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THE COLUMBIAN EXCHANGE AND CONFLICT IN ASIA

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ABSTRACT. Difference in difference and event study analyses in a panel of Asian grid cells over nine centuries demonstrate that greater agricultural potential due to New World crops increased violent conflict after 1500. Rising caloric potential in a typical grid cell increased conflict by roughly its mean. The result holds across several New World crops and conflict types. It is largely driven by South Asia, a densely populated, diverse region with several competing historical states. The evidence supports a rapacity effect – increases in the gains from appropriation to Asian and non-Asian belligerents – as a mechanism. Population density, urbanization, and British imperialism significantly mediate the impact of the Columbian Exchange.

1. INTRODUCTION

Did the introduction of New World crops after 1500 increase violent conflict in Asia? Evidence of the effects of productivity on conflict typically consider transitory shocks and short-run responses. Evidence on the impact of more long-lived changes in productivity are less common, with Iyigun, Nunn and Qian (2017*a*) as a notable exception. Over time, many of the proximate causes of conflict, including patterns of settlement and the configuration of states, may respond to permanent productivity increases. How, then, does conflict behave in the long run in response to the introduction of productivity-increasing crops? Further, Asian conflict may have facilitated European imperial expansion and changed trade relations in the centuries after 1500. Understanding the sources of Asian conflict thus helps to account for the Great Divergence in incomes between the West and the rest of the world since the early modern period.

In this paper, we geocode all conflicts in Asia between 1000 and 1900 recorded in Jaques (2007) and map these into a panel of $1^\circ \times 1^\circ$ grid cells by century. We merge these data with caloric suitability data from Galor and Özak (2015), which measures potential

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crop yields both before and after 1500 on the basis of exogenous climatic and soil conditions. We show in both difference in difference and event study specifications that grid cells that gained in land productivity due to the Columbian Exchange saw increases in conflict, including civil conflict. The magnitude of this effect is meaningful. An increase in caloric suitability for a typical grid cell increased conflict incidence by roughly the mean of the outcome variable (0.04 events per century).

We show these results are robust to several alternative estimation strategies. We adjust standard errors for spatial correlation and use spatially correlated randomization inference. We report alternative estimators suited to the nature of our outcome variable – a count variable with several zeroes and a long right tail. We control for differential time trends across small groups of cells. We make restrictions of the sample based on crop suitability, its change after 1500, and the presence of natural access to trade routes. We allow for changes in how we define our units of observation both spatially and temporally. We include additional controls for geography, trade, settlement, and past conflict. We can exclude or add conflicts based on the nature of participants, alternative data sources, and the number of battles recorded for larger wars.

In understanding the mechanisms that explain this main result, we look at both heterogeneity and mediating variables. These suggest that a *rapacity* effect – a rise in the gains from appropriation to belligerents – drives our results. Cells that increased in potential productivity saw their value rise, and became more densely settled and urban. This increased their attractiveness to both Asian and non-Asian political actors. Our results are driven by several New World crops and several types of conflict. They are largely driven by South Asia, a region that, in 1500, was comparatively densely settled, diverse, and housed several competing states. We show that the effects are largest in grid cells that have greater ethnic and genetic diversity in the present day. Mediation analysis supports population density, urbanization, and, to a lesser extent, British imperialism as mechanisms. Like Iyigun, Nunn and Qian (2017*a*), we find that New World crops reduce the impact of weather shocks on conflict, and so the changing response of conflict to adverse weather shocks due to the Columbian Exchange cannot explain our result. We do not find evidence that accumulated state history or greater inequality across or between grid cells explain our result.

1.1. **Contribution.** We contribute principally to two literatures. The first considers the economics of conflict, both in the present and historically. This is now a mature literature that has uncovered several causes of conflict, including resource price shocks (Dube and Vargas, 2013), weather shocks (Harari and Ferrara, 2018; Iyigun, Nunn and Qian, 2017*b*), historical state presence (Heldring, 2018), state capacity (Fearon and Laitin, 2003), the interaction of pathogens and weather shocks (Cervellati, Sunde and Valmori,

2017), colonial partition (Michalopoulos and Papaioannou, 2016), and leader gender (Dube and Harish, 2020). Other branches of this literature have focused instead on issues such as the role of networks of combatant groups (König et al., 2017) or the role of technology in army size (Onorato, Scheve and Stasavage, 2014).

Most closely related to our work are papers that demonstrate rapacity effects – conflicts motivated by the control of a contestable resource. Berman et al. (2017) show that greater mineral prices increase conflict intensity near African mines. Higher food prices in Africa, similarly, reduce conflict over territory in farming areas but increase conflict over the division of surplus (McGuirk and Burke, 2017). Conflicts are particularly likely if resources are concentrated in the territory of a minority group (Morelli and Rohner, 2015), and when they are near the border (Caselli, Morelli and Rohner, 2015). Rainfall shocks increase Maoist attacks on security forces in mining districts of India (Vanden Eynde, 2018). Mass killings too are more prevalent where there are natural resource rents, ethnic polarization, and low labor productivity (Esteban, Morelli and Rohner, 2015).

Our results contribute to this literature by further validating the role of natural resources as a determinant of conflict in a historical sample that is broad in geographic and temporal scope. The rising value of labor-intensive agricultural output can have both opportunity cost effects, by increasing the actors' cost of fighting relative to engaging in productive economic activity, and the aforementioned rapacity effects, by increasing the actors' incentives to control the contestable resource. Past work has found that the opportunity cost effect predominates (Berman and Couttenier, 2015; Collier and Hoeffler, 2004; Dal Bó and Dal Bó, 2011; Dube and Vargas, 2013). Our results contrast with these findings. The long-run nature of our results, in which population and urbanization have time to respond endogenously to the rise in caloric potential, is likely to be an important source for this difference in findings.

The paper closest to ours is Iyigun, Nunn and Qian (2017*a*), who show that the introduction of the white potato reduced violence in Europe, in part because it mitigated the impact of adverse weather shocks on conflict. Our analysis complements theirs in several ways. We examine a broader range of crops using improved suitability data and novel conflict data in a context covering more than half the world's population. Our findings point to an increase in conflict, highlighting the fact that the impact of agricultural productivity shocks – even those that are long lived – depends on the context in which they are experienced.

Second, we contribute to a literature in economics on the Columbian Exchange itself (Crosby, 1972; Nunn and Qian, 2010). Past empirical studies in economics have shown that sweet potatoes mitigated the effect of adverse weather shocks on peasant revolts

in China (Jia, 2014), and that maize increased population growth in China and Africa (Chen and Kung, 2016; Cherniwchan and Moreno-Cruz, 2019). Both Mokyr (1981) and Nunn and Qian (2011) have demonstrated population impacts of the white potato. We examine the direct effects across several New World crops and several conflict types in a broader geographic context and test for heterogeneity in these effects across regions of Asia. Contrary to Jia (2014), we find that the increase in agricultural potential raised conflict incidence. This difference may stem in part from the long-run nature of our analysis, in which population and urbanization can adjust to changes in agricultural productivity.

In Section 2 we explain our identification strategy. In Section 3 we present our data sources and outline the relevant historical background. In Section 4 we outline our results and the robustness exercises that we include in the appendix. In Section 5 we provide our heterogeneity and mediation analysis on mechanisms. Section 6 concludes.

2. Identification Strategy

2.1. **Identification: Difference in Difference.** Our dataset will consist of a set of more than 3,500 $1^\circ \times 1^\circ$ grid cells in Asia, as defined by the United Nations, observed each century. Our sample will start with the century that begins in 1000CE and end with the century that starts in 1800CE. In order to assess the impact of the increase in agricultural potential due to the Columbian Exchange on the prevalence of conflict, we will use both difference in difference and event study approaches. Our difference in difference specification is as follows:

$$ConflictStarts_{it} = \beta CSI_{it} + (x_i' \times Post_t)\gamma + \delta_i + \eta_t + \epsilon_{it} \tag{1}$$

Here, $ConflictStarts_{it}$ is the number of conflict starts observed in grid cell i in century t. In alternative specifications, we will replace $ConflictStarts_{it}$ with other measures of conflict, such as the number of civil conflicts. CSI_{it} is the Galor and Özak (2015) caloric suitability index. Prior to 1500, it is based on Old World crops only. Following European contact with the Americas from 1500 onward, it includes New World crops. Our fixed effects framework will remove the need to control for time-invariant confounding variables. However, because time trends arising from changes in CSI_{it} may correlate with time trends arising from time-invariant characteristics of grid cells, we include $x_i' \times Post_t$ in Equation (1). That is, we control for time-invariant variables interacted with a dummy for the period from 1500 onwards in order to account for these trends.[1] In our baseline, x_i includes only pre-1500 CSI. For robustness we add a wide set of other controls for

[1]In this specification, we interact these variables with a $Post_t$ dummy for symmetry with the CSI_{it}, which only takes one value before 1500 and one value after 1500. Interacting our controls X_i with century fixed

geography, trade, settlement, and past conflict. δ_i and η_t are grid cell and century fixed effects, respectively. Standard errors are clustered by grid cell in the baseline. For robustness, we will report alternative standard errors clustered at broader geographical units and that account for both spatial and serial correlation in the error term, ϵ_{it}.

2.2. **Identification: Event Study.** In our event study approach, by contrast, we estimate:

$$ConflictStarts_{it} = \sum_t \beta_t \Delta CSI_i + x_i' \gamma_t + \delta_i + \eta_t + \epsilon_{it} \tag{2}$$

Here, $ConflictStarts_{it}$, x_i, δ_i, and η_t are defined as in Equation (1). What has changed is that our principal right hand side variable becomes ΔCSI_i, which is the increase in the Galor and Özak (2015) caloric suitability index for cell i after 1500. That is, it is a measure of the extent to which the cell has been "treated" by the Columbian Exchange. We estimate a sequence of time-varying coefficients on this treatment measure, $\sum_t \beta_t$. Following standard conventions, the omitted century is the one beginning in 1400, i.e. the final "pre-treatment" time period. Coefficient estimates of β_t for prior centuries should be close to zero – this would be evidence in favor of the parallel trends assumption. Our control variables, x_i, are now interacted with century fixed effects. As before, we cluster standard errors by grid cell in the baseline.

3. Data and Historical Background

3.1. **Conflict.**

3.1.1. *Data.* Data on conflict come from Jaques (2007). Used previously in several studies, including Moscona, Nunn and Robinson (2018) and Gennaioli and Voth (2015), this is a dictionary of more than 8,000 battles spanning the entire globe. Each entry in the dictionary is a brief description of a battle, where and when it occurred, the participants, and the outcome. For example, one entry is as follows:

> Peshawar | 1001 | Muslim Conquest of Northern India
>
> On campaign from Afghanistan into India, Mahmud of Ghazni attacked the powerful Raja Jaipal of Punjab, previously defeated at Lamghan (989). Outside Peshawar, the Raja and a coalition of Hindu Princes were heavily defeated and Jaipal committed suicide in captivity. Jaipal's son Anandpal was similarly defeated near Peshawar at Waihand in 1006 and 1008 (27 November 1001).

effects, as we do when estimating the event study given in Equation (2), has little effect on our estimate of β (not reported).

Beginning in 1000CE, we geo-locate all events in this source that occurred in Asia according to the coordinates of the settlement closest to the conflict location listed. This approach allows us to bypass the difficulty of identifying the start and end dates of larger wars, which typically spanned multiple battlefield locations and years. We also code the conflict type (e.g. land battle, siege), date, duration, participants, and the coordinates of the participants' capitals. Conflict types are based on descriptions in Jaques (2007). A battle is coded as a civil conflict in two cases:

(1) Immediately prior to this battle, one of the actors was a subject of one of the opposing actors.
(2) If a renegade fights an overlord without substantial external support, that is, no external actors are named as supporting the renegade.

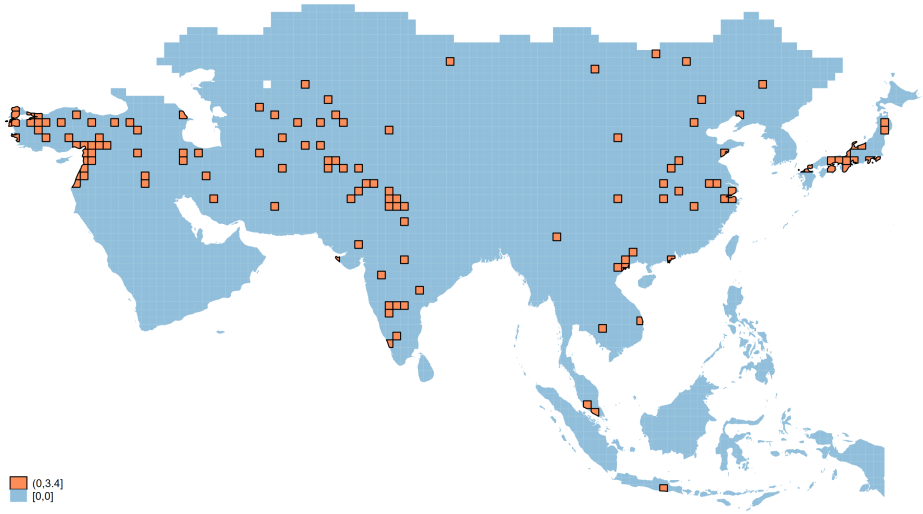
As a result, we have a sample of 1,278 recorded battles in Asia between 1000CE and 1900CE. Land battles fought in the open account for 53 percent of all sample battles, while sieges of strategic outposts (e.g. urban centers) account for another 33 percent. Stormings of strategic outposts account for an additional 20 percent, and the sacking or razing of them an additional 4 percent.[2] Naval battles account for just 7 percent of sample battles. 70 percent of sample battles were interstate conflicts, whereas 30 percent were civil conflicts. 54 percent of sample battles lasted only one day, while another 45 percent lasted multiple days.

