Muslim rulers generally did not patronize Hindu temples. Even when a powerful ruler like Akbar tried to patronize Hindu temples he encountered strong opposition from Muslim *Ulama*.

of Hindu temples. For example, soil quality is shown to dampen 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 destroying the Hindu temple in response to weather shocks.

Proposition 2: *During the period of an adverse weather shock, a location with better soil quality is less likely to experience a temple desecration under Muslim rule.*

Older Muslim States or Muslim rulers that were in power for a longer duration would be less vulnerable to civil unrest. Older states would have better military capacity and therefore can quell the civil unrest rather quickly. Older states would probably also have the fiscal capacity to provide tax relief to the masses during adverse weather shocks (Moreland, 2011). Muslim rulers generally faced succession strife during the initial years of their tenure (Faruqui, 2012). The challenges to a Muslim ruler's authority should therefore decline with his tenure. Hence we expect older Muslim States or rulers that were in power for longer duration to be less likely to engage in temple desecration during periods of adverse weather shocks.

Proposition 3: *During the period of an adverse weather shock an older Muslim State or a Muslim ruler that is in power for a longer period is less likely to desecrate a Hindu temple.*

3.2 Alternative Explanations: Scapegoating, Looting or Collateral Damage?

There are alternative explanations for why Muslim rulers would destroy Hindu temples during adverse weather shocks. For example, an emerging literature has shown that religious minorities can be repressed under authoritarian rule during periods of economic turmoil (Anderson, Johnson, and Koyama, 2017; Grosfeld, Sakalli, and Zhuravskaya, 2017; Johnson and Koyama, 2019). However, scapegoating is unlikely to be the underlying mechanism in our case since Muslim rulers in medieval India ruled over predominantly Hindu populations. Rough estimates from 1600 AD suggest that Muslims only constituted between 10% to 11% of the total population in the Indian subcontinent (Lal, 1973). Even when disaggregate population numbers become available from British census records in the 20th century, Muslims do not appear to exceed more than 10% of the total population in areas that constitute modern day India (see Figure 4).

It is also possible that Muslim States looted Hindu temples for its wealth to mitigate the fiscal loss from fallen agricultural productivity. However, by destroying temples the ruler would also forego future revenue from pilgrimage taxes. It is thus unlikely that a strategic Muslim ruler would destroy a temple under his rule to mitigate fiscal losses. Finally, it is also possible that weather shocks affected the incidence of wars between Hindu and Muslim States (Iyigun, Nunn, and Qian, 2017),[21] and the destruction of temples was merely a collateral damage from such wars.

In the following sections we investigate whether the data is consistent with our main hypotheses, as well as put the alternative explanations to test.

4 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 1192-1730 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 religious sites using maps 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). Then we matched these with historical temperature data from Mann et al. (2009) to create a panel data set at the religious site-decade level. In what follows we briefly explain the data collection and describe the main variables. A detailed description of how we

[21] For example, falling agricultural productivity could necessitate state expansion through conquests. On the other hand increasing price of foodgrains could increase the cost of maintaining army and therefore make military expeditions costlier.

construct the dataset is provided in the Appendix.

4.1 Temple Locations and Temple Desecrations

Locations of religious sites were obtained from maps on key religious and culutral 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 geo-location of religious sites where temples would be located.

Desecration events were coded from the dataset compiled by Eaton (2000). Relying on contemporary or near-contemporary epigraphic and literary sources, Eaton identifies 80 incidents of desecrations for the period between 1192 and 1730 "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).

It is important to note that the desecrations of a temple at a religious site does not preclude the possiblity of future desecrations at the same site.[22] This is because there could be multiple temples located at the same site or the temple could have been rebuilt over time, before being desecrated again. The rebuilding, though, would have to happen when the site was under Hindu control as most Muslim rulers outlawed the construction of new temples (Sharma, 1972).

We were able to locate about half of desecration events within our sample of historical

[22]Table B-3 lists the religious sites in our dataset that experienced multiple desecrations over time.

religious sites. To avoid losing observations we add the locations of the remaining half of desecrations to the dataset of religious site locations. We are thus able to have a more complete set of sites where desecrations happened. But we cannot complete the set of religious sites where desecrations did not happen, which could bias our results upwards. To address this concern we will exclude the subset of temple desecrations that were not matched with the religious site data in a robustness check in Table A-5.

4.2 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.

For our specification we use temperature shock as the explanatory variable, which compares the temperature in a location in a given decade with the distribution of temperature at that location over our entire period of study. Hence the use of temperature deviations from 1961-1990 as against absolute temperature values does not make any difference to our estimation procedure.

4.3 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 religious sites we were able to approximately identify the polity where a religious site was located in a given decade.

We could not identify the corresponding polity for every religious site 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 religious sites could have been within the confines of small polities that were not identified by Schwartzberg, Bajpai, and Mathur (1992). Finally, some Hindu religious sites were also located in remote locations such as mountain tops which could have been outside the territorial control of any state (Eck, 2012).

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.

The summary statistics are presented in Table 2. 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.[23]

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

Table 2: Summary Statistics- Probability of Temple Desecration

Sample Type	Mean	Standard Deviation	N
All	0.007	0.082	11502
Muslim Rule	0.008	0.089	3663
Muslim Rule and Temperature Deviation	0.010	0.101	1791

Notes: The averages correspond to the baseline regression without controls in Column (1) in Table 3. 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 religious site i's sample.

5 Empirical Specification

5.1 Baseline Model: Weather Fluctuations and Temple Desecration

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

$$D_{ikt} = \beta_1 M_{ikt} + \beta_2 T_{ikt} + \beta_3 M_{ikt} \times T_{ikt} + \gamma' \mathbf{X}_{ikt} + \mathbf{FE}_i + \mathbf{FE}_t + \mathbf{FE}_k + e_{ikt} \tag{5.1}$$

D_{ikt} is a dummy equal to 1 if a desecration event was recorded at religious site i in polity k in period t. M_{ikt} is a dummy that equals 1 if religious site i was under Muslim rule in period t. We use two definitions of Muslim rule because we can not match all religious sites to a corresponding polity in a given period.[24] First, we set all religious sites that do not have a corresponding polity in period t as being under non-Muslim rule. We do this because the smallest known polity in medieval India is part of our dataset, hence the unmatched religious sites are likelier to be part of non-Muslim polities if the non-identification is due to smaller polities not being identified in medieval maps.[25] This allows us to run our baseline regression with the full sample. Our assignment of an unmatched religious site to a non-Muslim polity is however imprecise. Therefore, we also use a more precise definition of Muslim rule where the sample

[24] See Appendix for details on how we constructed the dataset.

[25] As we noted in the data section the non-identification of religious sites with polities could also be due to imprecision in matching different historical maps, as well as due to the fact that some religious sites were located in remote areas that were could have been outside the territorial control of any state.

is restricted to religious sites that can be matched with a polity in a given period. We lose approximately 40% of the observations in this type of specification.

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 site 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).[26] 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. [27]

X_{ikt} is the vector of other control variables. We use the distance of religious site 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). Religious sites that were in proximity to the capital of a medieval state k were likely to be both economically and politically more salient. We can only calculate distance to capital for religious sites whose corresponding polity is known. Therefore, we can only include this control variable with the precise definition of Muslim rule.

We also control for the number of decades a 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 of religious site i to trading ports would increase its

[26] We also test the effect of abnormally hot and cold periods separately in Table A-2.

