Article

Journal of Conflict Resolution
2020, Vol. 64(6) 1043-1069

DOI: 10.1177/0022002719889665
journals.sagepub.com/home/jcr

Climate Shocks, Political Institutions, and Nomadic Invasions in Early Modern East Asia

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Abstract

While a large literature argues negative climate shocks can trigger conflicts, recent findings suggest moderate climatic conditions lead to war. This article proposes a conditional theory by incorporating political institution as a moderating variable. I argue that, under the impact of negative climate shocks, centralized societies can mobilize more resources for war, compared to decentralized societies. Thus, the former is more likely to resort to well-organized plundering to address the scarcity problem caused by detrimental climate shocks. Besides, centralized societies have little incentive to plunder when the climatic conditions are moderate, as they can collect taxes regularly through centralized institutions. A comparison between the more centralized Manchurian and the less centralized Mongols on their conflictual behavior serves as an empirical test. I find that temperature was *negatively* associated with the probability of Manchurian invasion after they embraced centralization but had a *positive* effect on the likelihood of Mongol invasion.

Keywords

militarized disputes, natural disasters, political economy, resource, extraction

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The linkage between climate change and political violence has received increasing attention from scholars and policy makers. Many pundits share the concern that, impacted by global climate change, civil and international conflicts may occur more frequently and more violently in regions that are environmentally fragile. According to a senior United Nations official, climate change—and the shortages of water and food that come from it—is becoming increasingly linked to conflict, and "[f]ragile countries are in danger of becoming stuck in a cycle of conflict and climate disaster."[1] Scholars from different disciplines have made much effort to rigorously examine whether climate change causes war. The empirical results about the effects of climate shocks on the likelihood of conflict initiation, however, are still largely disparate (Salehyan 2014; Theisen, Gleditsch, and Buhaug 2013). While scholars conventionally believe that bad weather results in more conflicts (Hsiang, Burke, and Miguel 2013), recent findings suggest that this is not necessarily true (Devlin and Hendrix 2014; Detges 2014; Landis 2014; Slettebak 2012).

In this article, I propose a conditional theory that identifies the social—more specifically, institutional—conditions under which negative climate shocks (and the absence of them) can increase the likelihood of war. It argues that societies suffering from scarcity caused by climate shocks may not necessarily resort to violence. The decision to attack or not depends on, under the impact of negative climate shocks such as extremely cold weather or severe droughts, whether they can mobilize sufficient resources for war. In other words, negative climate shocks not only affect the willingness to initiate a conflict but also the feasibility of doing so. Since institutionalized and centralized societies can effectively mobilize more resources for war even impacted by bad weather, they are more likely to respond to negative climate shocks by means of plundering their richer neighbors. Moreover, centralized institutions can help generate stable income that disincentivizes them from plundering when the weather is mild. Thus, the likelihood of conflicts initiated by centralized societies is increasing in the severity of negative climate shocks. On the other hand, since decentralized societies are unable to mobilize resources that are necessary for an effective military action when negative climate shocks occur, they are less likely to launch an offensive war under bad weather. But they become more war-prone when climatic conditions become moderate and suitable for military actions. Simply put, the relationship between climate and violence is moderated by the internal political institutions of the conflict initiator.

To test my conditional theory, I examine how two nomadic groups in East Asia responded to negative climate shocks in the early modern period (1368–1840). The two nomadic groups are the Mongols and Manchurian who shared many similarities. First, they confronted the same major enemy, the Han Chinese settlers. In addition, they were both very sensitive to temperature change due to the Mongols' nomadic lifestyle and the Manchurian's reliance on hunting and fishing. The difference in institutional capacity, however, significantly distinguished the two. The Mongols, ever since being driven back to the Mongolia Plateau by the Chinese settlers in 1368, formed a union of independent tribes. Hence, the Mongol society remained largely decentralized. The Manchurian located in today's Northeast China were no different from the Mongols until the late sixteenth century when an exogenous event changed its path of development. Since the Manchurian leader Nurhaci came into power in year 1583 as a result of an exogenous shock, the Manchurian successfully established state apparatus and centralized institutions within a very short period. If the conditional theory is correct, we should observe that the likelihood of Mongol invasion was increasing in temperature and/or precipitation. In addition, after 1583, the Manchurian should be more likely to invade the agricultural area when there was a negative climate shock than when a negative climate shock was absent.

Although this article is focused on historical events in premodern East Asia, the theory that political institution is a moderating variable in the climate–conflict connection is generalizable to contemporary inter- and intrastate conflicts as well. The nomads are similar to conflict participants engaging in contemporary communal violence as both of them rely heavily on the primary sector that is highly sensitive to climatic and environmental change (Detges 2014; Obioha 2008). Even if nomadic peoples and conflict participants in developing countries are environmentally vulnerable, their responses to bad weather and deteriorating environment are not simply determined by the severity of climate shocks but are conditional on a number of social factors. Difference in internal institutions of conflict participants—especially those that influence military and extractive capacity—should lead to a variation in war propensity and war outcome. If the theory of this article is correct, we could expect that conflict participants—either states or rebel groups—who have developed solid administrative and military institutions in their controlled territories are more likely to initiate external conflicts when negative climate shocks, compared to those who put little effort in building formal institutions (Huang 2016).

In this article, I exploit the readily available within- and cross-country variation to test my theory empirically. After reviewing existing studies that explore the relationship between climate shocks and conflicts, I propose a theory of how political institutions moderate the effect of weather on conflict initiation. It is followed by a brief introduction to the history of Mongols and Manchurian, particularly the institutional change of the latter. I then offer statistical tests based on pooled and split samples and find robust support for the conditional theory. This article ends with a conclusion part.