For a conflict to be included in Jaques (2007), it must have been written down, cross-referenced with at least two independent sources, and have a consensus among the sources on the main details. As a check on data quality, we construct alternative conflict data that we use in robustness exercises by adding non-overlapping conflicts from a number of sources that differ across Asian sub-regions. For South Asia including India, these come from Clodfelter (2002) and Naravane (1997). For imperial China, these come from the Nanjing Military Academy (2003), as put together by Dincecco and Wang (2018). For the Ottoman Empire, we add events from Bradbury (2004) and Clodfelter (2002).[3] Further robustness checks consider several additional changes to the set of

[2]For purposes of precision, we code battles as either sieges *or* stormings, sackings, or razings, depending on the specific terminology that Jaques (2007) employs in each entry.

[3]In our view, Jaques (2007) is the best source from which to construct the main conflict database for our study. First, unlike Brecke (1999), which starts in 1400CE, or Clodfelter (2002), which starts just prior to 1500CE, the use of Jaques (2007) enables us to start our analysis much farther back in time. Second, the units of observation in Brecke (1999) are wars (i.e. a group of battles which typically span multiple locations and years), whereas the units of observations in Jaques (2007) are battles, which not only makes geo-locating straightforward, but allows us to bypass the difficulty of identifying the start and end dates of larger wars. The conflict details provided by Brecke (1999), moreover, are somewhat vague. For example, one entry simply reads "China (minority in Hebei, Shandong, Anhui, Jiangsu), 1400-02". Third, while Jaques (2007) provides a standardized description for each battle (see the example above), the level of detail provided by Clodfelter (2002) varies idiosyncratically across battles. As described above, in robustness

FIGURE 1. Conflict starts before 1500



conflicts included in our database, such as discarding all conflicts involving non-Asian participants, or excluding the largest wars. Grid cell and century fixed effects and time trends help account for any remaining unobserved differences in data quality and coverage across place and time.

In our baseline analysis, we count the number of conflict starts in a given grid cell in a given century. To give an idea of the spatial dispersion of conflict in our data before and after the Columbian Exchange, we use Figure 1 to show the prevalence of conflict starts before 1500 across grid cells. Similarly, we use Figure 2 to show the prevalence of conflict starts after 1500, and Figure 3 to show the change in the prevalence of conflict between these two broader periods.

Before 1500, there are a number of visible clusters of conflict, including in Anatolia, the Levant, western Central Asia, along the Yangtze River, in the Hong River Delta, and on the islands of Honshu and Shikoku. After 1500, several of these remain active in conflict, but new clusters have emerged, including in the Caucasus, in much of South Asia, in Southern China, in Manchuria, and in the Korean Peninsula.

3.1.2. *Historical Background.* The set of conflicts and actors in our data reflects the changing nature of conflict in Asia over the past millennium. In the first two centuries of the data, events such as the first three Holy Land Crusades, the Muslim conquest of Northern India, the Seljuk Wars of Expansion, and the Genpei War contribute many of the battles seen. Actors who appear frequently include Mahmud of Ghazni, Minamoto Yoshinaka, and key figures in the Crusades, including Bohemund of Taranto, Raymond of Toulouse, Saladin, and Nur-ed-Din. The Crusades were a set of military

checks we still employ alternative conflict data from Clodfelter (2002) and other sources to supplement those from Jaques (2007).

FIGURE 2. Conflict starts after 1500

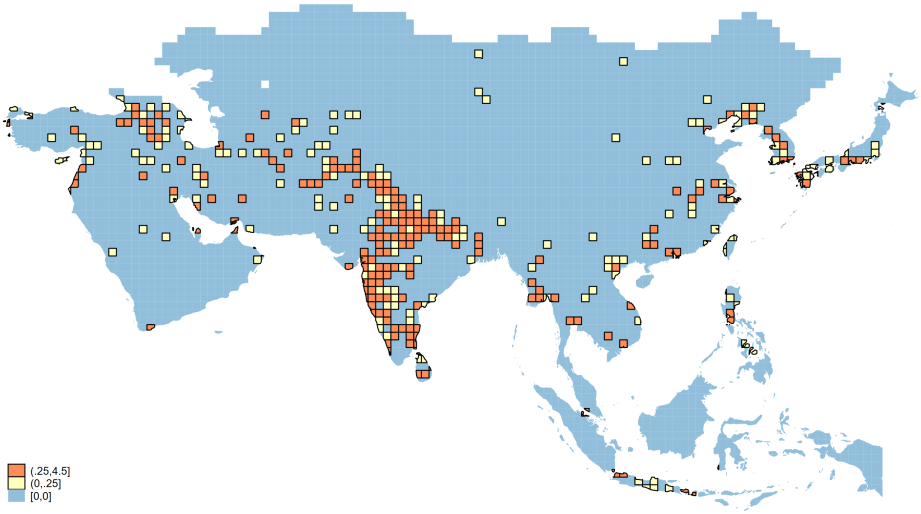
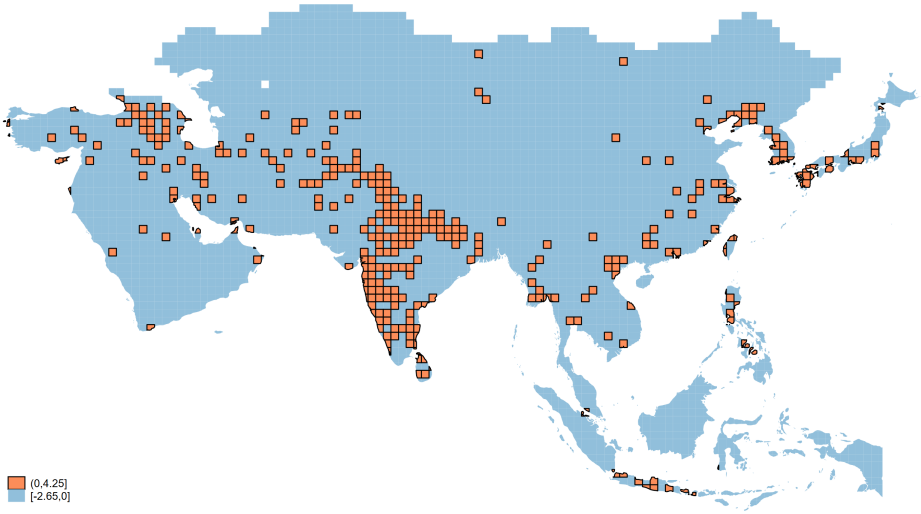


FIGURE 3. Change in conflict starts before and after 1500



campaigns from the eleventh through thirteenth centuries supported by the Roman Catholic Church with the aim of recapturing land between the Jordan River and the Mediterranean that had fallen to Islamic rule (Lock, 2013). Jaques (2007) reports several major events in these campaigns, including the 1098 siege of Orontes and the 1101 relief of Ramleh. Conquests of India by Muslim dynasties such as the Ghaznavids and Ghurids gave rise to the Delhi Sultanate in 1206 (Jackson, 2003). Jaques (2007) notes many events in this process, including Mahmud of Ghazni's attack on Bhera in 1006 and Muhammad of Ghor's rout of Chandwar in 1194. After its foundation in 1037, the Seljuk Empire expanded to encompass much of the area between Anatolia and the Hindu Kush (Peacock, 2015). Battles in the Seljuk expansion recorded in Jaques (2007) include the 1051 siege of Tarq and Beg's conquest of Baghdad in 1055. In Japan, the Genpei civil

conflict between the Minamoto and Taira clans paved the way for the creation of the Kamakura *bakufu* and the beginning of feudal government (Walker, 2015).

From the 1200s onwards, conflicts relating to the Mongols and their successors begin to fill the data, including the conquests of Genghis Khan, the Mongol Wars of Kubilai Khan, and the Conquests of Tamerlane. The rise of the Ming Dynasty, its imperial wars, and its wars in northern Vietnam also feature prominently. In South Asia, the Wars of the Delhi Sultanate and the Vijayanagar-Bahmani Wars contribute several conflict events. Many of the important actors of this period follow from this, including Genghis Khan, Tamerlane, and the Hongwu Emperor Zhu Yuanzhang.

Pre-industrial warfare in Asia differed from that in Europe: it was more violent, more likely to result in the collapse of empires, and featured the asymmetric involvement of Steppe nomads who raided agricultural peoples in times of distress and could retreat indefinitely when defeated (Ko, Koyama and Sng, 2018). After Temujin unified several Mongol Steppe nomads and took the title of Genghis Khan in 1206, the Mongol Empire spread to become the largest land empire in history. This had fractured by 1294 into the Golden Horde, Chagatai Khanate, Ilkhanate, and the Yuan Dynasty in China (May, 2007). Zhu Yuanzhang's forces conquered the Yuan in 1368, and he became the first emperor of the Ming dynasty that would last until 1644 (Mote, 1988). The Ming fought several imperial wars against the Mongols in the 1400s and that appear in Jaques (2007). Tamerlane saw himself as an heir of Genghis Khan and established the Timurid Empire, which by his death in 1405 controlled the former lands of the Golden Horde, Chagatai Khanate, and Ilkhanate (Manz, 1999).

The Delhi Sultanate was the dominant power in India from its foundation in 1206 until its conquest by Babur in 1526 gave rise to the Mughal Empire (Jackson, 2003). It fought a number of battles against other states in the region, including Deogiri and the Kingdom of Kakatiya (Jaques, 2007). The Vijayanagara Empire, based in India's Deccan Plateau, was a major power in the south of present-day India, and began to decline after its loss to the Deccan sultanates at the Battle of Talikota in 1565 (Sinopoli, 2000).

Between 1500 and 1700, many of the events in our data remain between Asian parties: the Japanese Era of the Warring States, the Japanese invasion of Korea, the Mughal Conquest of Northern India, Mughal conflicts with the Marathas, and the Manchu conquest of China all feature heavily. Mughal Emperors such as Babur, Akbar, and Humayun become frequent conflict actors, as do Japanese *daimyo* like Toyotomi Hideyoshi. With the weakening of the central authority of the Ashikaga *bakufu*, Japan descended from 1467 to 1582 into a period of conflict between local domain lords, or *daimyo*, which ended with Toyotomi Hideyoshi's completion of the military unification begun under

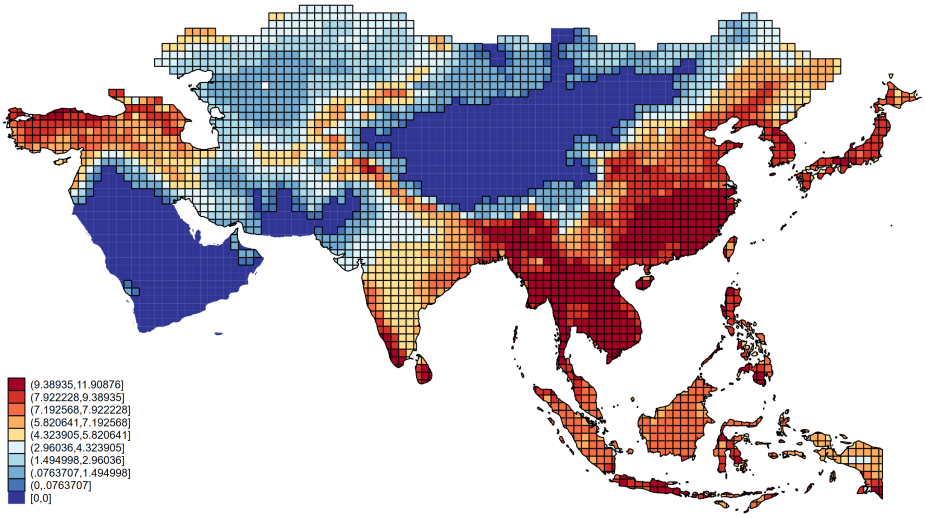
Oda Nobunaga. Hideyoshi's invasion of Korea in 1592 ultimately failed and his successor, Tokugawa Ieyasu, founded the Tokugawa Shogunate (Walker, 2015). The Mughal empire expanded to cover most of the Indian subcontinent by the death of Emperor Aurangzeb in 1707, before beginning a period of decline (Dalrymple, 2019). Events from the Mughal conquests in our data include the victories against Sultan Nasrat Ali at Gogra in 1529 and against the Deccan Sultanates in Bijapur in 1685-86 (Jaques, 2007). The Maratha Confederacy began with the coronation of Shivaji in 1674 and displaced the Mughals from much of modern India (Dalrymple, 2019). Events involving Mughal conflict with the Marathas in our data include a 1729 battle near Jaitpur and the Mughal capture of Kalyan in 1682 (Jaques, 2007). The Manchu conquest of China between 1618 and 1683 saw the Qing Empire replace the Ming and the unification of several regions outside China proper (Peterson, 2016). Jaques (2007) records many major events in this process, including the Ming repulsion of an attack on Ningyuan in 1626 and the failed attempt of the Ming to recapture Nanjing in 1659.