[27] We later check the robustness of the results to different definitions of weather shocks. The results are reported in Table A-4

economic importance and make it 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.[28]

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).[29]

We estimate Equation 5.1 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 predictor effects (Cook, Hays, and Franzese Jr., 2018).[30]

5.2 Results

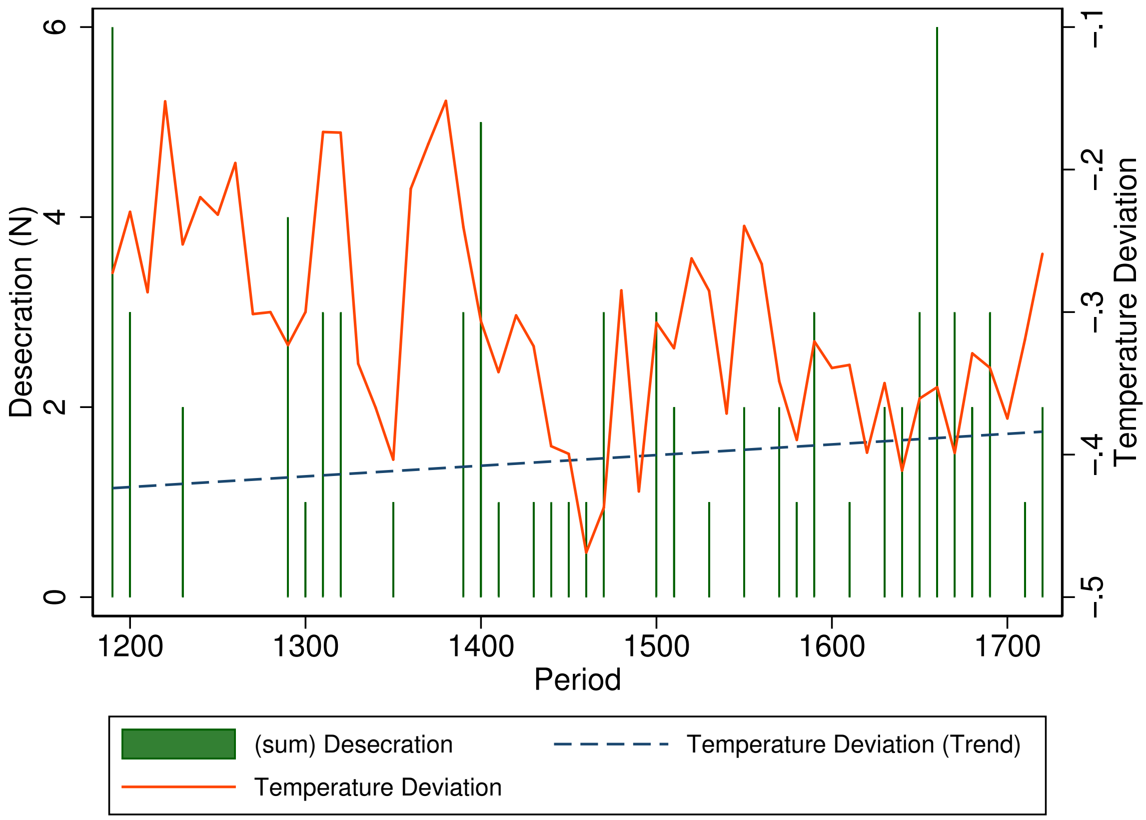
Column (1) and (2) of Panel (a) in Table 3 presents the baseline results for the full sample without and with fixed effects. Robust standard errors clustered at the religious site level are reported in parentheses. The coefficient is positive but statistically not different from zero, which is plausibly due to imprecision in defining the Muslim rule variable to use the full sample. In

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

[29]We also test the baseline results by setting the time dimension at five years and twenty years respectively. The results are reported in a robustness check in Table A-3.

[30]The corresponding non-linear estimates are reported in a robustness check in Table A-7.

Figure 1: Weather Fluctuation and Temple Desecration



Notes: The historical temperature data is constructed by Mann et al. (2009). The data is in degree Celsius and is reported in the form of deviations from 1961-1990 mean temperature. The decade average means are below zero which means that the period under study was on average relatively cooler than modern period.

Column (3) we report the results with the precise definition of Muslim rule and without 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 periods of large temperature fluctuations. The results are robust to the inclusion of location fixed effects in Column (4), (5) and (6), and period fixed effects in Columns (5) and (6), as well as the inclusion of dynasty fixed effects in Column (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 in areas under Muslim rule 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 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 specific rulers.

The results in Table 3 provide empirical support for **Proposition 1** which states that adverse weather shocks would make Muslim rulers more likely to desecrate temples under their rule. We argue that this mainly happened due to weather fluctuations disrupting the political equilibria which led the minority Muslim rulers to repress the Hindu religious authority. In the following section we investigate this and other economic and political channels that could connect weather fluctuations to temple desecrations.

Table 3: Baseline Results in LPM

Dependent variable: Desecration

Panel (a). Full Sample	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.000	0.021*	0.004	0.015	-0.001	-0.007
	(0.002)	(0.011)	(0.009)	(0.011)	(0.012)	(0.021)
Temperature Deviation	-0.002	-0.002	-0.004	-0.004	-0.004	-0.005
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.005	0.005	0.008*	0.009**	0.009*	0.009*
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length		-0.003**	-0.001	-0.002*	-0.000	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y
Muslim Rule definition	Lib	Lib	Con	Con	Con	Con
Panel (b). Excluding Iconclast Rulers	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Muslim Rule	-0.002	0.011	0.003	0.016	-0.000	-0.006
	(0.002)	(0.009)	(0.009)	(0.010)	(0.012)	(0.021)
Temperature Deviation	-0.002	-0.002	-0.004	-0.004	-0.004	-0.005
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.008**	0.008**	0.010**	0.011**	0.012**	0.011**
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance			-0.000	-0.001	-0.001	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length		-0.002*	-0.001	-0.002**	-0.000	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	11,015	11,015	6,275	6,275	6,275	6,275
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y
Muslim Rule definition	Lib	Lib	Con	Con	Con	Con

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the religious site level. The results correspond to equation 5.1. 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 site i. Muslim rule is a dummy that equals 1 if site 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 had been in power in period t. In Panel (b) we exclude the rule of known iconoclasts like Mughal king Aurangzeb and Sultan Sikander of Kashmir.

6 Causal Mechanism

6.1 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 4. 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 4 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. This supports **Proposition 2**, which states that during the period of an adverse weather shock, locations under Muslim rule with better soil quality are less likely to experience a temple desecration.

Table 4: Mechanism- Agricultural Productivity

Dependent variable: Desecration

Panel (a). Nitrogen Density (Soil Quality)	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	-0.006	-0.029	0.012	0.014	-0.006	0.019
	(0.029)	(0.042)	(0.035)	(0.047)	(0.050)	(0.066)
Temperature Deviation	0.008	0.006	-0.002	-0.007	-0.006	-0.011
	(0.021)	(0.021)	(0.027)	(0.029)	(0.031)	(0.030)
Muslim Rule × Temperature Deviation	0.186***	0.195**	0.184**	0.200**	0.203**	0.193**
	(0.071)	(0.076)	(0.085)	(0.091)	(0.091)	(0.090)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Log Nitrogen Density	0.002		0.004			
	(0.002)		(0.004)			
Log Nitrogen Density × Muslim Rule	0.003	0.007	-0.001	0.000	0.001	-0.004
	(0.004)	(0.006)	(0.005)	(0.007)	(0.007)	(0.009)
Log Nitrogen Density × Temperature Deviation	-0.001	-0.001	-0.000	0.000	0.000	0.001
	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)
Log Nitrogen Density × Muslim Rule × Temperature Deviation	-0.026**	-0.027**	-0.025**	-0.027**	-0.028**	-0.026**
	(0.010)	(0.011)	(0.012)	(0.013)	(0.013)	(0.013)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

Panel (b). Carbon Density (Soil Quality)	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	-0.002	0.002	-0.000	0.017	-0.000	0.014
	(0.014)	(0.018)	(0.016)	(0.020)	(0.022)	(0.034)
Temperature Deviation	0.000	-0.000	-0.002	-0.004	-0.003	-0.006
	(0.007)	(0.007)	(0.011)	(0.012)	(0.012)	(0.012)
Muslim Rule × Temperature Deviation	0.071***	0.075***	0.069**	0.075**	0.077**	0.073**
	(0.024)	(0.025)	(0.028)	(0.030)	(0.030)	(0.030)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Log Carbon Density	0.002		0.004			
	(0.003)		(0.005)			
Log Carbon Density × Muslim Rule	0.007	0.009	0.002	-0.001	-0.001	-0.008
	(0.005)	(0.007)	(0.006)	(0.009)	(0.009)	(0.012)
Log Carbon Density × Temperature Deviation	-0.001	-0.001	-0.001	-0.000	-0.001	0.000
	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)	(0.006)
Log Carbon Density × Muslim Rule × Temperature Deviation	-0.030***	-0.031***	-0.027**	-0.030**	-0.031**	-0.029**
	(0.011)	(0.011)	(0.013)	(0.014)	(0.013)	(0.013)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

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

6.2 Dynasty Duration

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 dynasty duration 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 at 10% level in most of the Columns. There is some evidence to support our prediction that an older Muslim State is less likely to experience social uprising and therefore less likely to repress Hindu religious authority during periods of large weather fluctuations.