Climate and Conflict

A growing body of literature attributes the outbreak of conflict, either interstate or intrastate, to the damaging effects of negative weather shocks. The logic of such an argument is straightforward: climate shocks result in a scarcity problem that induces the so-called resource war (Homer-Dixon 1994). These findings indicate that climate change, like natural disasters such as earthquakes or droughts, can trigger violence or unrests because they result in scarcities in basic, life-sustaining resources (Anderson, Johnson, and Koyama 2017; Burke, Hsiang, and Miguel 2015; Chen

2014; Hsiang, Burke, and Miguel 2013; Hsiang and Burke 2014; Kelley et al. 2017; Miguel, Satyanath, and Sergenti 2004; Nel and Righarts 2008; Obioha 2008; O'Loughlin et al. 2012). To overcome the scarcity problem, the affected groups may resort to plundering a richer neighbor (Bai and Kung 2011).

Recent findings, however, suggest that negative climate shocks may not necessarily lead to more violence (Selby et al. 2017). For example, some findings show that water abundance causes more conflicts, as sufficient precipitation can meet the basic needs for military actions and create a tactical environment that facilitates military attacks (Detges 2014; Salehyan and Hendrix 2014). Such relationship is stronger in less developed, more agriculture-dependent countries. Similarly, Landis (2014) indicate that prolonged periods of stable, warm weather are positively associated with the likelihood of civil war onset because a higher temperature can facilitate the transportation of resources and troops in remote regions. On the other hand, extreme weather, such as a sharp drop in temperature, can do a great disservice to military action (Büntgen and Cosmo 2016; Devlin and Hendrix 2014; Slettebak 2012).

Hence, the empirical inconsistencies in the field call for a conditional theory that could explain why sometimes negative climate shocks foster conflicts while at others they dampen the intensity of violence. Previous literature has argued that social factors matter in the environment–conflict connection (Akcinaroglu, DiCicco, and Radziszewski 2011; Burke, Hsiang, and Miguel 2015; Mach et al. 2019; Theisen, Holtermann, and Buhaug 2012). Specifically, whether resource scarcity as a result of natural disasters or climate shocks causes violence is conditioned on societal variables such as economic situations and human ingenuity (Bretthauer 2015; Fjelde and von Uexkull 2012), provision of key infrastructures (Detges 2016), political status of the environmentally vulnerable groups (Fjelde and von Uexkull 2012; von Uexkull et al. 2016), regime type (Flores and Smith 2013; Hendrix and Haggard 2015; Wood and Wright 2016), and resource distribution rule (Linke et al. 2018). While the scholarship gradually moves away from the simplistic view of universal climate effects and sheds light on the moderating role of social and political variables, it has not explicitly accounted for the possible interaction between climate shock and the *feasibility* of using violence to respond. Since centralization enhances states' military capacity in providing logistical and administrative support for a large army (Brewer 2002; Gennaioli and Voth 2015; Huntington 2006; North 1990), the level of centralization may play an important role in determining whether conflict participants respond to negative climate shocks peacefully or violently. In addition, since the elites can extract taxable income from the population through a centralized bureaucratic system (Olson 1993), centralization may also affect conflictual behavior under moderate climatic conditions. In the following paragraphs, I propose a theory that incorporates the moderating role of political institutions—particularly those that are closely related to military and extractive capacity—in the climate–conflict connection.

A Conditional Theory

In this section, I offer a conditional theory that specifies how the effects of climatic conditions on conflict initiation are moderated by political institutions, in particular, by the level of centralization. The level of centralization determines two aspects of state capacity—military and extractive—which, interacting with climate, affect the likelihood of conflict. First, the decision to launch an attack or not is conditional on how institutions perform under the impact of climate shocks, especially those that are linked to military efficiency and mobilization capacity. Second, institutions also matter when a negative climate shock is absent, as centralized institutions can help to generate stable income that makes external plundering less attractive under moderate climatic conditions. I call it the extractive capacity of a centralized state.

Mobilization capacity is of great importance in conflict, as it directly affects war outcome (Tarar 2013). If a conflict participant cannot reach the minimal level of mobilization that is necessary for military action, war is simply not feasible even if it is eager to initiate an attack. When negative climate shocks occur, an environmentally vulnerable group may be more willing to resort to conflict as it has the incentive to overcome the scarcity problem by plundering a richer area. However, the minimal level of mobilization required for military action also becomes higher when negative climate shocks occur. As existing research suggests, bad weather can do a great disservice to the provision of logistical support and the implementation of tactical plans (Büntgen and Cosmo 2016; Salehyan and Hendrix 2014). To address these problems, the offensive side must mobilize more manpower and material resources in order to launch an attack that is as effective as when a negative climate shock is absent. For political entities that have higher mobilization capacity, this may not be a big challenge. Their major concern is the severity of the scarcity problem resulting from negative climate shocks instead of the feasibility of military action. Thus, its likelihood of initiating a war is positively associated with the severity of the shocks (e.g., negatively associated with temperature or precipitation). However, for groups that have lower capacity in mobilization, an attack is simply infeasible no matter how needed plundering could be. On the other hand, less mobilization effort is required when a climate shock is absent or not severe. It is under such conditions that groups of lower mobilization capacity are more likely to attack.

Mobilization capacity is largely determined by the level of centralization (Brewer 2002; Gennaioli and Voth 2015; North 1990). Societies that have established centralized institutions are able to mobilize more resources (manpower and materials) for war, even under the impact of negative climate shocks. The size of an army matters because in many cases, a larger military force often means a higher chance of winning. In addition, centralized entities can gather the necessary resources at a faster pace, thus seizing the best chance to attack (e.g., when the defender is vulnerable). Institutions that are capable of mobilizing more resources more rapidly cannot be too decentralized: at least it should have a leadership with authority, a hierarchical system in which lower rank officials obey the higher ones, and an incentive mechanism that can effectively punish those who do not follow the command and award those who perform well in war (Olson 2009). Without the support of centralized institutions, a potential conflict participant cannot reach a high level of mobilization when it comes to war. Therefore, societies with centralized institutions are more likely to mobilize effectively and initiate an attack when negative climate shocks occur, compared to less centralized and loosely organized groups.