It is only after 1700 that conflicts involving Europeans begin to contribute a large number of events outside of the Middle East, including the Seven Years' War, the Carnatic Wars, the Indian Mutiny, and the First British Afghan War. Names of actors such as Akbar Khan, Tantia Topi, and General Sir Hugh Rose rise to prominence. Three Carnatic Wars in India between 1746 and 1763 were fought between the French East India Company, the British East India Company, and their Indian allies. Indeed, the Third Carnatic War (1756-1763) was an outgrowth of the Seven Years' War (Dalrymple, 2019). Jaques (2007) reports several battles in these conflicts, including the French taking of the British fort at Madras in 1746 and the ambush of Robert Clive by Raza Sahib at Kveripak in 1752. The Indian Rebellion of 1857 began in Meerut as a mutiny by Indian infantrymen in the British East India Company, but soon expanded into a widespread rebellion based on diverse grievances including resistance to social changes and land taxes (David, 2003). Here, coverage in Jaques (2007) is particularly thorough, including Colin Campbell's capture of Sikander Bagh and the rout of Tantia Topi at Sikar. The First British Afghan War took place between 1839 and 1942, when the British East India Company was defeated following its intervention in a succession dispute in Afghanistan. Battles like those at Ali Masjid and Tenzin in 1842 appear in Jaques (2007).

3.2. **Caloric suitability.**

3.2.1. *Data.* Our data on caloric suitability are taken from Galor and Özak (2015), and have been previously used in Galor and Özak (2016) and Galor, Özak and Sarid (2016). These data improve over past measures of land quality (e.g. Ramankutty et al., 2002) by taking potential caloric output into account. These are constructed using raster data from the FAO's Global Agro-Ecological Zones (GAEZ) project, which reports expected

FIGURE 4. Caloric suitability before 1500



rain-fed, low-input crop yields based on soil quality and climate. Galor and Özak (2015) convert these from tons per hectare per year to thousands of calories per hectare per year based on caloric data from the United States Department of Agriculture. Throughout, we will work with units of one million calories per hectare per year. Taking 2,500 calories per day as a guide, this would be roughly equivalent to the output needed to support an additional adult male.

These are reported separately for the crops available before and after 1500. They report caloric suitability separately for the crops available in a given grid cell prior to 1500 and after, based on the exchange of crops after European contact with the Americas. These are reported as raster data on a $5' \times 5'$ grid (approximately 6 miles by 6 miles at the equator). We average over raster points within a $1^\circ \times 1^\circ$ grid cell in order to compute a caloric suitability measure for that grid cell. This index varies over time for cells within our data primarily due to the introduction of New World Crops. Those New World crops for which Galor and Özak (2015) have made crop-specific suitability data available are: beans, cassava, coconuts, groundnuts, maize, sunflower, sweet potatoes, tomatoes, and white potatoes.

To give an idea of the spatial dispersion of caloric suitability in our data before and after the Columbian Exchange, we use Figure 4 to show average caloric suitability before 1500 for each grid cell. We then use Figure 5 to show average caloric suitability after 1500, and Figure 6 to show the change caloric suitability as a result of the Columbian Exchange.

Before 1500, the most fertile regions of Asia are concentrated in southern China, Japan, and southeast Asia. After 1500, gains in caloric suitability are concentrated in Northern

FIGURE 5. Caloric suitability after 1500

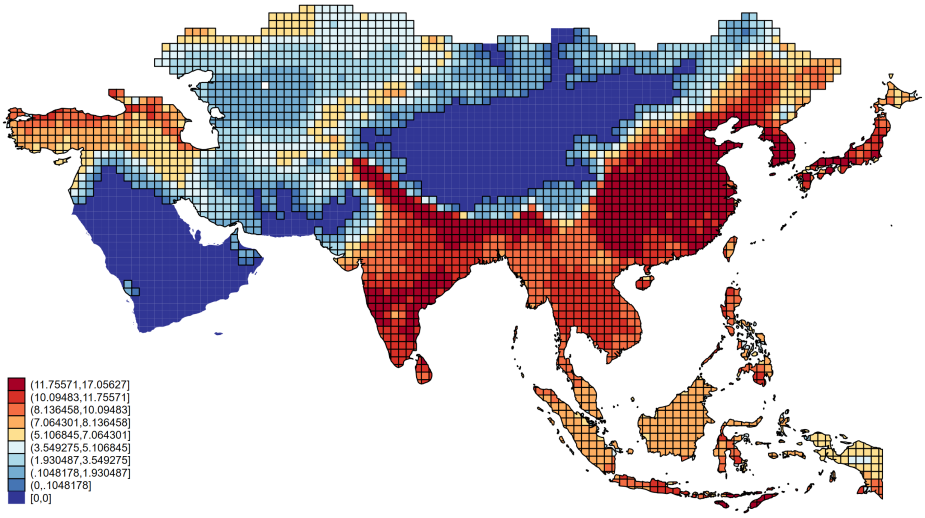
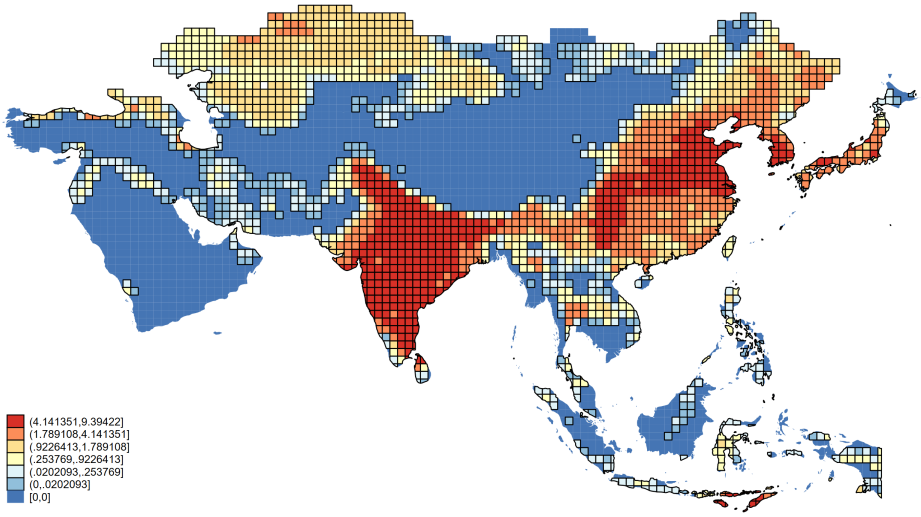


FIGURE 6. The Columbian Exchange: Change in caloric suitability



and Western China, the Korean peninsula, Japan, and much of South Asia. Particularly in the Korean peninsula, South Asia, and southern Japan, there is a clear overlap between cells that gained from the Columbian Exchange, and those that saw conflict increase after 1500.

To provide a sense of which New World crops contributed the most to gains in agricultural productivity, we computed the increase in caloric suitability in each cell, calculated as the difference (if positive) between caloric suitability for each new crop minus caloric suitability prior to 1500. Many cells experienced mean gains due to the introduction of New World crops, with maize by far the most important to rising agricultural productivity, followed by sunflower, groundnuts, coconuts, cassava, beans, and sweet potatoes in that order.

3.2.2. *Historical Background.* The New World crops that became available in Asia after the Columbian Exchange were primarily tubers – cassava, white potatoes, and sweet potatoes. Maize was the primary cereal that Asia gained from the New World, whereas several major cereals were already present (Mayshar et al., 2015). Many of these new crops had different soil and weather requirements than Old World crops, and so could complement them by being grown in other seasons or on land that would otherwise be unproductive (Crosby, 1972). Many foods that did not become major sources of calories in Asia were, however, important because of their other nutritional benefits. Capsicum peppers have become important in the cuisines of South and South East Asia, as well as southwestern China; these provide vitamins A, B, and C, magnesium, and iron. Tomatoes, similarly, are rich in vitamins A and C (Nunn and Qian, 2010). Chili peppers also aid in food preservation (Walton, 2018).

New World crops arrived early in the Middle East. Maize was available by the 1500s, and words for maize elsewhere in Asia reflect their perceived origin in an Islamic region (Crosby, 1972). The Philippines were a major source of diffusion of New World crops to the rest of Asia, after the Spanish introduction of "Castilian seeds." Cassava reached the Philippines by the 1600s (Mazumdar, 1999). Several New World food items made it into the Japanese diet during the sixteenth century, including sweet potatoes, white potatoes, and red peppers (Bestor and Bestor, 2011). In Indonesia, sweet potatoes may have arrived before Europeans, and maize was a staple before 1700. By 1800, it was the most important secondary crop in Java. Cassava produces nearly twice as many calories per hectare as rice on Java, and survives on more marginal land. It is also an important staple in Sumatra today (Boomgaard, 2003; Crosby, 1972; Dixon, 1982).

It was the Spanish and Portuguese who brought New World crops to China, largely through Guangdong and Fujian. The overland route from northeastern India to Bengal and Assam was also a source of new varieties (Mazumdar, 1999). In land-scarce China, the adoption of New World crops was comparatively rapid (Earle, 2012). 55% of the country's land was suitable for maize and 20% for sweet potatoes. For the first 200 years after its introduction in 1580, maize spread slowly from the three initial places it was introduced – Gansu, Yunnan, and Fujian. After 1750, it spread more rapidly into regions suitable for its cultivation, including the lower Yangtze, the North China plain, and the valleys of Sichuan (Chen and Kung, 2016).

Sweet potatoes and groundnuts were the basis of an agricultural revolution in China at the end of the 1500s (Mazumdar, 1999). Chinese businessmen working in Southeast Asia brought sweet potatoes back with them; government promotion only became important from the middle of the 1700s (Jia, 2014). Sweet potatoes arrived via Guangdong and Fujian, and became a substitute for rice (Mazumdar, 1999). Southern provinces

adopted them by the middle of the late 1600s, and northern provinces by the middle of the 1700s.

Maize became a staple of China's inland highlands, and was prevalent in Sichuan and Hubei before 1700. Sweet potatoes grew in marginal soil, resisted drought, withstood pests, and demanded little labor (Mazumdar, 1999). They allowed new land to be brought under cultivation (Earle, 2012). These combined productivity and insurance effects of sweet potatoes fueled population growth, and mitigated the impact of drought on peasant revolts (Jia, 2014). The adoption of sweet potatoes and maize was driven by peasants, rather than elites, due to their high caloric content and lower labor requirements (Earle, 2012). Groundnuts were introduced as early as 1538 (Mazumdar, 1999).

In India, the Portuguese and Dutch introduced most New World crops in the regions around Goa, Surat, Cochin, and Bengal (Mazumdar, 1999). The diffusion of New World crops was slower in India than in China, possibly due to lower pressure on agricultural land; their adoption increased under colonial pressure (Earle, 2012) and was particularly notable in the nineteenth century (Mazumdar, 1999). New World crops are noted in several sources earlier: pineapples were regularly served to the Mughal emperor Akbar, and guavas were also noted by accounts from the 1600s (Crosby, 1972; Mazumdar, 1999). Sweet potatoes are noted as early as 1615 and were common in the south by the 1670s. Potatoes were actively encouraged by the colonial government in the nineteenth century, and became (with the tomato) an urban staple (Mazumdar, 1999). They were cultivated in mountains and as a winter crop, and eaten especially on fast days when Hindus are not permitted to eat grain (Crosby, 1972).

Cassava was not widespread in India until the 1850s (Crosby, 1972), and was promoted by the local ruler in Kerala in the 1880s (Mazumdar, 1999). It became a staple in Assam, Travancore, and Cochin (Crosby, 1972). It was maize that had the greatest impact on Indian agriculture (Mazumdar, 1999). It was assessed for taxes in Rajasthan by 1664, and became a staple of the poorer highlands of the Himalayas and the poor in the Punjab, Uttar Pradesh, and Bihar (Crosby, 1972; Mazumdar, 1999). There was also maize cultivation in seventeenth-century Maharashtra (Habib, 1980). Maize and groundnuts both became casual foods of urban areas (Mazumdar, 1999). The Columbian Exchange brought chili peppers to Thailand and India (Earle, 2012). The spread of American foods in India from the late 1700s coincides with the subcontinent's rapid uptick in population growth (Crosby, 1972).