6.3 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).[31] 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.

Looking back at **Proposition 3**, which states that during the period of an adverse weather shock an older Muslim State, or a Muslim ruler that is in power for a longer period, is less likely to desecrate a Hindu temple, we find that the data provides strong support for the second part and weaker support for the first part of the proposition.

[31] 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- Dynasty Duration and Ruler Tenure

Dependent variable: Desecration

Panel (a). Dynasty Duration	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.006	0.014	-0.009	0.003	-0.010	-0.018
	(0.011)	(0.012)	(0.006)	(0.009)	(0.011)	(0.020)
Temperature Deviation	-0.013	-0.014	-0.027*	-0.028**	-0.023*	-0.025**
	(0.014)	(0.013)	(0.014)	(0.013)	(0.012)	(0.012)
Muslim Rule × Temperature Deviation	0.022	0.025	0.045*	0.047**	0.040**	0.042**
	(0.023)	(0.022)	(0.023)	(0.022)	(0.019)	(0.019)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002	0.001	-0.001	0.001	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Log Muslim Dynasty Length × Temperature Deviation	-0.002	-0.003	-0.005*	-0.005*	-0.004*	-0.004*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y
Panel (b). Ruler Tenure	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Muslim Rule	0.002	0.008	-0.005	0.003	-0.011	-0.015
	(0.009)	(0.010)	(0.009)	(0.010)	(0.012)	(0.021)
Temperature Deviation	-0.034***	-0.034***	-0.034***	-0.034***	-0.031***	-0.028***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)
Muslim Rule × Temperature Deviation	0.034***	0.035***	0.036***	0.035***	0.033***	0.029***
	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.008)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003*	-0.000	-0.001	0.001	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Log Muslim Ruler Tenure	0.002**	0.002**	0.002*	0.001	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Ruler Tenure × Temperature Deviation	-0.007***	-0.007***	-0.007***	-0.006***	-0.006***	-0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the religious site 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.

6.4 Alternative Explanations

6.4.1 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 (revenue from pilgrimage taxes) 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 6. 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 religious site i from a major medieval port as a proxy for its economic importance.[32] We create a dummy that equals 1 if religious site i's distance to the nearest medieval port was below the

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

median value and interact it with the temperature deviation dummy. Our hypothesis is that a temple in the vicinity of a major port would have been wealthier from the trading activity,[33] and hence more likely to be looted for wealth during a period of large weather fluctuations. There may be other characteristics that are unique to a medieval port which could affect the likelihood of temple desecration. For example, Jha (2013) shows that trading activity in medieval ports fostered long-term economic cooperation between Hindus and Muslims. Therefore a religious site that is in proximity to a medieval port is likely to observe better Hindu-Muslim ties and therefore may experience lower likelihood of temple desecration during periods of weather fluctuation. The effect of *inter-religious cooperation* would be in the opposite direction to what is predicted by the looting mechanism.

Columns 1-6 of Panel (a) in Table 6 show the coefficients of the interaction term. In all specifications the proximity to the medieval port has a positive 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. These results provide evidence that Muslim States were more likely to loot Hindu temples for wealth during periods of adverse weather shock.

Does the looting channel also explain the desecrations that happen under Muslim rule? To test this we interact the *Near port* dummy 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.[34] The results are

[33]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 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.

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

presented in Panel (b). The triple interaction term's coefficient is statistically not different from zero. This suggests that while Muslim States were more likely to desecrate Hindu temples for wealth during adverse weather shocks, looting does not seem to be the driving mechanism of temple desecration that occurred under Muslim rule.

Table 6: Mechanism- Looting

Dependent variable: Desecration

Panel (a). Distance to nearest port	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.010	0.019*	0.003	0.011	-0.005	-0.013
	(0.010)	(0.011)	(0.010)	(0.011)	(0.012)	(0.021)
Temperature Deviation	-0.007**	-0.007**	-0.013**	-0.016***	-0.016***	-0.016***
	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
Muslim Rule × Temperature Deviation	0.007*	0.007*	0.013**	0.015***	0.016***	0.015***
	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.006)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.003**	-0.001	-0.002	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Near port dummy	-0.005**		-0.004			
	(0.002)		(0.003)			
Near port dummy × Temperature Deviation	0.009***	0.009***	0.013**	0.016***	0.017***	0.017***
	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)	(0.006)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y
Panel (b). Distance to nearest port under Muslim rule	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.011	0.018	0.001	0.005	-0.012	-0.014
	(0.011)	(0.012)	(0.011)	(0.013)	(0.014)	(0.022)
Temperature Deviation	-0.006**	-0.007**	-0.012**	-0.017**	-0.018**	-0.020**
	(0.003)	(0.003)	(0.006)	(0.008)	(0.008)	(0.009)
Muslim Rule × Temperature Deviation	0.003	0.003	0.012*	0.016*	0.017**	0.018**
	(0.005)	(0.005)	(0.006)	(0.008)	(0.008)	(0.009)
Log Own Capital Distance			-0.000	-0.001	-0.001	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Near port dummy	-0.006*		-0.006			
	(0.003)		(0.007)			
Near port dummy × Muslim Rule	0.006	0.006	0.007	0.012	0.013	0.005
	(0.005)	(0.005)	(0.007)	(0.010)	(0.010)	(0.012)
Near port dummy × Temperature Deviation	0.007*	0.007*	0.011	0.015*	0.017**	0.019**
	(0.004)	(0.004)	(0.007)	(0.009)	(0.009)	(0.009)
Muslim Rule × Near port dummy × Temperature Deviation	0.005	0.006	-0.001	-0.004	-0.006	-0.007
	(0.007)	(0.008)	(0.009)	(0.010)	(0.010)	(0.011)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

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

6.4.2 Battles

We assess the effect of weather shocks on temple desecration through inter-state conflict. We hypothesize that weather shocks can increase temple desecration through intensity or outcome of Hindu Muslim battles. First, weather shocks can affect the intensity of Hindu Muslim battles.[35] For example, decline in agricultural productivity can increase the demand for land which escalates the competition over its control. 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.

Historians of medieval India propose another mechanism through which Hindu Muslim battles can cause 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). It is possible that Muslim States anticipated greater threat to their authority in a newly occupied territory when the occupation coincided with a weather shock. The Muslim State would respond to the anticipated social upheaval in a newly conquered territory by desecrating the Hindu temple.

We test these hypotheses by compiling data on Hindu Muslim battles. The data is obtained from Jaques (2007) which provides a description of about 8,500 battles from antiquity till the 21st century that happened around the world. We cross-check this data from a second resource, which lists key battles in medieval India, especially those which occurred between the 15th and the 18th centuries Narvane (1996).

[35] 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.