Centralized political institutions not only affect the military capacity of a country or a rebellion group but also enhance its extractive capacity. With the help of centralized bureaucratic system, the elites can, first, protect ordinary people and give them a stronger incentive to invest and produce; second, extract a stable income by regularly taxing the population (Olson 1993). In my empirical case, leaders of the centralized Manchurian state actively protected Han Chinese farmers from the transgression of the Manchurian nobles and taxed the farmers directly through establishing tax collection agencies (Liu 2007, 164). As a result, centralized entities have little incentive to plunder the rich area when there is no negative climate shock. For decentralized groups, however, the absence of negative climate shock does not lead to a high taxable income that can only be generated and collected with a centralized bureaucratic system. Therefore, when the climatic conditions are moderate—that is, when they are more suitable for military actions, decentralized society is more likely to resort to plundering. In other words, the absence and presence of centralized institutions not only determine how conflict participants respond to negative climate shocks but also affect how they respond to moderate climatic conditions.

In sum, the climate–conflict connection is moderated by the level of centralization. Whether a society responds to negative climate shocks (or the absence of them) violently depends on whether it has established centralized institutions or not. Using temperature/precipitation as proxies for climate conditions, I expect that for decentralized societies, their likelihood of conflict initiation is increasing in temperature/precipitation. In contrast, temperature/precipitation should have a negative effect on the likelihood of war initiated by centralized societies.

Historical Background and Hypotheses

The moderating effects of political institutions in the causal relationship between climate and conflicts can be observed in the interactions between the nomadic peoples and the Chinese and Korean settlers in the early modern era (fourteenth to nineteenth century). Specifically, I focus on the responses of two nomadic groups to negative climate shocks, namely, the Mongols in North China and the Jurchen people/Manchurian in Northeast China. Compared to the cross-country approach widely used in the literature, a focus on smaller geographical units is more suited to capturing the specific causal mechanisms between climate shocks and conflicts (Slettebak 2012). The Mongols and the Manchurian shared a number of similarities. First, both the Mongols and Manchurian largely relied on animal for food supply and clothing—which are very sensitive to the change of temperature, and slightly depended on agriculture as well thanks to their proximity to the settlers' region (Liu 2007, 121; Qu 2006, volume 8).[2] Second, the climatic conditions are very similar in North and Northeast China, as they have similar latitudes and are both affected by the monsoon season of East Asia. Finally, the Mongols and Manchurian for a long time faced the same settler enemy, the Ming Dynasty of Han Chinese (1368–1644). In year 1644, the Manchurian conquered Ming and replaced it with the Qing Dynasty (AD 1636–1911), the last imperial dynasty of China. In sum, the Mongol and Manchurian societies share many important similarities with the exception of the development in political institutions that a comparison between the two is meaningful.[3]

After the Mongolian Yuan Dynasty was defeated by the Ming Dynasty in 1368, the Mongols retreated to the north and resumed the nomadic lifestyle. Although the Mongols continued to be a threat to the settlers of Ming, they never conquered the agricultural zone again. One reason was that, unlike their predecessors, the Mongol tribes since year 1368 were largely divided. In the late fourteenth century, the North Yuan Dynasty, which was the successor of Yuan, split into a number of small tribal states. Although Dayan Khan reunited Eastern Mongolia in the late fifteenth century, he distributed the empire among his sons and relatives, thus the Mongolian society was highly decentralized under his rule (Wada 1984, 364). In other words, Mongol was more of a feudal society like Medieval Europe than a unified political entity. Dayan Khan's grandson, Altan Khan, successfully built a tribal league among the Khalkha Mongols in the north, the Chahar in the southeast, and the Southern Mongolia ruled by him directly. However, the polity he built was still largely a loose union of different tribes. Soon after Altan Khan's death, his descendants lost control of most parts of the empire: a number of tribal leaders simultaneously claimed to be the Great Khan in the Steppe (Wada 1984, 634-42).

Compared to the Mongols, the Jurchen people/Manchurian who lived in Northeast China made much more progress in building centralized institutions at the turn of the sixteenth and seventeenth century. Before tribal leader Nurhaci came to power in the late sixteenth century, however, there had been no united political entity but only small tribes or family-based tribal leagues in the Manchu area. In general, there had been no obvious hierarchy within a tribe or among different tribes.[4] In other words, the Manchurian tribes resembled their Mongolian counterparts, if not more decentralized. When the Manchurian came to war, dozens of people who usually came from the same family would voluntarily form a *niru* as the basic organizational unit in tribal conflicts. *Niru* would be disbanded immediately after the fight was over, and the leaders of *niru* enjoyed no special privileges. Hence, *niru* was merely an ad hoc organization like hunting groups (Liu 2007, 46-48).