Beyond new crops, the Columbian Exchange may have introduced other phenomena into Asia. Our analysis will account for time-varying unobservable features of the Columbian Exchange (e.g. new ideas) through local time trends, interaction effects, and a variety of robustness checks. Unlike indigenous populations in the Americas,

Asian populations were typically immune to the same diseases (e.g. measles, smallpox) as were Europeans (Diamond, 2005). Gunpowder and firearms were invented in ninth-century China, and spread across Eurasia (Hoffman, 2015). Piercing and cutting weapons were also commonplace. Hoffman (2015) argues that enduring differences in geopolitical contexts across Eurasia help explain why military technology advanced most rapidly in early modern Europe. For the above reasons, we do not expect either the introduction of new diseases or greater access to new military technology due to the Columbian Exchange to confound our analysis.[4]

3.3. **Data: Other Variables.** We use a variety of additional controls and candidate mediator variables in our analysis. As possible geographic confounders, we compute latitude, longitude, and distance from the coast for each cell ourselves using ArcMAP. Several variables are available as raster data, and we average these over points within a $1^\circ \times 1^\circ$ grid cell. These include terrain ruggedness from Nunn and Puga (2012), population density from Klein Goldewijk et al. (2011), and altitude from the FAO-GAEZ project. We control for presence of a river recorded in the Natural Earth project.[5] We use the populations of cities estimated by Chandler (1987) and Modelski (2003), which have been compiled and geo-coded by Reba, Reitsma and Seto (2016).[6] We will also make use of gridded temperature reconstruction data from Mann et al. (2009). We introduce additional controls and candidate mediators below when they are used for the first time.

3.4. **Summary Statistics.** We present summary statistics in Table 1. The mean of our outcome variable is 0.039, implying that a typical cell in our data experiences a conflict once every 25 centuries. The distribution of conflict events is, however, skewed, with some cells experiencing as many as 16 events in a century. Civil conflicts, being a subset of all conflict events, are more rare.

The mean cell in our data has a caloric suitability index of 4.81 million calories per hectare, though this mean also masks considerable heterogeneity. For the most productive cells in the sample, this is as high as 17.1 million, while other cells are completely unsuitable for agriculture.

[4]Over time, improvements in military technology made financial resources more important to battlefield success (Gennaioli and Voth, 2015). Our analysis will account for the rising costs of warfare through century fixed effects as well as local time trends and interaction effects.

[5]`http://www.naturalearthdata.com/`

[6]These data form an unbalanced panel of city sizes. For our analyses, we interpolate city populations geometrically between reported years. In years prior to the first reported city size, we assume a city grew geometrically in size from a population of 1 in 2250 BCE. We also assume a city ceased growing after the final reported city size. These imputations will be relevant to the mediation analysis presented in Table 9, the results of which are robust to making the alternative assumption that cities start at a population of 0, and only change stepwise each time a new city size is reported.

4. Results

4.1. **Main Results.** We present our main estimates of Equation (1) with grid cell and century fixed effects in Table 2. In Table 3, we add the geographic controls for latitude, longitude, ruggedness, altitude, distance from the coast, and rivers. In both tables, columns (1) and (2) consider all conflict starts as the dependent variable, while columns (3) and (4) consider civil conflict starts. Columns (2) and (4) add the interaction of pre-1500 caloric suitability with a post-1500 dummy, in order to account for any potential trend differences that may correlate with initial land quality. Coefficients are not sensitive to geographic controls interacted with the post-1500 indicator.

In both tables and across specifications, we find that increases in potential land productivity due to the Columbian Exchange increased the number of conflicts, including civil conflicts. The magnitude of these results is sizable: a one unit (i.e. one million calories per hectare per year) increase in caloric suitability raised conflict in a given grid cell by 0.041 events per century. The mean gain in caloric suitability from the Columbian Exchange in our sample was 1.11 units. So: the mean Columbian Exchange treatment raised conflict incidence by $0.041 \times 1.11 = 0.046$ events in a century, which is slightly larger than its mean. As an alternative approach to considering magnitudes, a one standard deviation increase in caloric suitability (4.12) raised conflict in a cell by $0.041 \times 4.12 = 0.167$ events in a century, compared with a standard deviation of 0.36. Roughly half of this increase comes from civil conflict.

The coefficient on the interaction of pre-1500 caloric suitability with a post-1500 dummy is insignificant in several specifications, much smaller than the coefficient on time-varying caloric suitability, and negative. This on its own serves as a sort of placebo that validates the parallel trends assumption. As further evidence, we present our estimates of Equation (2) as event-study graphs in Figures 7 and 8. These correspond to specifications in which pre-1500 caloric suitability has been included as a control, interacted with the century fixed effects. Both figures show a similar pattern: coefficients on the interaction of the change in caloric suitability with century dummies are close to zero before the century beginning in 1400 (i.e. the final "pre-treatment" time period, which we omit), validating the parallel trends assumption. From 1500, conflict becomes more prevalent in cells that benefitted more from the Columbian Exchange. This increase is gradual, but growing over time. This is consistent with the slow diffusion of New World crops throughout Asia. Our results should be taken as intent-to-treat estimates, not of the impact of the cultivation of New World crops *per se* but of the capacity to cultivate them.

In Table 4, we replace the caloric suitability index with a measure of the suitability for a given New World crop, interacted with post. We consider all New World food crops

FIGURE 7. Event study results: Conflict starts

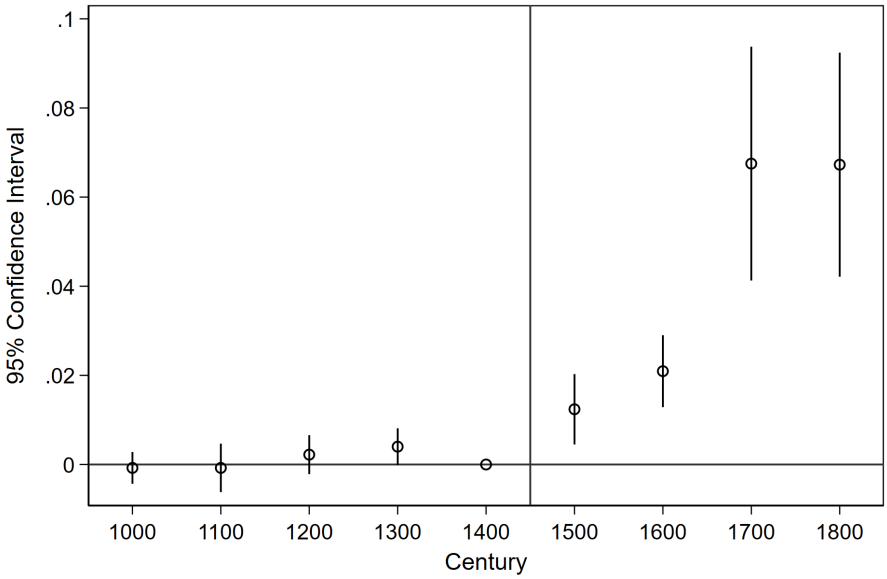
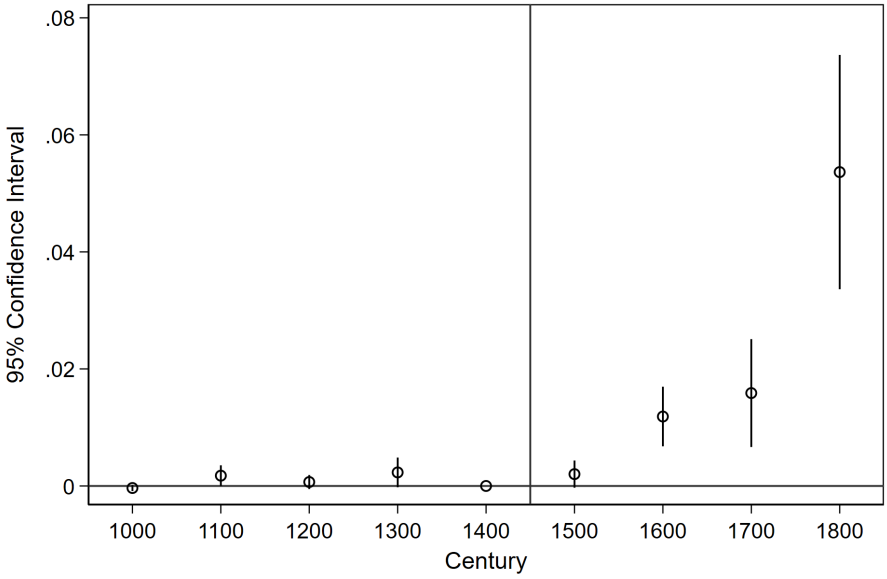


FIGURE 8. Event study results: Civil conflict starts



that Galor and Özak (2015) have made available: beans, cassava, coconuts, groundnuts, maize, sunflower, sweet potatoes, tomatoes, and white potatoes. We find that our results are driven by a wide set of crops. The key exceptions are white potatoes and coconuts. As in Iyigun, Nunn and Qian (2017*a*), white potatoes have a conflict-dampening effect in some specifications.

4.2. **Robustness.** In this section, we outline a number of robustness exercises that we report in the appendix.

We take three alternative approaches to *standard errors*. The first is Conley (1999) standard errors that account for spatial correlation up to cutoffs of, in alternative specifications, 500, 1000, 1500, and 2000km. These also permit serial correlation up to ten lags.[7] Our results, in Table A1, remain significant at the 5 percent level across cutoffs. The second is spatially unconstrained randomization inference. We randomly reallocate the caloric suitability indices across grid cells in our data and re-estimate Equation (1). We do this 999 times, and plot the distribution of coefficient estimates in Figure A1. These are narrowly concentrated around zero. We do not plot our baseline results in these figures because they lie far outside the distribution of coefficients generated in this placebo exercise. Our baseline coefficient estimates are nearly four times as large as the largest estimate that we obtain when instead using randomly reallocated caloric suitability. It is unlikely, then, that estimates of the same magnitude as ours could be generated by chance.

Because this procedure may not be sufficiently conservative given the spatial correlation in variables such as conflict and caloric suitability (Kelly, 2019), our third approach is an alterative in which we only reallocate caloric suitability across cells with centroids within 500km. We again do this 999 times, and plot the distribution of coefficient estimates in Figure A2. Now, the coefficient estimates are often larger than zero, albeit smaller than our baseline estimates. This is unsurprising, as the placebo values of caloric suitability assigned to each cell will be correlated with the true values. However, it is still clear that the estimates produced are much smaller than our baseline estimates, which are now indicated with vertical lines. In all four cases, corresponding to the columns of Table 2, our baseline estimates are larger than the maximum of the coefficients obtained through randomization inference. Even noise that is highly correlated with the true treatment variable is unlikely to produce a treatment effect similar to the one we estimate.

We consider several alternative approaches to *estimation*. Because our outcome variable is a count variable with a large number of zeroes, we begin by estimating a Poisson estimator with high-dimensional fixed effects (Guimaraes and Portugal, 2010). The results, in Table A2, remain positive and significant. Alternatively, because there are some observations with many more conflict events than the mean, we transform our dependent variables using $\ln(1+x)$ in Table A3, and the results remain robust.[8] Including a lagged dependent variable, in Table A4, does little to our coefficient estimates.

[7] We use Thiemo Fetzer's implementation based on Hsiang (2010).

[8] Recoding our outcome variables as dummies for the presence of any conflict start or civil conflict start in a cell in a given century also gives results that are positive and significant, though we do not report these.

Because of the computational infeasibility of including more than 3,500 cell-specific time trends as controls, we instead control for trends for broader cells: $5^\circ \times 5^\circ$, $4^\circ \times 4^\circ$, $3^\circ \times 3^\circ$, and $2^\circ \times 2^\circ$. We report these results in Table A5. Although these reduce our coefficient estimates, the results for conflict starts remain positive and significant across all cell sizes, while those for civil conflicts remain positive and significant with linear trends for $5^\circ \times 5^\circ$ cells. Given the gradual response to treatment that is evident in Figures 7 and 8, we do not believe these trends are appropriate controls in our baseline, but we do believe this is evidence that the results we find are not simply artifacts of differential trends across cells that would have existed in the absence of the Columbian Exchange. Alternatively, we control for (anachronistic) country $\times$ century fixed effects in Table A6. Although smaller than in the baseline, the coefficient estimates remain positive and significant.