Table 7 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 religious site i in period t, and the weather fluctuation dummy.[36] The effect of the interaction term in all columns is 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 7: Mechanism- Collateral Damage

Dependent variable: Desecration

Panel (a). Battle Intensity	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.012	0.021*	0.005	0.015	-0.001	-0.005
	(0.010)	(0.011)	(0.009)	(0.010)	(0.012)	(0.021)
Temperature Deviation	-0.002	-0.002	-0.004	-0.005*	-0.005	-0.005
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.005	0.005	0.008**	0.009**	0.009*	0.009*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
	(0.013)	(0.013)	(0.017)	(0.016)	(0.016)	(0.016)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Muslim Hindu Battle	0.012	0.014	-0.003***	-0.002*	-0.003	-0.004
	(0.009)	(0.009)	(0.001)	(0.001)	(0.003)	(0.003)
Muslim Hindu Battle × Temperature Deviation	-0.003	-0.005	0.022	0.019	0.017	0.018
	(0.013)	(0.013)	(0.017)	(0.016)	(0.016)	(0.016)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

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

Next we test the effect of a Muslim State's battle victory against a Hindu State. We test this mechanism in Table 8. In Panel (a) we control for the number of battles won by a Muslim State against a Hindu State within 200 kilometer radius of religious site i in period t. The effect of the Muslim State's battle victory on the desecration outcome is positive but statistically not different from zero in most of the specifications. As noted earlier, the revenue from Hindu

[36] We consider those battles that occurred within 200 km of a religious site as proximate.

pilgrimage was a useful source for imperial economy, and Muslim States often contested to control these locations. Once under his control, a strategic Muslim ruler would avoid destroying an economically valuable asset like a temple.

However, the equilibrium could be disrupted when the condition for social upheaval was particularly high in the newly conquered territory following a weather shocks. In Panel (b) of Table 8 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 period 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 however positive and statistically significant in Columns (3) to (6). 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 indicates that Muslim States were more sensitive to social unrest in newly conquered territories and therefore more likely to engage in religious repression.

Table 8: Mechanism- Battle Victories

Dependent variable: Desecration

Panel (a). Battle Victories	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.012	0.021*	0.004	0.015	-0.001	-0.008
	(0.010)	(0.011)	(0.009)	(0.011)	(0.012)	(0.021)
Temperature Deviation	-0.002	-0.002	-0.004	-0.004	-0.004	-0.005
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.005	0.005	0.008*	0.009**	0.009*	0.009*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Log Own Capital Distance			-0.000	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002))
Muslim Win Against Hindu	0.016*	0.016*	0.009	0.006	0.004	0.002
	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y
Panel (b). Battle Victories and Weather Fluctuation	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Muslim Rule	0.012	0.021*	0.004	0.015	-0.001	-0.004
	(0.010)	(0.011)	(0.009)	(0.010)	(0.012)	(0.022)
Temperature Deviation	-0.002	-0.002	-0.005*	-0.006*	-0.005	-0.006*
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.005	0.005	0.009**	0.009**	0.009**	0.009*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Log Own Capital Distance			-0.000	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Muslim Win Against Hindu	0.012	0.012	-0.005***	-0.008***	-0.009***	-0.011***
	(0.010)	(0.010)	(0.001)	(0.002)	(0.003)	(0.003)
Muslim Win Against Hindu × Temperature Deviation	0.014	0.014	0.040*	0.042*	0.039*	0.039*
	(0.021)	(0.021)	(0.023)	(0.023)	(0.023)	(0.022)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the religious site 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.

7 Robustness Checks

7.1 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 ranging from 100 km to 500 km for the spatial kernel and assume that serial correlation decays over 500 years. The results are reported in Table A-1. Due to space limitation we only present the coefficient on the main interaction, and they corroborate our baseline findings.[37]

7.2 Hotter versus colder periods

Our construction of weather fluctuation variable implies that both positive and negative weather shocks hamper agricultural productivity equally, which then creates condition for temple desecration. Positive shocks may however have different effect on agricultural productivity than negative shocks. For example, Sarkar, Dasgupta, and Sensarma (2019) show that heat shocks substantially reduce wheat output in modern day India. In Table A-2 we separately test the effect of hotter and colder periods. Results suggest that Muslim polities were more like desecrate temples under their rule at a location that experienced large and positive weather fluctuation in period t.

7.3 Alternative time dimension of the panel

In our baseline model the time dimension t is set at the decade level. This is mainly because the temperature data is less reliable at finer frequencies than a decade (Iyigun, Nunn, and Qian,

[37] 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 religious, dynasty and decade fixed effects.

2017). In Panel (a) and (b) of Table A-3 we estimate the baseline model by setting the time dimension at five years and twenty years respectively. When time dimension is set at five years, the coefficient on the main interaction is small and statistically not different from zero. However, when we set the time dimension at twenty year level the coefficient is statistically significant and larger than compared to our baseline estimate. The result suggests that the measurement error in temperature data increases in smaller time intervals.

7.4 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-4 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) is similar to our baseline result, although we lose statistical significance in different specifications.

7.5 Excluding religious sites not in maps

As discussed in the data section we could match about half of temple sites that experienced a desecration to the temple sites 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-5, is similar to our baseline finding and statistically significant at 5% level. We are assured that our data construction strategy does not affect the results.

7.6 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-6 shows that the contemporaneous effect is similar to our baseline result and is not affected by the introduction of a lag structure.

7.7 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-7 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 Muslim States generally 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 Muslim elites 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 States in medieval 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 has been responsible for severe Hindu-Muslim riots in the recent past, causing a great deal of harm to life and property. We hope that going forward this study will better inform the discussion on temple desecrations in medieval India.