Things changed dramatically when Nurhaci—who had been heavily influenced by the Confucian culture through engaging in cross-border trade—became the chieftain of a Jurchen tribe in year 1583 when his father and grandfather were accidentally killed. Thereafter, centralized state apparatus started to emerge in the Manchu area. First, around the early seventeenth century, Nurhaci reformed the *niru* system, turning it into a permanent organization that was essentially a professional army. *Niru* became commanded by aristocrats loyal to Nurhaci. Members of *niru* were no longer from the same family, sometimes not even from the same tribe, and they were not allowed to give up their membership (Liu 2007, 139-42). *Niru* served as the basis of *Gusa*, or banner, a military–administrative unit which governed the whole Manchurian society. With the foundation of the banners, a hierarchical political system was established in which Nurhaci was at the top of the pyramid. Moreover, the establishment of centralized institutions also helped Nurhaci implement laws to protect farmers from the herding activities of the Manchurian nobles and encourage the development of agriculture (Liu 2007, 164). Later, Nurhaci's son Hong Taiji introduced the Chinese bureaucratic system to the Manchurian state, placed Confucian scholars in key positions, and further centralized its political institutions. Specifically, Hong Taiji abolished the tribal democracy (*gongzhi guozheng*), established tax collection agencies in the whole Manchurian territory, formalized ranks for military officers, issued written statutes concerning the conduct of war, and introduced a large number of other governing institutions that could not be found in the Mongol tribes even when they were temporarily unified (Liu 2007, 246-308). These institutions, on one hand, significantly enhanced the Manchurian's military capacity and enabled them to plunder the agricultural area to address the scarcity problem caused by negative climate shocks. On the other, they also discouraged them from attacking the settlers when the climate was moderate: with centralized institutions and impersonal bureaucrats, the Manchurian leadership can extract revenue from the population regularly by collecting taxes, as long as the climatic conditions were good enough to generate sufficient output to be taxed (Liu 2007, 241-43).

Since the Manchurian under Nurhaci and Hong Taiji's rule could mobilize more resources for military action, I expect that when negative climate shocks such as extremely cold weather occurred, they were more likely to raid the settlers and plunder the agricultural zone compared to the Mongols. In addition, when the weather became suitable for production, the Manchurian would have little incentive to attack as centralized institutions like tax collection agencies can generate a stable income. The negative association between temperature and the probability of invasion, however, should only exist *after* the Manchurian had established the centralized system in 1583. Moreover, as the level of centralization kept increasing in the state-building process, this negative association should become stronger. For the Mongols, the relationship between temperature/precipitation and conflict initiation should be different. Under the impact of severe climate shocks, they were unable to attack the settlers even though they had the willingness to do so. As the temperature or precipitation increased, war became more feasible for the Mongols because the tactical environment would become suitable for military actions. Besides, they could not extract a stable income from the population even under moderate climatic conditions due to the lack of a bureaucratic system, particularly tax collection agencies. Hence, when the temperature/precipitation was high, the Mongols should be more likely to attack than when the temperature/precipitation was low. In sum, using temperature and precipitation to proxy for the severity of negative climate shocks, I derive the following hypotheses to be tested in the empirical analysis:

> **Hypothesis 1 (decentralized societies):** The likelihood of Mongol invasion is positively associated with temperature/precipitation.

> **Hypothesis 2 (centralized societies):** The likelihood of Manchurian invasion is negatively associated with temperature/precipitation, but such association should only exist after the Manchurian embraced centralization. As the level of centralization increases, the marginal effect of temperature/precipitation on conflict initiation decreases.

Research Design and Results

In this section, I empirically examine whether political institutions, in particular, the level of centralization, can moderate the relationship between climatic conditions and conflict initiation. The baseline results are estimated using split samples—one for the Mongols and the other for the Manchurian—in which the unit of analysis is year.

Data and Variables

In the analysis of Mongol and Manchurian invasion, the dependent variable equals 1 if there was a nomadic invasion, and 0 otherwise. The *Early Modern East Asian War Data* (thereafter EAW) compiled by Kang, Shaw, and Fu (2016) provide information on the conflicts between nomadic peoples and settlers in East Asia from year 1368 to 1840, when China was ruled by the Ming (1368–1644) and the Qing Dynasty (1636–1911) and Korea was ruled by the Choson Dynasty (1392–1910). For a detailed illustration of the conflict data and the process through which I construct the dependent variable using EAW, please refer to the Online Appendix. During 1368–1840, Mongol invasions occurred in 114 years. Before 1644—which is the year when the Qing Dynasty founded by the Manchurian replaced Ming as the master of China, Mongol invasions occurred in 110 years, while Manchurian invasions—either

Table 1. Summary of Variables in the Split Sample Analysis.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Mongol attacks against settlers (1470–1840)	371	.2372	.4259	0	1
Mongol attacks against only Ming (1470–1644)	175	.48	.5010	0	1
Manchurian attacks against Ming and Choson (1470–1644)	175	.1486	.3567	0	1
Settlers' attacks against Mongols (1470–1840)	371	.0674	.251	0	1
Ming's attacks against Mongol (1470–1644)	175	.08	.2721	0	1
Ming's attacks against Manchurian (1470–1644)	175	.0343	.1825	0	1
Korean attacks against Manchurian (1470–1644)	175	.0229	.1499	0	1
Temperature (1470–1840)	371	.0081	.0844	−.1867	.2523
Temperature (1470–1644)	175	.0104	.0946	−.1867	.2523
Precipitation index (1470–1840)	371	.0203	.2843	−.88	.831
Precipitation index (1470–1644)	175	−.0479	.2828	−.88	.638

targeting Chinese or Korean settlers—occurred in 29 years. Often the conflicts initiated by the nomads broke out once per year, thus I adopt a binary measure of the dependent variable.[5]

The first major independent variable in the empirical analysis is temperature. For this variable, I use the historical reconstruction by Shi, Yang, and Gunten (2012). The data cover the past 1,000 years for China with an annual resolution. It is based on a collection of 415 accurately dated climatic proxies that are distributed evenly across the whole country and estimated using the regularized errors-in-variables methods. The proxies include historical records, ice cores, speleothems, and composites.[6] The unit of the temperature variable is Celsius.