We consider several alternative *sample* restrictions. We use two approaches to show that our results are not driven by the inclusion of low-potential cells in the data. In Table A7, we show that results hold restricting to a sample of cells that experienced a positive change in caloric suitability as a result of the Columbian Exchange. In Table A8, we discard cells that are in the bottom quintile, bottom two quintiles, and bottom three quintiles of pre-1500 caloric suitability. The results remain positive and significant across these sample restrictions. Although our data span all of Asia, it is not the case that our results are driven by comparing a broad set of agriculturally poor cells to a small subset that are either high-productivity or that made exceptional gains due to the Columbian Exchange.

To rule out the possibility that our results are confounded by correlations between the gains due to the Columbian Exchange and gains from trade after 1500, in Table A9 we discard all cells that are coastal or intersected by a river. Results remain robust and are not, therefore, driven by a coincidental increase in caloric suitability in the locations that may have seen the greatest increase in trade due to other natural features after 1500.

We also consider several alternative *units of observation*. In Table A10, we show that our results continue to hold when data are aggregated to $2^\circ \times 2^\circ$, $3^\circ \times 3^\circ$, $4^\circ \times 4^\circ$, and even $5^\circ \times 5^\circ$ grid cells. In Table A11, we show that our results remain positive and significant in all but one specification if the time window used to define a period is narrowed to 50 years or widened to 250.

We include several *additional controls* not in our baseline analysis. In Table A12, we control for conflicts prior to 1500, interacted with a dummy for 1500 and later. In Table A13, we control for distance from the closest city reported in Reba, Reitsma and Seto (2016), interacted with a dummy for 1500 and later. In Table A14, we control for whether a cell is intersected by one of the trade routes existing in 1500 mapped by

Kennedy (2002), interacted with a dummy for 1500 and later. In Table A15 we interact the Beck and Sieber (2010) index of suitability for nomadic pastoralism with the "post" dummy. Our results remain similar to the baseline across these specifications, and so it is unlikely that our results are driven by spurious correlations between the post-1500 increase in caloric suitability and past legacies of conflict, prior urbanization, declining overland trade including the Silk Roads, or changes in the role of the pastoralist groups such as the Mongols that featured prominently in warfare before 1500.

We make several changes to the *set of conflicts* included in our database. In Table A16, we discard all conflicts involving at least one non-Asian participant. Results continue to be positive and significant, and so our results are not driven exclusively by European imperialism, even if it may be one important mechanism. Adding additional conflicts for South Asia from Clodfelter (2002) and Naravane (1997) (Table A17), for China from Dincecco and Wang (2018) (Table A18), or for Turkey from Clodfelter (2002) and Bradbury (2004) (Table A19) do not change the results appreciably. Because some broader wars involve a large number of battles (such as the Crusader-Muslim Wars or the Mughal-Maratha Wars), we show in Table A20 that excluding the largest (by number of events), 3 largest, 5 largest, and even 10 largest wars from the data does not lead the link between the Columbian Exchange and conflict to become statistically insignificant. Our results are not, then, driven by a small number of outliers. Similarly, as an alternative check whether imperialism drives our results, we exclude conflicts between participants whose capitals are more than 500, 1000, 1500, and 2000 km apart in Table A21. Again, the results remain robust. A list of the wars in our data and the number of battles recorded for each is in Table A22.

5. Mechanisms

5.1. **Conceptual Framework.** We base our consideration of possible mechanisms on prior literature in economics. Many studies focus on the dichotomy between opportunity cost and rapacity effects highlighted by Dal Bó and Dal Bó (2011). Adapted to our context, the relationship between an increase in agricultural productivity due to the Columbian Exchange and conflict can in theory go either way. On one hand, greater agricultural productivity can have opportunity cost effects, by raising the actors' cost of fighting relative to engaging in (now more productive) economic activity. On the other hand, greater agricultural productivity can have rapacity effects, by increasing the actors' incentives to control the (now more valuable) contestable resource. That we find an increase in conflict in response to an increase in agricultural productivity after 1500 suggests that the opportunity cost effect is unlikely to operate in our data, since this

effect would have reduced the incentive for engaging in violence rather than in productive economic activity. It thus makes sense to focus on *rapacity* as a broad category of mechanisms.

Rapacity is an incentive often cited in explanations of present-day conflict (Berman et al., 2017; McGuirk and Burke, 2017). As cells become more productive, this might increase population, urbanization, and the value of land. Nunn and Qian (2011), Chen and Kung (2016), and Cherniwchan and Moreno-Cruz (2019) have all demonstrated population effects of New World crops in other data. Crosby (1972) himself linked population in the Old World after 1500 to the greater caloric content of New World crops; potatoes, for example, produced 7.5 million calories per hectare, versus 4.2 for wheat (Earle, 2012). This would make cells more valuable prizes for both Asian and non-Asian belligerents which, following a logic similar to Dube and Vargas (2013), could increase conflict. Increases in population, urbanization, and the value of land could also facilitate trade and other interactions that could themselves result in conflict (Acemoglu, Fergusson and Johnson, 2020; Brückner, 2010; Desmet, Ortuño-Ortín and Wacziarg, 2012). These effects might be greatest where inter-group and intra-group diversity reduce social cohesion and can form the basis for coalitions that contest power and economic gains (Arbatlı et al., 2020; Esteban, Mayoral and Ray, 2012*a*,*b*).

Consistent with a rapacity-based interpretation, many of the battles in Jaques (2007) after 1700, once there had been time for New World crops to diffuse, are attempts at territorial conquests in areas that had increased in caloric potential. Zaman Shah Durrani, ruler of the Afghan Durrani empire, made several incursions into the Punjab during the 1790s (Singh, 2008). He fought battles in locations such as Gujrat and Amritsar, which fall into grid cells in the top 3% of all cells in our data for white potato suitability, 4% for sweet potato suitability, and the top 2% for maize suitability. The Second Anglo-Sikh War of 1848-49, by which the British East India Company annexed the Punjab, occurred in many of the same locations (Lawrence, 1997). In China, several battles of the Taiping Rebellion of 1851-1864 took place in locations such as Zhenjiang, Nanjing, Yuhuatai, and Changzhou, which are in the top 1% of cells for maize suitability in the data. Led by Hong Xiuquan, the Taipings were able to establish control over much of southern China, commanding territory with a population of almost 30 million (Kuhn, 1978).

5.2. **Heterogeneity.** We begin our investigation of the mechanisms driving our result by examining its heterogeneity.

To start, recall that we replaced the caloric suitability index with a measure of the suitability for a given New World crop in Table 4. That we find a conflict-promoting impact for sweet potatoes implies that there is a mechanism that offsets the effects of drought resistance that lessened the link between drought and peasant revolts in China

(Jia, 2014). While the ability to leave cassava in the ground unharvested for long periods (Hillocks, Thresh and Bellotti, 2002) may facilitate conflict, this too cannot be a complete explanation, since several other crops also display positive and significant coefficients.

In Table 5, we look at different conflict types. That is, instead of counting all conflict starts together, we use as dependent variables events such as land battles, sieges, stormings, or sackings or razings. Across a wide set of conflict types, increasing caloric suitability due to the Columbian Exchange drives significantly greater violence. Our results are not, then, driven by any one type of conflict.

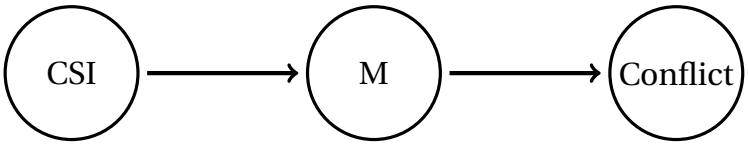
We use Table 6 to divide our sample according to UN sub-regions: Central Asia, Eastern Asia, Southeastern Asia, Southern Asia, and Western Asia. Here, the results are informative. While there is some limited evidence that the effect we find exists in Eastern and Western Asia, depending on the specification, the table makes it clear that our results are driven primarily by South Asia. That is, the mechanisms that drive our result are those that operate in a densely-settled environment with considerable population heterogeneity and several small competing states on the eve of the Columbian Exchange (de la Garza, 2016; Gommans, 2003; Roy, 1994).[9]

To explore these features further, we examine whether the impact of caloric suitability is greater in regions of greater population diversity. We employ two measures of diversity – ethnic and genetic. The literature has taken these as measures of inter-group and intra-group diversity, respectively. This analysis should be read as speculative, since we are unable to measure heterogeneity in the past, and contemporary measures of diversity may be outcomes of both the Columbian Exchange and of historic conflicts. In the case of genetic diversity, our data are based on a small number of underlying data points.

In Table 7, we investigate whether more genetically diverse grid cells respond more to the Columbian Exchange. We begin by using data from Arbatlı et al. (2020) to identify the heterozygosity of 207 ethnic groups around the globe, as well as the coordinates of their centroid. To impute genetic diversity across the cells in our sample, we take a weighted average of the cells with non-missing heterozygosity data, where weights decay quadratically with distance from the grid cell in question. Although this involves substantial spatial imputation, the result is a pattern by which imputed diversity is largely a function of migratory distance from Addis Ababa (Ashraf and Galor, 2013). By this measure, the response to caloric suitability is greater in more genetically diverse cells.

[9]Historically a tributary international order helped promote stability in Eastern Asia (Kang, 2020). This order may have mitigated the impact of the introduction of New World crops on conflict in this subregion.

FIGURE 9. A simple model of mediation



Following Michalopoulos (2012), we measure ethnic diversity as the log of the number of ethnic groups recorded within a grid cell in the *Ethnologue* map of languages. In Table 8, we show that grid cells with a larger number of ethnic groups – i.e. more diverse cells – experience a greater conflict response to the caloric suitability increases due to the Columbian Exchange.

Taking stock: our results are driven by several types of New World crop and types of conflict, but operate primarily in South Asia, and in regions of greater genetic and ethnic diversity.

5.3. **Mediation.** Next, we consider possible mediators. Consider a simple model of mediation, as represented by the directed acyclic graph in Figure 9. Here, caloric suitability (CSI) affects the final outcome ($Conflict$) through an intermediate variable (M). In this sub-section, we provide evidence for three intermediate mediators – population density, urbanization, and the spread of the British Empire. We also discuss a number of other possible mediators for which we do not find evidence of their importance, namely accumulated state history and inequality within or across grid cells.

We begin by considering urbanization and population density. Our data on urbanization are taken from Reba, Reitsma and Seto (2016), while our data on population density are taken from Klein Goldewijk et al. (2011). In Table 9, we perform three exercises. First, in the top panel, we estimate Equation (1), but replacing the dependent variable with one of the two candidate mediator variables, M. Second, in the bottom panel, we estimate Equation (1), including them as additional control variables. Third, we use the mediation analysis proposed by Imai, Keele and Yamamoto (2010) in order to assess the percentage of the impact of caloric suitability that is mediated by each of these two variables.[10] Note that this final step should be interpreted as suggestive only: all mediation analyses are premised on the sequential ignorability assumption that the mediator is assumed to be ignorable (i.e. uncorrelated with omitted determinants of the outcome) conditional on both observed controls and the exogenous treatment (in our case caloric suitability).

Columns (1) and (2) of Table 9 show that the increase in caloric suitability raised the urban population of the affected cells. Columns (3) and (4) show a similar effect on

[10]In particular, we use the implementation made available by Hicks and Tingley (2011).

population density; the Columbian Exchange raised both total population and the urban population in a grid cell. To put the magnitudes in context, the log of (one plus) the urban population has a mean of 1.27 and a standard deviation of 3.45, while the log of population density has a mean of 1.39 and a standard deviation of 1.32. The mean change in caloric suitability due to the Columbian Exchange, then, increased urban population by $(1.11 \times 0.048/1.27)$ roughly 4.2% of its mean and population density by $(1.11 \times 0.066/1.39)$ roughly 5.2% of its mean.

In the bottom panel, it is clear that both of these variables correlate positively with conflict, conditional on cell and century fixed effects. The coefficient magnitudes imply that a one standard deviation increase in urban population predicts an increase in conflict starts by $(3.45 \times 0.181/0.36)$ roughly 1.7 standard deviations. Similarly, a one standard deviation increase in population density predicts an increase in conflict starts by $(1.32 \times 0.091/0.36)$ roughly 0.33 standard deviations.

It is also clear that controlling for these mediating variables substantially reduces the estimated coefficient on caloric suitability, relative to Table 2. Results of the Imai, Keele and Yamamoto (2010) mediation tests suggest that population density explains between 12% and 21% of the impact of the Columbian Exchange on conflict in Asia, while the increase in urbanization explains between 18% and 24% of it. Note that population and urbanization both have explanatory power, but only partially explain the impact of caloric suitability; we take this as evidence that our results are not simply due to a mechanical relationship between population and conflict prevalence.