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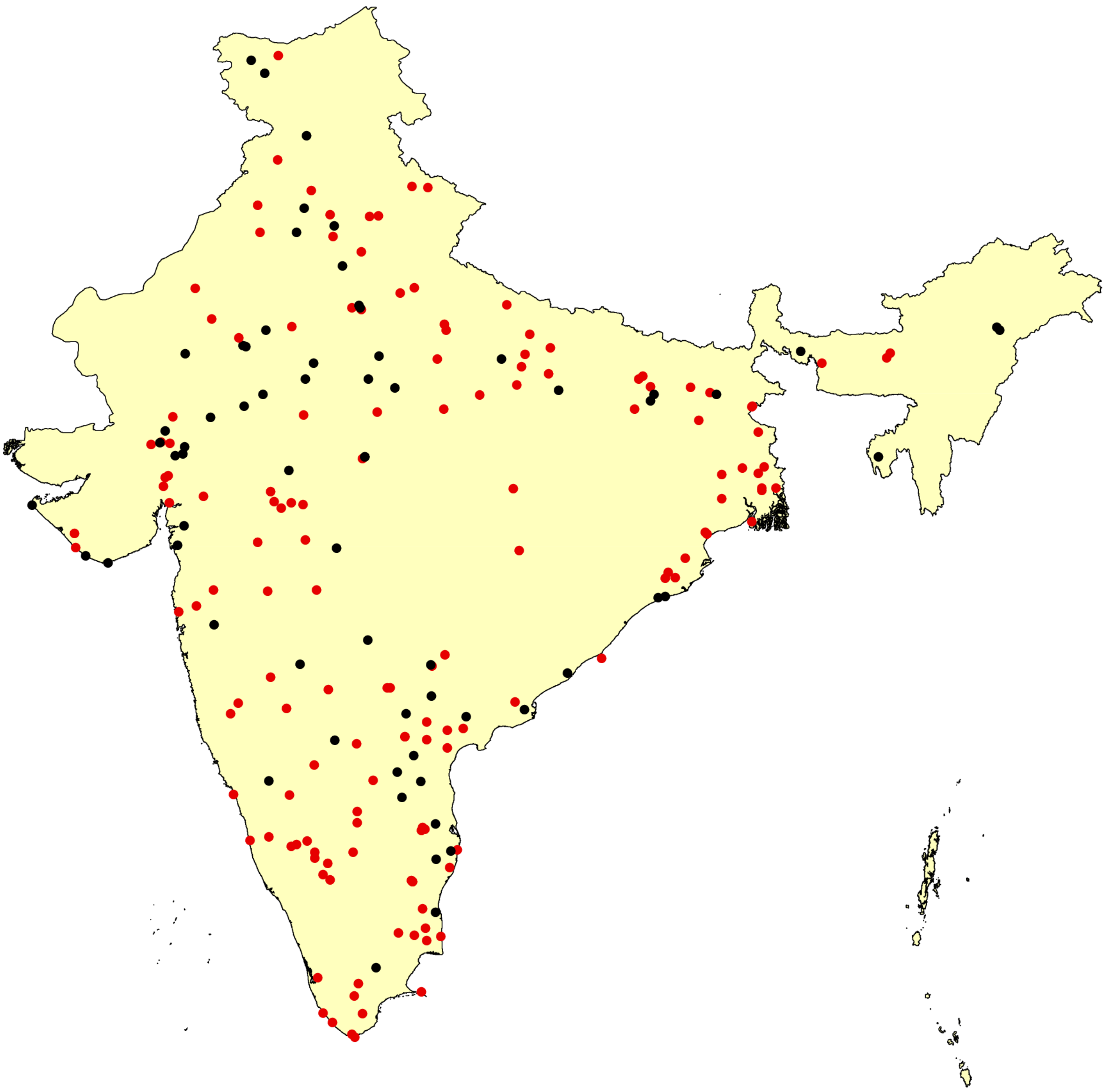
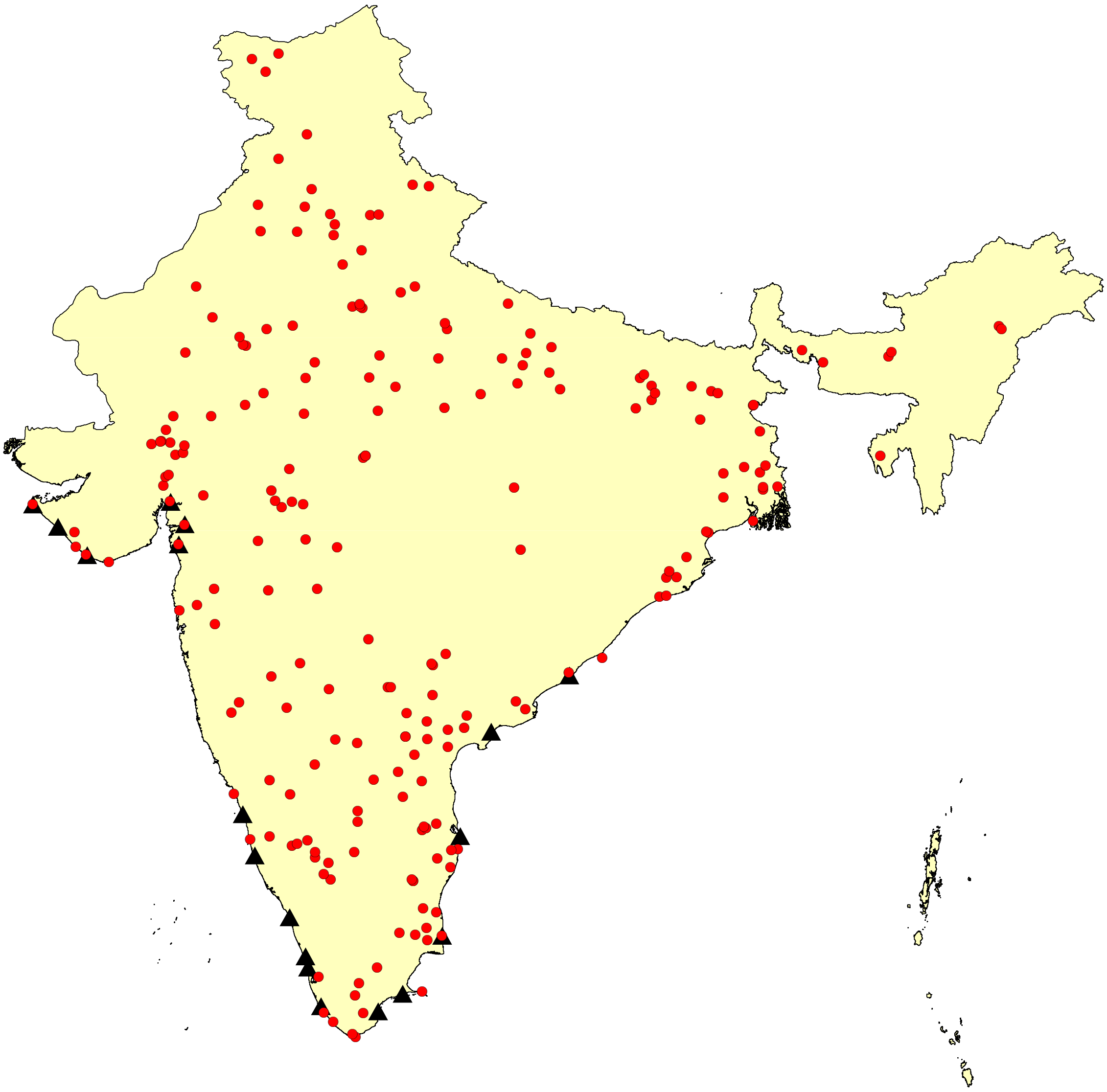
Tables and Figures

Figure 2: Religious Sites and Temple Desecrations



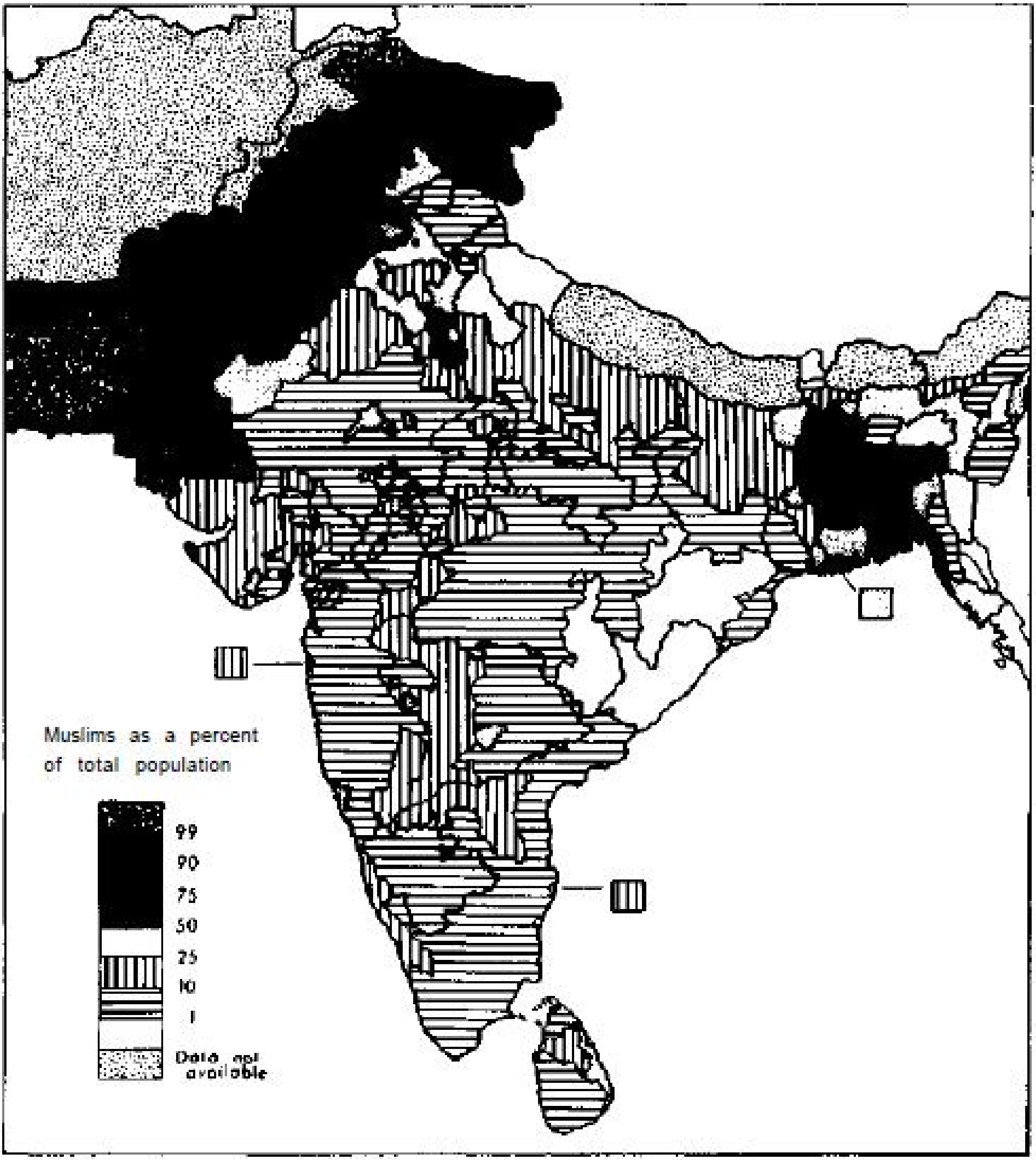
Notes: The dots represent medieval religious sites. Black dots represent religious sites that observed a temple desecration. Red dots represent religious sites where no desecration is recorded.