The other climatic factor that may also affect the likelihood of nomadic invasion is precipitation. To measure it, I use the index of annual summer precipitation constructed by Yi et al. (2012) that begins in AD 1470.[7] Their reconstruction is based on tree-ring data as well as another index of historical drought and flood created by the China Meteorological Administration. The Yi et al. (2012) index captures the absolute level of precipitation. The sample area is North-Central China (108-115°E, 33-41°N), which is adjacent to and partially covers the territory of southern Mongol tribes that initiated most nomadic conflicts against the settlers.

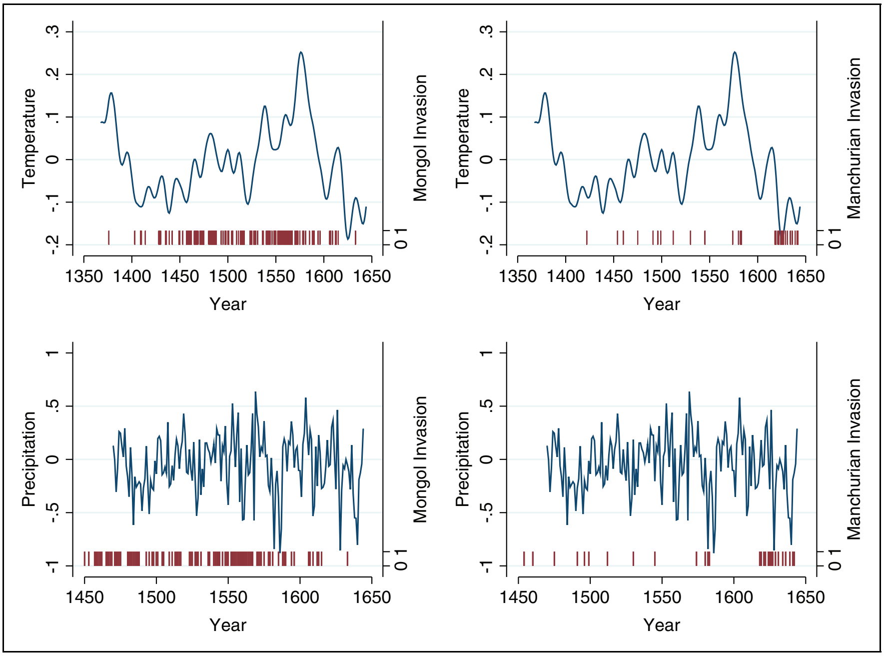

Figure 1. Nomadic invasion, temperature, and precipitation in premodern East Asia.

I control for the attack initiated by the settlers—by China's Ming Dynasty, the Qing Dynasty after year 1644, and the Choson Dynasty of Korea. Since the likelihood of conflicts instigated by settlers is also correlated with climatic conditions, omitting this variable may lead to inconsistent estimates (Bai and Kung 2011). To operationalize, I include a dummy variable that equals 1 if the settlers attacked the nomadic peoples and 0 otherwise. The data source is the same as the dependent variable with details illustrated in the Online Appendix.

Summary statistics of the dependent and independent variables are presented in Table 1. In Figure 1, I plot the temperature and precipitation indicators over time against the binary measure of nomadic invasion. The upper left graph suggests that Mongol invasions were more likely to occur when the temperature was increasing (such as the period between 1540 and 1570), while the upper right graph shows that Manchurian invasions occurred mainly in the first half of the seventeenth century when the temperature kept decreasing. This pattern is consistent with my theoretical expectation. Finally, the bottom graphs do not reveal a clear pattern on the relationship between precipitation and nomadic invasion. Below I use statistical methods to quantitatively examine how the two nomadic groups responded to climatic change differently.

Table 2. Logit Estimations of Mongol Invasions.

	(1)	(2)
Time Span	1470–1840	1470–1644
Temperature	4.9708** (2.0753)	5.7880** (2.3765)
Precipitation	−0.1147 (0.5776)	0.2752 (0.6322)
Settler attack	−2.0782*** (0.6850)	−2.0303 *** (0.7083)
t	−0.4834*** (0.1108)	−0.3683 (0.2807)
t^2	0.0160*** (0.0057)	−0.0024 (0.0623)
t^3	−0.0002** (0.0001)	0.0014 (0.0030)
Constant	0.4156* (0.2146)	0.4674* (0.2484)
N	371	175
AIC	264.5223	215.6003
BIC	291.9357	237.7538
Log likelihood	−125.2611	−100.8001

Note: The table displays coefficients and standard errors (in parentheses). Two-tail tests.
*$p < .10$.
**$p < .05$.
***$p < .01$.

Mongol Invasion

Since the dependent variable has a binary outcome, I estimate logit models. The estimation results based on the Mongol sample are presented in Table 2. Cubic polynomial approximation is also included in the right-hand side of the equation to address the concern for temporal autocorrelation (Carter and Signorino 2010). In model 1, the sample years cover 1470–1840, while the sample years of model 2 end at 1644, when the Manchurian became the master of the China Proper. In both models, the coefficients on temperature are statistically distinguishable from 0 at 95 percent confidence level and have a positive sign. The results indicate that the Mongols were unlikely to invade south when there was a negative climate shock but became more belligerent under moderate climatic conditions. The findings confirm Hypothesis 1, suggesting that the conflict propensity of decentralized entities decreases in the severity of negative climate shocks. Precipitation, on the other hand, does not have a statistically significant effect on the probability of Mongol invasion. The difference between the effects of precipitation and temperature may result from the fact that the Mongols could overcome the precipitation shortage problem by moving to wherever water is available—after all, the Yellow River runs through the Hetao Area they occupied, but could not adjust to a sudden drop in temperature. The average marginal effect (AME) of temperature on the probability of Mongol invasion is reported in Table 2: a 0.1 °C increase in the temperature is associated with a 11.4 percent increase in the probability of Mongol invasion (see Figure 2).