Next, we consider the spread of the British Empire, the largest of Europe's overseas empires. In Tables 10 and 11, we consider two alternative measures of British colonial occupation. The first is at the (anachronistic) country level, and is based on the dates given by Olsson (2009) for the start of colonial rule. We code a cell as part of the British Empire if it falls within a modern-day country that was occupied by Britain during a given century. The second is at the grid cell level, and is based on data provided by the GeaCron Project.[11] We use political maps every 50 years from 1500 onwards, and code a grid cell as part of the British Empire in a given century if it intersects a polygon corresponding to the British Empire at either the start of the century or in the middle of the century.

Both the country-level results in Table 10 and the cell-level results in Table 11 tell a similar story: cells that saw caloric suitability increase after 1500 due to the Columbian Exchange were significantly more likely to be violently occupied by Britain. Adding the British Empire as a control variable on the right hand side shows that British colonization significanly predicts both conflict starts and civil conflict. However, the decline in

[11] `http://geacron.com/home-en/`

the coefficient on caloric suitability is smaller than in Table 9: while British expansion is a possible mediator, its quantitative importance is less than that of either urbanization or population density.

Table A23 considers the spread of other European overseas empires in Asia: those of France, the Netherlands, Portugal, and Spain. The top panel indicates that the Netherlands and Spain were significantly less likely to violently occupy cells that saw caloric suitability increase after 1500 due to the Columbian Exchange, while Portugal was significantly more likely. The bottom panel indicates that colonization by Spain significantly predicts conflict starts.

5.4. **Other potential mechanisms.** We also consider a number of possible mechanisms that, on the basis of our results, we do not believe are important in driving the effect that we find.

One alternative mechanism is the *moderation of weather shocks*, which Iyigun, Nunn and Qian (2017*a*) find to be important in understanding how the white potato reduced violence in early modern Europe. We use data on reconstructed temperature anomalies from Mann et al. (2009). These are deviations from normal temperatures for a given grid cell, and so in our fixed effects framework they can be interpreted as equivalent to temperature when they are included as a right hand side variable. These are reported on a $5^\circ \times 5^\circ$ grid at an annual frequency. For each grid cell in our data, we use inverse distance weighting to assign each cell a weighted average of the temperature anomalies of points within 1000km. We then average over all years in a century to construct the temperature anomaly for that cell in a given century.

In Table 12, we present estimates of Equation (1), except that we now include two additional controls: the temperature anomaly and its interaction with caloric suitability. Across columns, our results suggest that warmer years were less likely to experience conflict. The coefficient on the interaction is positive, however, suggesting that greater caloric suitability helped attenuate the link between these weather events and conflict. Thus we find that the Columbian Exchange dampened the link between weather shocks and violence in Asia, much like Iyigun, Nunn and Qian (2017*a*) find in Europe. This cannot, then, explain why the direct impact of the increase in caloric suitability was an increase in violence.

We discuss additional candidate mechanisms in the appendix. One broad alternative category of mechanisms we consider is *state-making*. Greater agricultural output could facilitate greater tax revenues, which are then used to finance war (Gennaioli and Voth, 2015; Voigtländer and Voth, 2013). This could be particularly pronounced in the case of cereals and grains, due to the fact they can be stored and so are easily appropriable (Mayshar et al., 2015; Scott, 2009). Crops that increase the transparency of production

are also well-suited to taxation (Mayshar, Moav and Neeman, 2017). The logic here is also similar to that in Lagerlöf (2010); in a Malthusian environment where agricultural production is important, states have an incentive to capture productive territory, not only because it adds to output, but because it can be taxed in order to increase military capacity.

As shown in Table 4, that maize increases conflict is consistent with the Mayshar et al. (2015) mechanism of increased taxability. However, the positive and significant coefficients on several tuber and vegetable crops implies that greater ease of extraction by the state cannot be a complete explanation. Nor do we find evidence that accumulated state history is a mechanism explaining our result. In order to assign a measure of state presence to each grid cell in each century, we use the state history index from Borcan, Olsson and Putterman (2018) for each 50-year period. We assign each cell the sum of the state history indices at the start and middle of each century for the (anachronistic) modern country that contains it. In Table A24, we find no evidence that caloric suitability increased state presence, nor that the state history index correlates with conflict.

That the introduction of New World crops after 1500 provided individuals with a wider variety of foodstuffs on which to subsist may have made it less likely that state-making would take place. Scott (2009) argues that several New World crops were "escape crops." Take cassava, which grows underground, does not require much cultivation, and remains edible for up to two years after ripening. Since cooperation was less urgent among growers of tubers than among growers of cereals and grains, there may have been less demand for state structures. Furthermore, since tubers required less care, individuals may have had more time to spend on anti-state activity. Areas that experienced rises in potential land productivity due to the Columbian Exchange may have thus become more attractive to non-state actors who battled against Asian and non-Asian states, increasing the incidence of conflict.

We also consider two measures of inequality as possible mediators. The first is within-cell inequality, as measured by a Gini index of the caloric suitability of all raster cells within a $1^\circ \times 1^\circ$ grid cell. The second is cross-cell inequality, as measured by taking the ratio of a cell's caloric suitability to the average of its eight neighbors. In Table A25, we show that cells that gained due to the Columbian Exchange saw their within-cell inequality fall, rather than rise, and that this within-cell inequality does not predict conflict, conditional on average caloric suitability. In Table A26, we show that cells that saw their caloric suitability rise due to the Columbian Exchange also saw an increase relative to their neighbors. This cross-cell inequality does not, however, predict conflict.

Similarly, we also report results in which we include the interaction of the caloric suitability index and the pre-1500 values of these inequality measures in order to test

whether the response to the increase in caloric suitability was greater in areas that were initially more unequal. Results using the Gini index are in Table A25 and those using the caloric suitability of a cell relative to its neighbors are in Table A26. In both tables the interaction is insignificant, further suggesting that inequality is unlikely to explain our findings.

6. Conclusion

Using difference in difference and event study frameworks, we have shown that increases in caloric suitability due to the Columbian Exchange increased the prevalence of conflict in Asia. The standardized effect size that we find is meaningful – roughly half a standard deviation in standardized magnitude. We interpret our results as evidence of a *rapacity* effect. We have provided empirical evidence that population density and urbanization are quantitatively important mechanisms helping explain the result, suggesting that these cells became more valuable prizes for political actors, including the British Empire. We find no evidence that moderation of economic shocks, accumulated state history, or within-cell or cross-cell inequality can explain the results.

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Table 1. Summary Statistics

	(1) Mean	(2) s.d.	(3) Min	(4) Max	(5) N
Conflict Starts	0.039	0.36	0	16	33,120
Civil Conflicts	0.012	0.18	0	11	33,120
Caloric Suitability	4.81	4.12	0	17.1	33,120
Caloric Suitability before 1500	4.32	3.59	0	11.9	33,120
Caloric Suitability after 1500	5.42	4.62	0	17.1	33,120
Change in Caloric Suitability	1.11	1.92	0	9.39	33,120
Century	1,400	258	1,000	1,800	33,120
Latitude	30.0	15.3	-11	55	33,120
Longitude	87.4	28.3	26	146	33,120
Ruggedness	140,792	153,154	76.1	1.03e+06	33,120
Altitude	927	1,186	-27.8	5,457	33,120
Coast Distance	553,772	623,802	0	2.40e+06	33,120
River	0.37	0.48	0	1	33,120

Table 2. Main Results

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.041***	0.041***	0.019***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 3. Results with Geographic Controls

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.042***	0.042***	0.020***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.000		-0.001
		(0.002)		(0.001)
Controls X Post	Yes	Yes	Yes	Yes
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell. Controls are latitude, longitude, ruggedness, altitude, coast distance, and river.

Table 4. Results by Crop

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
White Potato X Post	-0.001	-0.021**	0.003	-0.001
	(0.006)	(0.008)	(0.003)	(0.003)
Tomato X Post	0.169***	0.175***	0.062***	0.088***
	(0.025)	(0.050)	(0.014)	(0.026)
Sweet Potato X Post	0.043***	0.055***	0.017***	0.025***
	(0.005)	(0.009)	(0.003)	(0.005)
Sunflower X Post	0.006***	0.002	0.004***	0.003***
	(0.002)	(0.003)	(0.001)	(0.001)
Maize X Post	0.011***	0.023***	0.004***	0.010***
	(0.001)	(0.003)	(0.001)	(0.002)
Groundnut X Post	0.043***	0.054***	0.017***	0.023***
	(0.005)	(0.007)	(0.002)	(0.003)
Coconut X Post	-0.003	-0.011***	-0.002**	-0.005***
	(0.003)	(0.003)	(0.001)	(0.001)
Cassava X Post	0.018***	0.018***	0.005***	0.005***
	(0.003)	(0.004)	(0.001)	(0.002)
Beans X Post	0.039***	0.052***	0.016***	0.024***
	(0.005)	(0.008)	(0.002)	(0.004)
Pre-1500 Suitability X Post	Yes	Yes	Yes	Yes
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 5. Results by Type of Conflict

	(1)	(2)	(3)	(4)
	Land		Naval	
Caloric Suitability	0.023***	0.024***	0.001*	0.001
	(0.003)	(0.004)	(0.001)	(0.001)
Pre-1500 Suitability X Post		-0.002**		0.000*
		(0.001)		(0.000)
	Siege		Storming	
Caloric Suitability	0.014***	0.014***	0.008***	0.008***
	(0.002)	(0.003)	(0.001)	(0.002)
Pre-1500 Suitability X Post		0.000		0.001
		(0.001)		(0.000)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
	Sacking/Razing		Other	
Caloric Suitability	0.001**	0.001*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Pre-1500 Suitability X Post		0.000		0.000
		(0.000)		(0.000)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 6. Results by Region

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Central Asia				
Caloric Suitability	-0.000	-0.001	-0.001	-0.000
	(0.005)	(0.004)	(0.001)	(0.001)
Pre-1500 Suitability X Post		-0.003		0.000
		(0.003)		(0.001)
Observations	4,554	4,554	4,554	4,554
Eastern Asia				
Caloric Suitability	0.010***	0.004	0.004*	0.004
	(0.003)	(0.004)	(0.002)	(0.003)
Pre-1500 Suitability X Post		0.004**		0.000
		(0.002)		(0.001)
Observations	12,015	12,015	12,015	12,015
South- *Eastern* Asia				
Caloric Suitability	-0.000	0.000	0.000	0.001
	(0.005)	(0.005)	(0.002)	(0.002)
Pre-1500 Suitability X Post		0.011***		0.002**
		(0.004)		(0.001)
Observations	5,940	5,940	5,940	5,940
Southern Asia				
Caloric Suitability	0.069***	0.070***	0.035***	0.039***
	(0.010)	(0.011)	(0.006)	(0.006)
Pre-1500 Suitability X Post		-0.002		-0.008***
		(0.005)		(0.002)
Observations	6,120	6,120	6,120	6,120
Western Asia				
Caloric Suitability	0.027	0.051*	-0.004**	-0.007
	(0.021)	(0.030)	(0.002)	(0.005)
Pre-1500 Suitability X Post		-0.007		0.001
		(0.005)		(0.001)
Observations	4,491	4,491	4,491	4,491
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 7. Heterogeneity by Genetic Diversity

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.046***	0.044***	0.021***	0.021***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		0.004***		0.000
		(0.001)		(0.001)
Caloric Suitability X Genetic Diversity	0.035***	0.037***	0.015***	0.015***
	(0.005)	(0.005)	(0.003)	(0.003)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 8. Heterogeneity by Ethnic Diversity

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.040***	0.041***	0.019***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Caloric Suitability X Ethnic Diversity	0.007**	0.007**	0.006***	0.006***
	(0.003)	(0.003)	(0.002)	(0.002)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	31,905	31,905	31,905	31,905

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 9. Mediation

	(1)	(2)	(3)	(4)
	ln (1 + Urban Population)		ln (1 + Population Density)	
Caloric Suitability	0.048***	0.044***	0.066***	0.037***
	(0.004)	(0.005)	(0.002)	(0.002)
Pre-1500 Suitability X Post		0.008***		0.045***
		(0.001)		(0.001)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.026***	0.029***	0.013***	0.015***
	(0.005)	(0.005)	(0.002)	(0.003)
Pre-1500 Suitability X Post		-0.007***		-0.004***
		(0.002)		(0.001)
ln (1 + Urban Population)	0.181***	0.179***	0.074***	0.073***
	(0.038)	(0.038)	(0.020)	(0.020)
ln (1 + Population Density)	0.091***	0.118***	0.030***	0.046***
	(0.020)	(0.023)	(0.010)	(0.011)
Mediation: Urban Population	23.58%	21.06%	20.61%	17.69%
Mediation: Population Density	21.41%	14.33%	16.49%	11.72%
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 10. Mediation: The British Empire (Country Level)

	(1)	(2)	(3)	(4)
	Empire: Britain			
Caloric Suitability	0.031***	0.031***		
	(0.002)	(0.002)		
Pre-1500 Suitability X Post		-0.000		
		(0.001)		
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.032***	0.033***	0.016***	0.017***
	(0.004)	(0.005)	(0.002)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Empire: Britain	0.268***	0.268***	0.092***	0.092***
	(0.037)	(0.037)	(0.018)	(0.018)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 11. Mediation: The British Empire (Grid Cell Level)

	(1)	(2)	(3)	(4)
	Empire: Britain			
Caloric Suitability	0.019***	0.020***		
	(0.001)	(0.001)		
Pre-1500 Suitability X Post		-0.001*		
		(0.000)		
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.036***	0.037***	0.015***	0.017***
	(0.005)	(0.005)	(0.002)	(0.003)
Pre-1500 Suitability X Post		-0.000		-0.002***
		(0.001)		(0.001)
Empire: Britain	0.228***	0.228***	0.175***	0.175***
	(0.057)	(0.057)	(0.041)	(0.041)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table 12. Moderating Temperature Shocks

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Temperature Anomaly X CSI	0.015***	0.015***	0.009***	0.008***
	(0.004)	(0.004)	(0.003)	(0.002)
Temperature Anomaly	-0.081***	-0.081***	-0.067***	-0.066***
	(0.021)	(0.021)	(0.012)	(0.012)
Caloric Suitability	0.045***	0.045***	0.021***	0.022***
	(0.006)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.000		-0.002**
		(0.001)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

APPENDIX A. ADDITIONAL ANALYSIS

Table A1. Conley Standard Errors (500 Km Cutoff)

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.041***	0.041***	0.019***	0.020***
500km cutoff	(0.009)	(0.010)	(0.006)	(0.006)
1000km cutoff	(0.011)	(0.012)	(0.007)	(0.008)
1500km cutoff	(0.012)	(0.013)	(0.008)	(0.008)
2000km cutoff	(0.013)	(0.013)	(0.008)	(0.008)
Pre-1500 Suitability X Post	Yes	Yes	Yes	Yes
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Spatial standard errors in parentheses.