Figure 3: Religious Sites and Medieval Ports



Notes: Red dots represent medieval religious sites. Black triangles identify medieval ports.

Figure 4: Distribution of Muslim Population in Pre-Independence India



Notes: The map is sourced from Eaton (1985). The underlying data comes from British administered censuses that were held in 1931 and 1941. The dark coloured areas where Muslims were in majority are now in modern day Pakistan and Bangladesh and are not covered in this study.

Robustness Checks

Table A-1: Spatial and Serial Correlation

Dependent variable: Desecration

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (a). Spatial kernel distance is 100 km						
Muslim Rule × Temperature Deviation	0.005	0.005	0.007*	0.009*	0.009*	0.009*
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)
Panel (b). Spatial kernel distance is 200 km						
Muslim Rule × Temperature Deviation	0.005	0.005	0.007	0.009**	0.009*	0.009*
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)
Panel (c). Spatial kernel distance is 300 km						
Muslim Rule × Temperature Deviation	0.005	0.005	0.007	0.009**	0.009*	0.009*
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)
Panel (d). Spatial kernel distance is 400 km						
Muslim Rule × Temperature Deviation	0.005	0.005	0.007	0.009**	0.009*	0.009*
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)
Panel (e). Spatial kernel distance is 500 km						
Muslim Rule × Temperature Deviation	0.005	0.005	0.007	0.009**	0.009*	0.009*
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

*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 100km to 500km for the spatial kernel and assume that serial correlation decays over 500 years.

Table A-2: Hotter versus Colder Periods

Dependent variable: Desecration

	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.000	0.020*	0.002	0.014	-0.002	-0.008
	(0.002)	(0.011)	(0.009)	(0.010)	(0.012)	(0.021)
Hotter Period	-0.003*	-0.004**	-0.004	-0.004	-0.005	-0.007*
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
Colder Period	-0.000	-0.000	-0.003	-0.005	-0.003	-0.003
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Muslim Rule × Hotter Period	0.009*	0.009*	0.010*	0.011*	0.011*	0.013*
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)
Muslim Rule × Colder Period	0.002	0.002	0.006	0.007	0.007	0.005
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance			-0.000	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length		-0.003**	-0.001	-0.002	0.000	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the religious site level. Hotter period is a dummy that equals 1 if the temperature deviation in period t was in the top quartile for religious site i. Colder period is a dummy that equals 1 if the temperature deviation was in the lowest quartile for religious site i.

Table A-3: Alternative Time Dimensions

Dependent variable: Desecration

Panel (a). Time Dimension equals 5 years	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	-0.000	0.025**	0.015*	0.018**	0.019*	0.002
	(0.001)	(0.010)	(0.008)	(0.009)	(0.010)	(0.015)
Temperature Deviation	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Muslim Rule × Temperature Deviation	0.002	0.001	0.003	0.003	0.004	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Log Own Capital Distance			-0.000	-0.001	-0.001	-0.001
			(0.000)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length		-0.003***	-0.002**	-0.002**	-0.003**	-0.003**
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	23,004	23,004	13,310	13,310	13,310	13,310
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

Panel (b). Time Dimension equals 20 years	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	-0.005	0.034*	0.033*	0.043**	0.044**	-0.029
	(0.004)	(0.018)	(0.019)	(0.020)	(0.021)	(0.052)
Temperature Deviation	-0.003	-0.003	-0.008	-0.009	-0.016**	-0.018**
	(0.003)	(0.004)	(0.006)	(0.006)	(0.007)	(0.007)
Muslim Rule × Temperature Deviation	0.012*	0.009	0.016**	0.016**	0.017**	0.018**
	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)	(0.008)
Log Own Capital Distance			-0.001	-0.002	-0.002	-0.004
			(0.001)	(0.002)	(0.002)	(0.003)
Log Muslim Dynasty Length		-0.007**	-0.006**	-0.008***	-0.008***	-0.009**
		(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Observations	5,751	5,751	3,344	3,344	3,344	3,344
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

*Notes:**** $p<0.01$, ** $p<0.05$, * $p<0.10$. Standard errors are clustered at the religious site level. In Panel (a) period t equals 5 years, while in Panel (b) period t equals 20 years.

Table A-4: Alternative Definition of Weather Fluctuation

Dependent variable: Desecration

Panel (a). Dummy equals 1 for top and bottom 20th percentile	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.013	0.022**	0.006	0.017	0.001	-0.006
	(0.010)	(0.011)	(0.009)	(0.011)	(0.012)	(0.021)
Temperature Deviation	-0.002	-0.002	-0.001	-0.002	-0.000	-0.000
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
Muslim Rule × Temperature Deviation	0.006	0.006	0.006	0.007	0.006	0.006
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y
Panel (b). Dummy equals 1 for top and bottom 30th percentile	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Muslim Rule	0.013	0.022*	0.003	0.015	-0.001	-0.007
	(0.010)	(0.011)	(0.010)	(0.011)	(0.012)	(0.021)
Temperature Deviation	-0.002	-0.002	-0.005*	-0.006*	-0.005	-0.005
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Muslim Rule × Temperature Deviation	0.004	0.004	0.008*	0.008*	0.008	0.007
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y
Panel (c). Dummy equals 1 for top and bottom 35th percentile	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Muslim Rule	0.013	0.022*	0.002	0.014	-0.002	-0.008
	(0.011)	(0.011)	(0.010)	(0.011)	(0.012)	(0.022)
Temperature Deviation	-0.001	-0.001	-0.007**	-0.008**	-0.007	-0.007
	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
Muslim Rule × Temperature Deviation	0.002	0.002	0.009*	0.008*	0.008	0.008
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Log Own Capital Distance			-0.001	-0.001	-0.000	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.003**	-0.001	-0.002*	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	11,502	11,502	6,750	6,750	6,750	6,750
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the religious site 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-5: Excluding Temple Sites Not In Maps

Dependent variable: Desecration

	(1)	(2)	(3)	(4)	(5)	(6)
Muslim Rule	0.009	0.015	-0.001	0.008	-0.007	-0.001
	(0.009)	(0.010)	(0.006)	(0.005)	(0.011)	(0.009)
Temperature Deviation	-0.001	-0.002	-0.002	-0.003	-0.003*	-0.003*
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Muslim Rule × Temperature Deviation	0.004*	0.005*	0.007**	0.008**	0.008**	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Log Own Capital Distance			-0.000	-0.001	-0.001	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.001	-0.002*	-0.000	-0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	9,288	9,288	5,287	5,287	5,287	5,287
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the religious site level. We exclude sites that are recorded in the desecration sample but are not shown on the medieval maps of religious sites.