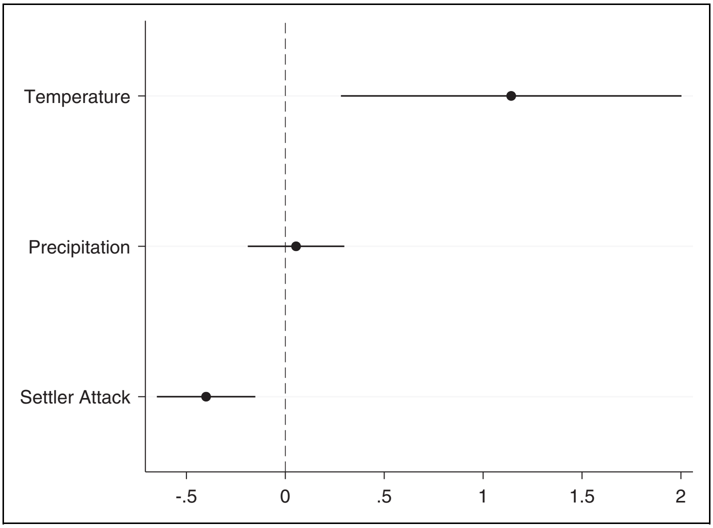

Figure 2. Average marginal effects on the probability of Mongol invasion. Average marginal effects with 95 percent confidence interval. Based on the results of model 2 in Table 2.

There is also strong evidence indicating that the likelihood of Mongol invasion is negatively associated with the attack from settlers. In other words, if in certain year the settlers launched a war against the Mongols, the Mongols were unlikely to respond with violence in the same year. Attacks initiated by settlers imply that the Chinese Dynasties were powerful and stable. Under such circumstances, the Mongols indeed would not have a strong incentive to invade, as they were facing a powerful enemy. This is different from the results in the analysis of Manchurian invasion, which I will elaborate more in the following paragraphs.

Manchurian Invasion

I proceed to examine how the Manchurian responded to climate shocks. I expect to see different patterns before and after the Manchurian embraced centralization, and a pattern different from the Mongols'. I use two measures for the institution moderating variable. The first is a dichotomous measure, a dummy variable that equals 1 since 1583 when Nurhaci started unifying the Jurchen tribes and establishing state apparatus that greatly enhanced the level of centralization—thus mobilization and extractive capacity—for the Manchurian and 0 before. The dichotomous measure captures the fact that the emergence of the Manchurian state was the outcome of an exogenous event.[8]

However, state building is usually a time-consuming process. Hence, I also use a continuous measure for the level of centralization. The proxy I use is the number of banners—the basic administrative and military unit in the Manchu society. Both Nurhaci and Hongtaiji used flags (*qi*) with different colors and patterns to name and identify the banners. Soon after Nurhaci's rise in 1584, he created the first banners labeled with black flags. The number of Manchurian banners gradually increased to eight by 1615. The Eight Banners (*baqi*) became the foundation of the Manchu state (Liu 2007, 146). Thereafter, Han Chinese and Mongols conquered by the Manchurian were also incorporated into the banner system. The first two Mongol banners were established in 1629. Two years later, the first Han banner was created, turning the total number of banners to eleven. The number of Han and Mongol banners gradually reached eight as well. By 1642, a total of twenty-four banners were created (Yao 1995). The growing number of banners is an indication that the Manchurian state apparatus was becoming increasingly complex and centralized. Therefore, the number of banners could serve as a proxy for the level of centralization in the Manchu state.

State building is endogenous to many other factors, as states may adopt centralization in response to external threat.[9] But this endogeneity problem does not necessarily do a disservice to inference. For an interaction term in which one variable is endogenous and the other is exogenous, the coefficient on the interaction term can be consistently estimated without using the instrumental variable approach. So is the marginal effect of the exogenous variable on the dependent variable (Bun and Harrison 2018).[10] Since we are mostly interested in the coefficient on the interaction term and the marginal effect of temperature—which is exogenously given—at different levels of centralization, the endogeneity of political institution does not prevent us from consistently testing whether it is a moderating variable in the climate–conflict connection.

The Manchurian sample ends in 1644. I discard all the regime consolidation wars between the Manchurian Qing Dynasty and forces loyal to Ming in and after AD 1644 because wars fought thereafter were conducted in the agricultural zone, and the major goal of the Manchurian/Qing Empire became eliminating the remaining power of Ming and conquering the whole China instead of fighting for survival. In addition, since 1644, the Manchurian troops were joined by many Han Chinese warlords such as Wu Sangui, and the main forces were no longer the Banner soldiers, but the Green Standard Army (*luying*) that consisted of Han Chinese recruited in the agricultural zone (Luo 1984, 2, 62). Thus, the conquest of the China Proper after 1644 was no longer a conflict between the nomads and settlers. Restricting sample years to 1470–1644 can partial out expansionist wars that occurred out of motivations other than surviving under negative climate shocks.

The results of logistic regressions in which Manchurian invasion is the dependent variable are reported in Table 3. The dependent variable is coded as 1 if the Manchurian attacked the Ming Dynasty of Han Chinese or the Korean Chosen Dynasty and 0 otherwise. In model 3, I use the dichotomous measure for institution, which takes the value of 1 from year 1583, when Nurhaci started unifying the Jurchen tribes and establishing state apparatus that greatly enhanced the level of

Table 3. Logit Estimations of Manchurian Invasions.