Table A2. Results using Poisson with high-dimensional fixed effects

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.247***	0.247***	0.297***	0.298***
	(0.048)	(0.049)	(0.059)	(0.064)
Pre-1500 Suitability X Post		-0.019		-0.145
		(0.042)		(0.090)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations used	3,933	3,933	1,683	1,683
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A3. Outcome variables transformed as ln(1+x)

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.018***	0.018***	0.009***	0.010***
	(0.002)	(0.002)	(0.001)	(0.001)
Pre-1500 Suitability X Post		-0.000		-0.001***
		(0.001)		(0.000)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A4. Results with a lagged dependent variable

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.039***	0.040***	0.019***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	29,440	29,440	29,440	29,440

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A5. Linear Cell Trends

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Trends for 5 X 5 Cells				
Caloric Suitability	0.028***	0.029***	0.009***	0.009***
	(0.005)	(0.005)	(0.002)	(0.003)
Pre-1500 Suitability X Post		-0.002		-0.001
		(0.002)		(0.001)
Observations	33,120	33,120	33,120	33,120
Trends for 4 X 4 Cells				
Caloric Suitability	0.017***	0.017***	0.003	0.003
	(0.004)	(0.005)	(0.002)	(0.002)
Pre-1500 Suitability X Post		0.000		-0.000
		(0.002)		(0.001)
Observations	33,120	33,120	33,120	33,120
Trends for 3 X 3 Cells				
Caloric Suitability	0.016***	0.016***	0.003	0.003
	(0.004)	(0.005)	(0.002)	(0.002)
Pre-1500 Suitability X Post		-0.001		-0.000
		(0.002)		(0.001)
Observations	33,120	33,120	33,120	33,120
Trends for 2 X 2 Cells				
Caloric Suitability	0.010**	0.008**	-0.001	-0.001
	(0.004)	(0.004)	(0.000)	(0.000)
Pre-1500 Suitability X Post		0.002		0.001
		(0.002)		(0.000)
Observations	33,120	33,120	33,120	33,120
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A6. Country X Century FE

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.028***	0.031***	0.015***	0.018***
	(0.004)	(0.005)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.004*		-0.003***
		(0.002)		(0.001)
Observations	33,093	33,093	33,093	33,093
Country X Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A7. Restrict sample to cells with a positive change in CSI

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.043***	0.045***	0.021***	0.023***
	(0.006)	(0.007)	(0.003)	(0.004)
Pre-1500 Suitability X Post		-0.003		-0.004***
		(0.002)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	18,873	18,873	18,873	18,873

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A8. Drop cells by quantiles of pre-1500 CSI

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Drop lowest quintile				
Caloric Suitability	0.040***	0.041***	0.019***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.002)		(0.001)
Observations	26,397	26,397	26,397	26,397
Drop 2 lowest quintiles				
Caloric Suitability	0.040***	0.040***	0.019***	0.019***
	(0.006)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.008***		-0.006***
		(0.003)		(0.002)
Observations	19,872	19,872	19,872	19,872
Drop 3 lowest quintiles				
Caloric Suitability	0.022***	0.022***	0.009***	0.009***
	(0.005)	(0.005)	(0.003)	(0.003)
Pre-1500 Suitability X Post		0.001		-0.002
		(0.007)		(0.002)
Observations	13,248	13,248	13,248	13,248
Drop 4 lowest quintiles				
Caloric Suitability	-0.002	-0.002	0.000	0.001
	(0.005)	(0.005)	(0.002)	(0.003)
Pre-1500 Suitability X Post		-0.005		0.005
		(0.013)		(0.007)
Observations	6,624	6,624	6,624	6,624
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A9. Drop cells with coast or river

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.019***	0.018***	0.009***	0.009***
	(0.005)	(0.007)	(0.003)	(0.003)
Pre-1500 Suitability X Post		0.001		0.000
		(0.003)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,842	13,842	13,842	13,842

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A10. Change Cell Size

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
2 X 2 Cells				
Caloric Suitability	0.156***	0.160***	0.070***	0.074***
	(0.029)	(0.031)	(0.016)	(0.017)
Pre-1500 Suitability X Post		-0.006		-0.008***
		(0.006)		(0.003)
Observations	9,459	9,459	9,459	9,459
3 X 3 Cells				
Caloric Suitability	0.322***	0.327***	0.145***	0.154***
	(0.071)	(0.076)	(0.045)	(0.049)
Pre-1500 Suitability X Post		-0.009		-0.015*
		(0.014)		(0.009)
Observations	4,617	4,617	4,617	4,617
4 X 4 Cells				
Caloric Suitability	0.569***	0.584***	0.262***	0.279***
	(0.154)	(0.164)	(0.098)	(0.105)
Pre-1500 Suitability X Post		-0.024		-0.028*
		(0.027)		(0.016)
Observations	2,844	2,844	2,844	2,844
5 X 5 Cells				
Caloric Suitability	0.787***	0.797***	0.357**	0.377**
	(0.232)	(0.246)	(0.148)	(0.157)
Pre-1500 Suitability X Post		-0.018		-0.037
		(0.043)		(0.025)
Observations	1,890	1,890	1,890	1,890
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A11. Change Time Period Length

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
50 years				
Caloric Suitability	0.002**	0.003**	0.002*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)
Pre-1500 Suitability X Post		-0.000		-0.000*
		(0.000)		(0.000)
Observations	62,199	62,199	62,199	62,199
250 years				
Caloric Suitability	0.022*	0.020	0.017**	0.017*
	(0.012)	(0.013)	(0.009)	(0.009)
Pre-1500 Suitability X Post		0.002		0.000
		(0.002)		(0.001)
Observations	15,305	15,305	15,305	15,305
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A12. Control for conflicts before 1500 X Post

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.042***	0.042***	0.020***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		0.001		-0.001**
		(0.001)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A13. Control for city populations before 1500 X Post

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.041***	0.040***	0.020***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		0.001		0.000
		(0.002)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A14. Control for trade routes before 1500 X Post

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.041***	0.041***	0.019***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A15. Control for pastoral suitability

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.043***	0.043***	0.020***	0.021***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		0.001		-0.001
		(0.002)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A16. Discard conflicts with non-Asian actors

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.018***	0.018***	0.008***	0.009***
	(0.003)	(0.003)	(0.002)	(0.002)
Pre-1500 Suitability X Post		-0.001		-0.000
		(0.001)		(0.000)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A17. Add conflicts from Clodfelter and Naravane

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.045***	0.046***	0.019***	0.020***
	(0.006)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A18. Add conflicts from Clodfelter and Naravane + Additional Data from China

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.039***	0.039***	0.016***	0.015***
	(0.007)	(0.007)	(0.002)	(0.002)
Pre-1500 Suitability X Post		0.000		0.000
		(0.002)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A19. Add conflicts from Clodfelter and Naravane + Additional Data from Turkey

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.045***	0.046***	0.017***	0.017***
	(0.006)	(0.006)	(0.002)	(0.002)
Pre-1500 Suitability X Post		-0.001		0.000
		(0.001)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A20. Discard conflicts with the most events

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Without 1 largest				
Caloric Suitability	0.030***	0.029***	0.009***	0.008***
	(0.004)	(0.005)	(0.002)	(0.002)
Pre-1500 Suitability X Post		0.001		0.000
		(0.001)		(0.000)
Without 3 largest				
Caloric Suitability	0.027***	0.027***	0.006***	0.006***
	(0.004)	(0.005)	(0.001)	(0.002)
Pre-1500 Suitability X Post		0.001		-0.000
		(0.001)		(0.000)
Without 5 largest				
Caloric Suitability	0.024***	0.024***	0.006***	0.006***
	(0.004)	(0.005)	(0.001)	(0.002)
Pre-1500 Suitability X Post		0.001		-0.000
		(0.001)		(0.000)
Without 10 largest				
Caloric Suitability	0.020***	0.020***	0.004***	0.004***
	(0.004)	(0.004)	(0.001)	(0.001)
Pre-1500 Suitability X Post		0.001		-0.000
		(0.001)		(0.000)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A21. Discard conflicts with distant capitals

	(1)	(2)	(3)	(4)
	Conflict Starts		Civil Conflict Starts	
Without capitals 500 km apart				
Caloric Suitability	0.009***	0.010***	0.004***	0.004***
	(0.002)	(0.002)	(0.001)	(0.001)
Pre-1500 Suitability X Post		-0.001***		-0.001***
		(0.000)		(0.000)
Without capitals 1000 km apart				
Caloric Suitability	0.016***	0.017***	0.007***	0.007***
	(0.003)	(0.003)	(0.002)	(0.002)
Pre-1500 Suitability X Post		-0.001		-0.001*
		(0.001)		(0.000)
Without capitals 1500 km apart				
Caloric Suitability	0.020***	0.021***	0.008***	0.008***
	(0.003)	(0.003)	(0.002)	(0.002)
Pre-1500 Suitability X Post		-0.001*		-0.001*
		(0.001)		(0.000)
Without capitals 2000 km apart				
Caloric Suitability	0.021***	0.022***	0.008***	0.009***
	(0.003)	(0.003)	(0.002)	(0.002)
Pre-1500 Suitability X Post		-0.001		-0.000
		(0.001)		(0.000)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A22. List of Wars by Number of Events

	Events	Rank
Indian Mutiny	103	1
Taiping Rebellion	38	2
Crusader-Muslim Wars	33	3
Japanese Invasion of Korea	24	4
Mughal-Maratha Wars	24	5
Persian-Afghan Wars	24	6
Seven Years War (India)	23	7
Japan's Era of the Warring States	21	8
1st British-Afghan War	20	9
Mughal-Sikh Wars	20	10
2nd Carnatic War	19	11
Conquests of Genghis Khan	19	12
Mughal Conquest of Northern India	19	13
1st Crusade	16	14
2nd British-Maratha War	15	15
Gempei War	15	16
Later Mughal-Maratha Wars	15	17
Persian Wars of Succession	15	18
Philippine-American War	15	19
Sino-Japanese War	15	20
1st British-Maratha War	14	21
3rd British-Maratha War	14	22
Conquests of Tamerlane	14	23
2nd British-Mysore War	13	24
Indian Campaigns of Ahmad Shah	13	25
Mongol Wars of Kubilai Khan	13	26
Philippines War of Independence	13	27
3rd British-Mysore War	12	28
Manchu Conquest of China	12	29
Maratha Territorial Wars	12	30
Turko-Persian Wars	12	31
1st Opium War	11	32
Later Crusader-Muslim Wars	11	33
Mughal Wars of Succession	11	34
Mughal-Uzbek Wars	11	35
Russo-Turkish Wars	11	36
1st British-Burmese War	10	37
2nd British-Afghan War	10	38
Bijapur-Maratha Wars	10	39
British-Gurkha War	10	40
Byzantine-Ottoman Wars	10	41
Russo-Persian Wars	10	42
Mughal-Ahmadnagar Wars	9	43
Sino-French War	9	44
Bengal War	8	45
Crimean War	8	46
Eastern Muslim Dynastic Wars	8	47
French Conquest of Indo-China	8	48
Muslim Conquest of Northern India	8	49
Seljuk Wars of Expansion	8	50
Wars of the Delhi Sultanate	8	51
2nd British-Burmese War	7	52
2nd British-Sikh War	7	53
3rd Crusade	7	54
Burmese Dynastic Wars	7	55
Later Afghan War of Succession	7	56