Table A-6: Lagged Effect of Weather Fluctuation

Dependent variable: Desecration

	(1)	(2)	(3)	(4)	(5)	
Muslim Rule	0.016	0.027*	0.007	0.022	0.007	0.000
	(0.013)	(0.015)	(0.013)	(0.015)	(0.011)	(0.022)
Temperature Deviation	-0.000	-0.001	-0.004	-0.004	-0.005	-0.005
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Temperature Deviation (t-1)	-0.002	-0.002	0.001	0.001	0.003	0.002
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim Rule × Temperature Deviation	0.002	0.003	0.007	0.008*	0.008*	0.008*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Muslim Rule × Temperature Deviation (t-1)	0.007*	0.007*	0.003	0.004	0.003	0.003
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Log Own Capital Distance			-0.000	-0.000	0.000	-0.001
			(0.001)	(0.001)	(0.001)	(0.001)
Log Muslim Dynasty Length	-0.002	-0.004**	-0.001	-0.003*	-0.001	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Observations	11,289	11,289	6,701	6,701	6,701	6,701
Location Fixed Effects	N	Y	N	Y	Y	Y
Period Fixed Effects	N	N	N	N	Y	Y
Dynasty Fixed Effects	N	N	N	N	N	Y

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

Table A-7: Non Linear Estimation

Dependent variable: Desecration

	(1)	(2)	(3)	(4)	(5)
Muslim Rule	0.007	0.348***	0.003	0.474*	-0.010
	(0.004)	(0.060)	(0.006)	(0.246)	(0.072)
Temperature Deviation	-0.002	-0.062	-0.005	-0.173	-0.048
	(0.002)	(0.058)	(0.003)	(0.116)	(0.080)
Muslim Rule × Temperature Deviation	0.005	0.127	0.008*	0.300**	0.087
	(0.003)	(0.096)	(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*	-0.052***	-0.001	-0.068***	-0.001
	(0.001)	(0.006)	(0.001)	(0.023)	(0.010)
Observations	11,502	3,564	6,750	1,675	1,675
Location Fixed Effects	N	Y	N	Y	Y
Period Fixed Effects	N	N	N	N	Y
Dynasty Fixed Effects	N	N	N	N	N
Model	Logit	CLogit	Logit	CLogit	CLogit

*Notes:**** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the religious site 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 1 to 5 in Panel (a) of Table 3.

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 (kg/m^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 (3) in Table 3.

Table B-2: Instances of Temple Desecration (1192-1730 AD)

Year	Site	District	Perpetrator	Type	Muslim Dynasty
1193	Ajmer	Ajmer	Mohammed Ghauri	Sultan	Ghurid
1193	Delhi	Delhi	Mohammed Ghauri	Sultan	Ghurid
1193	Kuhram	Karnal	Qutb-ud-Din Aibek	Governor	Mamluk
1193	Samana	Patiala	Qutb-ud-Din Aibek	Governor	Mamluk
1194	Kol	Aligarh	Ghurid Army	Army	Ghurid
1194	Varanasi	Varanasi	Ghurid Army	Army	Ghurid
1202	Nalanda	Patna	Bakhtiyar Khalaji	Commander	Mamluk
1202	Odantapuri	Patna	Bakhtiyar Khalaji	Commander	Mamluk
1202	Vikramsila	Saharsa	Bakhtiyar Khalaji	Commander	Mamluk
1234	Bhilsa	Vidisha	Iltutmish	Sultan	Mamluk
1234	Ujjain	Ujjain	Iltutmish	Sultan	Mamluk
1290	Jhain	Sawai Madhopur	Jalal al-Din Khalaji	Sultan	Khilji
1292	Bhilsa	Vidisha	Ala al-Din Khalaji	Governor	Khilji
1295	Devagiri	Aurangabad	Ala al-Din Khalaji	Governor	Khilji
1299	Somnath	Junagadh	Ulugh Khan	Commander	Khilji
1301	Jhain	Sawai Madhopur	Ala al-Din Khalaji	Sultan	Khilji
1310	Vijapur	Mehsana	Khalaji invaders	Army	Khilji
1311	Chidambaram	South Arcot	Malik Kafur	Commander	Khilji
1311	Madurai	Madurai	Malik Kafur	Commander	Khilji
1323	Bodhan	Nizamabad	Ulugh Khan	Crown Prince	Khilji
1323	Pillalamarri	Nalgonda	Ulugh Khan	Crown Prince	Khilji
1323	Warangal	Warangal	Ulugh Khan	Crown Prince	Khilji
1359	Puri	Puri	Firuz Tughluq	Sultan	Tughlaq

1393	Sainthali	Gurgaon	Bahadur K. Nahar	Commander	Tughlaq
1394	Idar	Sabarkantha	Muzaffar Khan	Governor	Tughlaq
1395	Somnath	Junagadh	Muzaffar Khan	Governor	Tughlaq
1400	Bijbehara	Srinagar	Sikander	Sultan	Shah Miri
1400	Martand	Anantnag	Sikander	Sultan	Shah Miri
1400	Paraspur	Srinagar	Sikander	Sultan	Shah Miri
1400	Tripuresvara	Srinagar	Sikander	Sultan	Shah Miri
1401	Diu	Amreli	Muzaffar Khan	Sultan	Muzaffarid
1401	Idar	Sabarkantha	Muzaffar Khan	Sultan	Muzaffarid
1406	Manvi	Raichur	Firuz Bahmani	Sultan	Bahmani Sultanate
1415	Sidhpur	Mehsana	Ahmed Shah	Sultan	Gujarat Sultanate
1433	Delwara	Sabarkantha	Ahmed Shah	Sultan	Gujarat Sultanate
1442	Kumbhalmir	Udaipur	Mahmud Khalaji	Sultan	Khilji
1457	Mandalgarh	Bhilwara	Mahmud Khalaji	Sultan	Khilji
1462	Malan	Banaskantha	Ala al-Din Suhrab	Commander	*Not Known*
1473	Dwarka	Jamnagar	Mahmud Begdha	Sultan	Muzaffarid
1478	Kanchi	Kanchipuram	Mohammed II Bahmani	Sultan	Bahmani Sultanate
1478	Kondapalle	Krishna	Mohammed II Bahmani	Sultan	Bahmani Sultanate
1505	Amod	Broach	Khalil Shah	Governor	Gujarat Sultanate
1507	Narwar	Shivpuri	Sikander Lodhi	Sultan	Lodhi dynasty
1507	Utgir	Sawai Madhopur	Sikander Lodhi	Sultan	Lodhi dynasty
1517	Nagarkot	Kangra	Khawwas Khan	Governor	Sur dynasty
1518	Gwalior	Gwalior	Ibrahim Lodhi	Sultan	Lodhi dynasty
1531	Devarkonda	Nalgonda	Quli Qutb Shah	Sultan	Qutb Shahi
1552	Narwar	Shivpuri	Dilawar Khan	Governor	*Not Known*
1556	Puri	Puri	Sulaiman Karrani	Sultan	Mughals