	(3)	(4)
Centralization Measure	Dichotomous	Continuous
Centralization	−0.8088 (1.0592)	−0.4503** (0.1947)
Temperature	3.9739 (4.4504)	−3.1221 (3.6471)
Centralization × temperature	−33.3678*** (9.6367)	−4.6438*** (1.5867)
Precipitation	−0.0866 (1.4535)	−0.2574 (1.1607)
Centralization × precipitation	1.0152 (1.8744)	0.2065 (0.1284)
Attack from Ming	4.5846** (1.8379)	4.5252*** (1.5946)
Attack from Choson	4.1540*** (1.5817)	2.1141 (1.2928)
t	0.3565 (0.2756)	0.2084 (0.2359)
t^2	−0.0351 (0.0221)	−0.0244 (0.0194)
t^3	0.0008* (0.0005)	0.0007* (0.0004)
Constant	−3.4919*** (0.9861)	−2.6941*** (0.7490)
N	175	175
AIC	122.9254	126.4380
BIC	157.7380	161.2507
Log likelihood	−50.4627	−52.2190

Note: The table displays coefficients and standard errors (in parentheses). Two-tail tests.
*$p < .10$.
**$p < .05$.
***$p < .01$.

centralization and mobilization and extractive capacity for the Manchurian. In model 4, I use the continuous measure for the level of centralization, which is proxied by the number of banners. I adopt the same precipitation index reconstructed by Yi et al. (2012) in the analysis of Manchurian invasion. As the contemporary data show, precipitation in North China is highly correlated with that in Northeast China, thus the index is a good proxy for the historical precipitation in the Manchu area as well.[11] In terms of the settlers' attacks, I distinguish those initiated by the Ming Dynasty of China from those initiated by Korea based on the information provided by Kang, Shaw, and Fu (2016).

The interaction terms between the institution variable and temperature have a negative sign in both models and are statistically distinguishable from 0 at 99 percent level. These results suggest that political institutions do moderate the effect of temperature on the probability of Manchurian invasion: as the level of centralization increases (from 0 to 1 or continuously), the marginal effect of temperature decreases.

The AMEs of temperature at different levels of centralization based on models 3 and 4 are reported in Figure 3. The left graph suggests that, indeed, with the presence of centralized institutions, temperature is negatively associated with the probability of Manchurian invasion. On the other hand, absent centralized institutions, the AME of temperature has a positive sign, though it is statistically indistinguishable from 0 at 95 percent confidence level. The AME graph based on model 4 reveals a similar

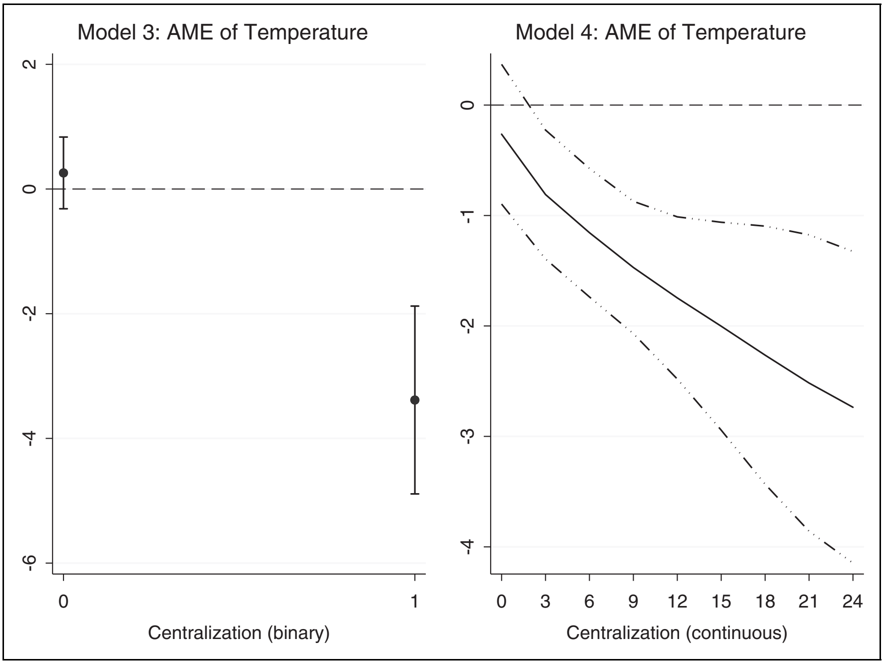

Figure 3. Average marginal effects of temperature on the probability of Manchurian invasion with 95 percent confidence interval. The vertical axis represents the average change of the probability of Manchurian invasion in response to a unit increase in temperature. The horizontal axis represents the level of centralization (dichotomous and continuous).

pattern: as the level of centralization increases, the marginal effect of temperature decreases. Both graphs suggest that the Manchurian before embracing centralization (i.e., centralization = 0) were even unlikely to attack the settlers when the temperature increased. This may result from the fact the hunting and gathering based economy of the Manchurian—which was more backward than the animal husbandry of the Mongols (Liu 2007, 121)—and the fragile society built on it had prevented them from launching an attack even in the absence of negative climate shocks.