Persian-Uzbek Wars	7	57
Russian Conquest of Central Asia	7	58
Turko-Persian Wars of Nadir Shah	7	59
1st British-Sikh War	6	60
1st Carnatic War	6	61
2nd Opium War	6	62
Afghan Wars of Succession	6	63
Afghan-Sikh Wars	6	64
Burmese-Siamese Wars	6	65
Byzantine-Turkish Wars	6	66
Early Portuguese Colonial Wars in Asia	6	67
Jin-Song Wars	6	68
Maratha Wars of Succession	6	69
Mongol Invasion of the Middle East	6	70
Mughal-Maratha War of Ismail Beg	6	71
Persian-Mughal Wars	6	72
War of the Meiji Restoration	6	73
War of the Mughal Princes	6	74
1st British-Mysore War	5	75
Anglo-Arab Wars	5	76
Dutch Conquest of Bali	5	77
Later Portuguese Colonial Wars in Asia	5	78
Mongol Invasions of India	5	79
Portuguese Colonial Wars in Arabia	5	80
Rise of the Ming Dynasty	5	81
Turko-Persian War	5	82
Vijayanagar-Bahmani Wars	5	83
War of the American Revolution	5	84
1st Turko-Egyptian War	4	85
Anglo-Persian War	4	86
Ashikaga Rebellion	4	87
Chitral Campaign	4	88
Dutch Wars in the East Indies	4	89
Dutch-Portuguese Colonial Wars	4	90
Earlier Nine Years War	4	91
Early Dutch Wars in the East Indies	4	92
Genko War	4	93
Great Frontier Rising	4	94
Later Muslim Conquest of Northern India	4	95
Ming Imperial Wars	4	96
Mongol Conquest of China	4	97
Mughal Conquest of the Deccan Sultanates	4	98
Pathan War	4	99
Portuguese Colonial Wars in Asia	4	100
Punjab Campaigns of Shah Zaman	4	101
Venetian-Turkish Wars	4	102
Wars of the Deccan Sultanates	4	103
2nd Crusade	3	104
2nd Turko-Egyptian War	3	105
4th British-Mysore War	3	106
4th Crusade	3	107
Anglo-Portuguese Colonial Wars	3	108
British Conquest of Sind	3	109
Bulgarian Imperial Wars	3	110
Chinese-Mongol Wars	3	111
Early Mughal-Sikh Wars	3	112
French Revolutionary Wars (Middle East)	3	113
Later Byzantine-Muslim Wars	3	114

Later Indian Dynastic Wars	3	115
Mughal-Hyderabad War	3	116
Persian-Turkoman Wars	3	117
Satsuma Rebellion	3	118
Sino-Vietnamese War	3	119
Turko-Persian War in Anatolia	3	120
Vietnamese Civil War	3	121
Wars of the Great Seljuk Sultanate	3	122
1st British-Kandyan War	2	123
1st Latin-Byzantine Imperial War	2	124
3rd British-Burmese War	2	125
Afghan Civil Wars	2	126
British-Gwalior War	2	127
Burmese Civil Wars	2	128
Burmese Invasions of Siam	2	129
Chinese Conquest of Taiwan	2	130
Ghor-Ghazni Wars	2	131
Later Dutch Wars in the East Indies	2	132
Later Portuguese Colonial Wars in Arabia	2	133
Later Three Years War	2	134
Mamluk-Ottoman Wars	2	135
Maratha Rebellions	2	136
Maratha-Mysore Wars	2	137
Mongol Dynastic Wars	2	138
Mughal Dynastic War	2	139
Mughal-Berad Wars	2	140
Ottoman-Mamluk War	2	141
Ottoman-Turkoman War	2	142
Persian Invasion of India	2	143
Persian-Georgian War	2	144
Portugese Colonial Wars in Asia	2	145
Portuguese-Maratha War	2	146
Rebellion of Prince Shahjahan	2	147
Saudi-Rashidi Wars	2	148
Siamese-Cambodian Wars	2	149
Spanish-American War	2	150
Thai-Malacca War	2	151
Turko-Persian War in Azerbaijan	2	152
Venetian-Genoese Wars	2	153
Venetian-Turkish War in Cyprus	2	154
Vijayanagar-Gajapati War	2	155
War against Malabar Pirates	2	156
War of the American Revolution: 1775-1783	2	157
Xinjiang Rebellion	2	158
2nd British-Kandyan War	1	159
2nd Latin-Byzantine Imperial War	1	160
3rd British-Kandyan War	1	161
3rd Latin-Byzantine Imperial War	1	162
Anatolian Rebellion	1	163
Baluchi Rebellion	1	164
Branas Rebellion	1	165
British-Bhutanese War	1	166
British-Maratha Wars	1	167
British-Satsuma War	1	168
Burmese-Laotian Wars	1	169
Byzantine Wars of Succession	1	170
Cambodian-Spanish War	1	171
Catherine the Great's 1st Turkish War	1	172

Dutch-Spanish Colonial Wars	1	173
French Revolutionary Wars	1	174
French Revolutionary Wars (Egypt)	1	175
Ghor-Khwarezm War	1	176
Great Java War	1	177
Heiji War	1	178
Hogen War	1	179
Japanese Christian Rising	1	180
Jokyo Disturbance	1	181
Jurchen Invasion of Northern China	1	182
Later Byzantine Military Rebellions	1	183
Malwa-Bahmani Wars	1	184
Mamluk Wars	1	185
Manchu Conquest of Korea	1	186
Martha Civil War	1	187
Mongol Conquest of Asia Minor	1	188
Napoleonic Wars (3rd Coalition)	1	189
Napoleonic Wars (4th Coalition)	1	190
Napoleonic Wars (5th Coalition)	1	191
Ningxia Mutiny	1	192
Ottoman Civil Wars	1	193
Ottoman Conquest of Persia	1	194
Pathan Rising	1	195
Persian Reconquest of Khorasan	1	196
Philippines Expedition	1	197
Revolt of the Three Feudatories	1	198
Rohilla War	1	199
Russian Conquest of the Caucasus	1	200
Russian Invasion of the Caspian	1	201
Russo-Afghan War	1	202
Saga Rebellion	1	203
Serbian Imperial Wars	1	204
Seven Years War (Philippines)	1	205
Shimabara Rebellion	1	206
Shimonoseki War	1	207
Siamese-Laotian Wars	1	208
Thai Invasion of Cambodia	1	209
Turkish-Druse War	1	210
Turko-Persian Gulf War	1	211
Turko-Wahhabi War	1	212
Vellore Mutiny	1	213
Vietnamese-Cham War	1	214
War of the Japanese Emperors	1	215

Table A23. Other Empires (Grid Cell Level)

	(1)	(2)	(3)	(4)	(5)	(6)
			Empire			
Caloric Suitability	0.020***	0.000	-0.009***	0.003***	-0.007***	0.007***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)
Pre-1500 Suitability X Post	-0.001*	0.000	0.006***	0.001***	0.005***	0.011***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
			Conflict Starts			
Caloric Suitability	0.037***	0.041***	0.041***	0.041***	0.042***	0.040***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)
Empire	0.228***	5.080	0.015	0.021	0.171*	0.179***
	(0.057)	(3.211)	(0.025)	(0.056)	(0.089)	(0.037)
Pre-1500 Suitability X Post	-0.000	-0.001	-0.001	-0.001	-0.001	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Empire	British	French	Dutch	Portuguese	Spanish	Any
Century Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A24. Other Possible Mediators: State Capacity

	(1)	(2)	(3)	(4)
	State History Index			
Caloric Suitability	-0.474***	-0.037		
	(0.101)	(0.126)		
Pre-1500 Suitability X Post		-0.702***		
		(0.095)		
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.041***	0.041***	0.019***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.000		-0.002**
		(0.001)		(0.001)
State History Index	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A25. Other Possible Mediators: Within-Cell Inequality

	(1)	(2)	(3)	(4)
	Gini Index			
Caloric Suitability	-0.064***	-0.149***		
	(0.023)	(0.022)		
Pre-1500 Suitability X Post		0.132***		
		(0.019)		
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.041***	0.041***	0.019***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Gini Index	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.000)
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.043***	0.043***	0.020***	0.021***
	(0.006)	(0.006)	(0.004)	(0.004)
CSI X Pre-1500 CSI Gini	-0.062	-0.064	-0.035	-0.040
	(0.081)	(0.081)	(0.046)	(0.047)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes
Observations	33,120	33,120	33,120	33,120

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

Table A26. Other Possible Mediators: Relative CSI

	(1)	(2)	(3)	(4)
	Relative CSI			
Caloric Suitability	0.009***	0.010***		
	(0.001)	(0.001)		
Pre-1500 Suitability X Post		-0.003*		
		(0.001)		
Observations	28,641	28,641	28,641	28,641
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.041***	0.041***	0.019***	0.020***
	(0.005)	(0.006)	(0.003)	(0.003)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Relative CSI	-0.020	-0.021	-0.015	-0.016
	(0.016)	(0.016)	(0.010)	(0.011)
Observations	28,641	28,641	28,641	28,641
	Conflict Starts		Civil Conflict Starts	
Caloric Suitability	0.047***	0.047***	0.024**	0.024**
	(0.018)	(0.018)	(0.010)	(0.010)
CSI X Pre-1500 Relative CSI	-0.007	-0.006	-0.005	-0.004
	(0.016)	(0.016)	(0.009)	(0.009)
Pre-1500 Suitability X Post		-0.001		-0.002***
		(0.001)		(0.001)
Observations	28,629	28,629	28,629	28,629
Century Fixed Effects	Yes	Yes	Yes	Yes
Cell Fixed Effects	Yes	Yes	Yes	Yes

*** Significant at 1%. ** Significant at 5%. * Significant at 10%. Standard errors in parentheses clustered by grid cell.

FIGURE A1. Randomization Inference: Without Spatial Restrictions

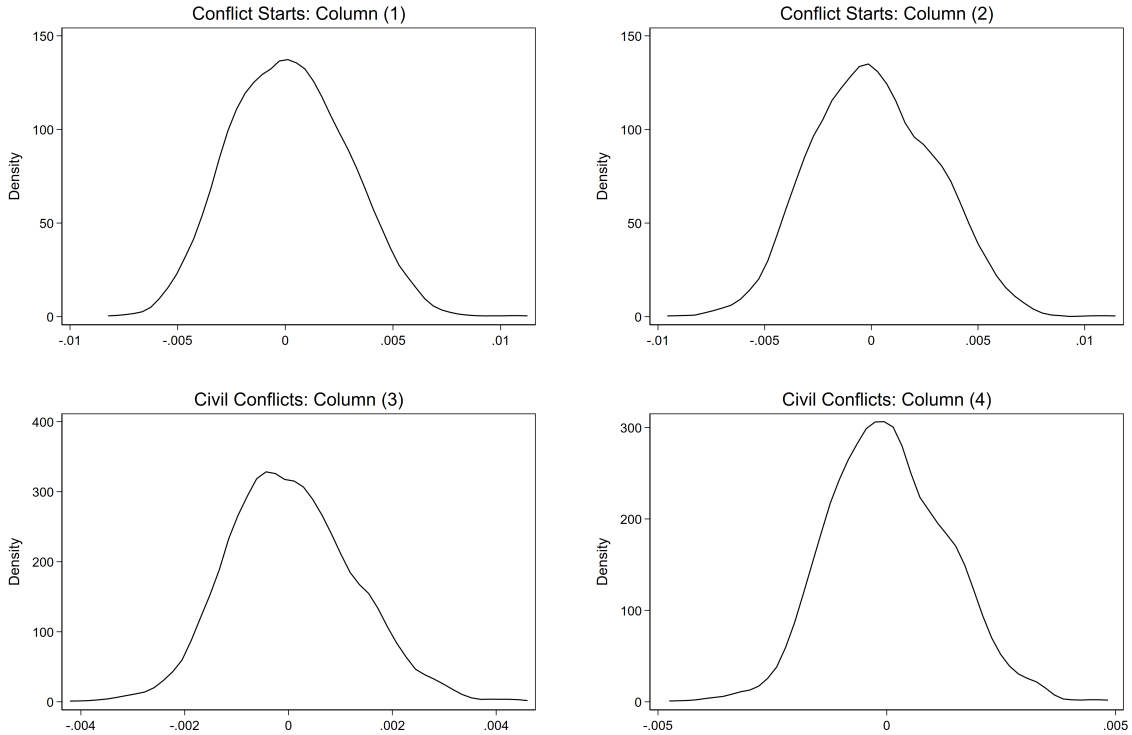

FIGURE A2. Randomization Inference: With Spatial Restrictions