1576	Bankapur	Dharwar	Ali Adil Shah	Sultan	Bijapur Sulanate
1579	Ahobilam	Kurnool	Murhari Rao	Commander	Bijapur Sulanate
1586	Ghoda	Pune	Mir Mohammad Zaman	*Not Known*	*Not Known*
1593	Cuddapah	Cuddapah	Murtaza Khan	Commander	*Not Known*
1593	Kalihasti	Chitoor	I'tibar Khan	Commander	Mughals
1599	Srikurman	Vishakapatnam	Qutb Shahi General	Commander	Qutb Shahi
1613	Pushkar	Ajmer	Jahangir	Emperor	Mughals
1632	Varanasi	Varanasi	Shah Jahan	Emperor	Mughals
1635	Orchha	Tikamgarh	Shah Jahan	Emperor	Mughals
1641	Srikakulam	Srikakulam	Sher Mohammad Khan	Commander	Mughals
1642	Udayagiri	Nellore	Ghazi Ali	Commander	*Not Known*
1653	Poonamalle	Kanchipuram	Rustam b Zulfiqar	Commander	*Not Known*
1655	Bodhan	Nizamabad	Aurangzeb	Crown Prince	Mughals
1659	Tuljapur	Osmanabad	Afzal Khan	General	Adil Shahi dynasty
1661	Cooch Behar	Cooch Behar	Mir Jumla	General	Mughals
1662	Devalgaon	Sibsagar	Mir Jumla	General	Mughals
1662	Garhgaon	Sibsagar	Mir Jumla	General	Mughals
1664	Gwalior	Gwalior	Mu'tamad Khan	General	Mughals
1667	Akot	Akola	Mohammad Ashraf	General	*Not Known*
1669	Varanasi	Varanasi	Aurangzeb	Emperor	Mughals
1670	Mathura	Mathura	Aurangzeb	Emperor	Mughals
1679	Jodhpur	Jodhpur	Khan Jahan	Commander	Mughals
1679	Khandela	Sikar	Darab Khan	General	Mughals
1680	Chitor	Chitorgarh	Aurangzeb	Emperor	Mughals
1680	Udaipur	Udaipur	Rahullah Khan	Commander	Mughals
1692	Cuddapah	Cuddapah	Aurangzeb	Emperor	Mughals

1698	Bijapur	Bijapur	Hamid al-Din Khan	Commander	*Not Known*
1698	Sambhar	Jaipur	Shah Sabz Ali	*Not Known*	*Not Known*
1718	Surat	Surat	Mohammad Salih	General	Mughals
1729	Cumbum	Kurnool	Murshid Quli Khan	General	*Not Known*
1729	Udaipur	West Tripura	Haider Quli Khan	Nawab	Mughals

Notes: The underlying data is sourced from Eaton (2000). Dynasty data is sourced from Hunter (1908).

Table B-3: Sites with Multiple Desecrations

Site	Decade of Desecration No. 1	Decade of Desecration No. 2	Decade of Desecration No. 3
Anmakonda	1590	1640	-
Bodhan	1320	1650	-
Brahmagiri	1350	1550	-
Cuddapah	1590	1690	-
Gwalior	1510	1660	-
Idar	1390	1400	-
Jhain	1290	1300	-
Narwar	1500	1550	-
Somnath	1290	1390	-
Srinagar	1400	1400	1400
Udaipur	1680	1720	-
Varanasi	1190	1630	1660

Table B-4: Variables description

Variable	Description	Data source
ikt variables		
Temple Desecration	Dummy equals 1 if atleast one desecration occured at religious site (i) in decade (t).	Eaton (2000)
Muslim Rule	Dummy equals 1 if the religious site (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 religious site (i)'s sample.	Mann et al. (2009)
Own Capital Distance	Distance of religious site *i* to the capital in decade (t).	Various Sources
Muslim Dynasty Length	Number of decaded a Muslim State was in power in period (t)	Hunter (1908) and Lane-Poole (1986)
Muslim Ruler Tenure	Number of years Muslim ruler was in power in state (k) in decade (t).	Hunter (1908) and Lane-Poole (1986)
it variables		
Hindu Muslim Battle	Number of battles fought between a Muslim and a Hindu State within 200 km of religious site (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 religious site (i) in decade. (t)	– "–
i variables		
Soil Nitrogen Density	Soil nitrogen content in religious site (i).	EarthDATA Spatial Data Access Tool (SDAT)
Soil Carbon Density	Soil carbon content in religious site (i).	– "–
Distance to Major Medieval Port	Minimum distance of religious site (i) to a major medieval port.	Jha (2013)

Data Construction

Religious sites

We used two maps from Schwartzberg, Bajpai, and Mathur (1992). The first map shows key religious and cultural sites between 1200 and 1525 AD, and the second map shows them from 1526 to 1707 AD. Superimposing these maps on the territorial maps of modern day India we were able to identify these sites and their coordinates. Overall, we were able to identify 136 religious sites for the first period and 74 for the second period, with a total of 172 different locations.

Temple desecrations

Table B-2 shows the list of all temple desecrations documented by Eaton (2000). We matched the locations to current location of towns and districts and then geo-located them. The 80 events of temple desecrations reported here happened at 66 different sites, out of which 12 sites experienced multiple desecrations over time. We added these sites to the key religious sites found in medieval maps. 25 sites occur in both lists and account for 32 temple desecration events. We add the 41 sites that are not common to both lists to the list of key religious sites. This gives us a total of 213 different religious sites. These are shown in Figure 2.

Construction of panel data

A panel dataset was constructed with 213 sites as the cross sectional variable and 54 decades starting from 1190, which was the beginning of Islamic rulers invading of India, till 1730 which approximately coincides with the decline of the Mughal empire, which was the last major Islamic dynasty in India.

Temperature

The temperature data is obtained from Mann, Zhang, Rutherford, Bradley, Hughes, Shindell, Ammann, Faluvegi, and Ni (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. This corresponds to roughly a 500 km by 500 km grid in India. While the cross sectional variation is coarse, the temporal variation is at an annual level. Even there, the accuracy is high for 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. As we are interested in temperature extremes, it doesn't matter whether we use levels or deviations from a fixed baseline. Using GIS we match the yearly temperature data for each temple location and then take the decadal deviation average.

Identification of polity

The next task was to identify the polity governing a particular religious site in a particular decade. For this, we used 11 maps for different periods from Schwartzberg, Bajpai, and Mathur (1992). We were able to identify 51 polities or dynasties and their approximate political borders. Superimposing these borders on the locations of religious sites allowed us to assign the polities that governed these sites at different periods of time. A significant number of religious sites-decade observations fell into areas where there were no ruling polities identified. These could either be because the polities that governed those sites were too small, or because the sites were in inaccessible locations like mountains, which were free of the control of any State.

We determine the religion of each polity and assign the variable Muslim Rule as 1 if a site in a decade was ruled by a Muslim polity. As there are 11 maps covering a period of 54 decades, these assignments are coarse. Since the measurement error is in the explanatory variable here, it will dampen the coefficients, leading us to lower bounds of actual coefficients.

We also create a variable determining the distance of the site from the capital of the ruling polity – own capital distance. This would be a proxy for the political importance of the site. Here we lose all those observations where we do not know the polity that governed a particular religious site.

We then use historical sources to gather information about the tenure of rulers of all Muslim polities (Hunter, 1908; Lane-Poole, 1986). We use this information to create a variable for the length of the Muslim dynasty for each religious site within a Muslim kingdom – Muslim dynasty length. This proxies for the strength of the dynasty, assuming that older dynasties are different than ones that have just started. We also construct a variable for the length of the tenure of a particular Muslim ruler – Muslim ruler tenure.

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.

We then matched this dataset with our religious sites panel data to identify the battles that happened within a given range of each temple site in that decade. We show results with a range of 200 km but the results are robust to varying the range.

Soil fertility

We use the nitrogen and carbon content of soil as a measure of soil fertility. The data is taken from EarthDATA Spatial Data Access Tool (SDAT). The data has a spatial resolution of 0.08 degree $\times$ 0.08 degree (or roughly 10 $\times$ 10 kilometers). Carbon density of the soil is measured int is kg/cubic meter, while for nitrogen it is in g/cubic centimeter. 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 religious site (i).

Ports

Jha (2013) constructs a list of important ports in medieval India from multiple sources. We use the closeness of a religious site to the port as a proxy for the economic importance of the temple. Using the GIS locations of the religious sites and of the ports, we calculate the distance of all ports from all sites and take distance of each site to its closest port as an 'inverse' measure of economic importance i.e. the smaller the distance, the higher the economic importance of the site. We create a dummy that equals 1 if site i's distance to the nearest medieval port is above the median value.