Precipitation has no independent effect on the war propensity of the Manchurian. Moreover, its marginal effect across different levels of centralization is also statistically indistinguishable from 0 (see the Online Appendix). Same as the Mongols, the Manchurian were insensitive to the change in precipitation. Like the Mongols, major rivers run through the Liao River Plain and the Songnen Plain—an alluvial plain formed by the Songhua River and Nen River—where the Jurchen tribes resided. Thus, the shortage of water was not a major concern for the Manchurian. Different from the Mongols, however, attacks initiated by the Ming Dynasty are positively associated with the likelihood of Manchurian invasion. There is also weak evidence that the attacks initiated by the Choson Dynasty of Korea can increase the likelihood of Manchurian invasion as well. In other words, unlike the Mongols, the Manchurian more often responded to settlers' military offense with violence. The data and historical details suggest that the Ming Dynasty initiated attacks against the Manchurian in six years, all of them occurred in or after year 1582 when Nurhaci came to power. Thereafter, all but one settlers' attacks triggered the retaliation from the Manchurian in the same year. This too can be explained by the stronger mobilization capacity of the Manchurian. Attack from Ming is an indication of fierce rivalry between the two peoples that gave both sides the willingness to fight a war. With stronger mobilization capacity, the Manchurian were able to launch a counterattack against the aggressive settler, while the less centralized Mongol societies had to opt for appeasement. In sum, based on the Manchurian sample, I find support for Hypothesis 2.

The empirical results based on the two split samples confirm both Hypotheses 1 and 2. When the temperature was extremely low, the Mongols were unable to mobilize sufficient resources to attack the settlers' border. When the temperature increased, the probability of Mongol invasion would become higher as the climatic conditions became suitable for war. Moreover, the lack of a centralized bureaucratic system means that the Mongols could not extract sufficient income by taxing the population, thus the absence of negative climate shocks could only encourage them to attack the settlers. On the other hand, the interaction between the Jurchen people/Manchurian and the settlers exhibits a different pattern: the temperature measure was negatively associated with the likelihood of Manchurian invasion. In other words, unlike the Mongols, the Manchurian were most likely to raid the agricultural area when the temperature was extremely low. However, such a negative association between temperature and conflict initiation only existed after the establishment of centralized political system in the Manchurian society at the turn of the sixteenth to seventeenth century. In sum, the empirical evidence based on the split samples indicates that the Mongols and Manchurian responded to the scarcity problem caused by negative climate shocks differently. Whether the nomadic people responded to negative climate shocks violently depended on whether they had the support of centralized institutions that could greatly enhance mobilization capacity. In addition, they responded to moderate climate differently, as centralized institutions could generate stable tax income that outweighed the payoffs of plundering when negative climate shocks were absent.

Historical evidence also supports my theory. Chinese and Korean documents recorded a number of severe famines in the Manchu area since AD 1595, and they also recorded that Nurhaci raised petitions to borrow and trade grains in almost every year of the first decade of the 1600. After the unification of Manchu, in 1618, Nurhaci openly declared war against Ming. A historian concluded that the war was essentially diversionary and launched to overcome the economic and social crisis caused by the famine (Yan 2006, 176-77). The temperature kept decreasing during Hong Taiji's reign. Meanwhile, the effort of centralization continued. Right after Hong Taiji became the Manchurian leader in 1626, he appointed forty high-rank officials to the banners. As a result, the influence of tribal leaders over the Manchurian army was significantly reduced (Liu 2007, 248). In year 1628, Hong Taiji asked the Korea Choson Dynasty for food aid. Being declined, he decided to take an adventurous action and directly attacked Beijing, the capital of Ming, with the newly reformed Eight Banners. His army successfully breached the Great Wall and razed the surroundings of the city. Although the Manchurian were temporarily driven back, "razing the west (*qiang xibian*)" had become a slogan among the Manchurian warriors (Wang 2008). Approximately at the same time, the Mongols were also suffering from bad weather. Instead of plundering the agricultural area, many Mongol tribes fled to the Manchu area and became subjects of the Manchurian, which put further pressure on food supplies (Wang 2008). Unlike the Mongols, with the help of highly centralized state apparatus that guaranteed efficient military mobilization, the Manchurian were able to launch invasions against the settlers to address the scarcity problem. Eventually, they defeated the Ming Dynasty—which had a 1 million strong army—with merely 120,000 banner soldiers. In sum, the mobilization capacity of the Manchurian after the rise of Nurhaci was much stronger than that of the Mongols. The gap in mobilization capacity explains why the Mongols and the Manchurian responded to the impact of negative climate shocks in the early seventeenth century so differently.

Robustness Checks

I test the sensitivity of the results to using a pooled sample, alternative model specifications, different measurements for the dependent and independent variables, and reverse causality concern. The results presented above remain robust.

Regression analysis using a pooled sample. For robustness checks, I test the moderating effect of political institutions using a pooled sample in which the unit of analysis is country-year (e.g., Mongol-1470) instead of year. Nomadic group fixed-effects are included to account for the unobserved time-invariant heterogeneity between the two peoples. The model specifications and results are presented in Table 4. I use the dichotomous measure for centralization in models 5 and 7 and the continuous measure in models 6 and 8. Since Ming was replaced by Qing founded by the Manchurian in 1644 as the master of the China Proper, I include sample years from 1470 till 1644 in models 5 and 6, leaving 175 Mongol-years and 175 Manchurian-years in the sample. I extend sample years to 1840 for the Mongol observations (but not the Manchurian ones) in models 7 and 8. In other words, in models 7 and 8, there are 371 Mongol-years and 175 Manchurian-years, in total 546 observations.

According to the results in Table 4, the interaction term between temperature and centralization is statistically significant at the 95 percent level and has a negative sign in all four models. The results further confirm that the level of centralization is a moderating variable in the climate–conflict connection: the effect of temperature on the probability of nomadic invasion becomes negative for nomadic groups with a

Table 4. Fixed-effects Logit Estimations Using Pooled Sample.

Centralization Measure	(5) Dichotomous	(6) Continuous	(7) Dichotomous	(8) Continuous
Time Span	1470–1644	1470–1644	1470–1840	1470–1840
Centralization	−0.3131 (0.8942)	−0.1906** (0.0813)	0.4537 (0.7316)	−0.1845*** (0.0424)
Temperature	5.4277*** (1.8698)	1.1437 (1.7185)	5.0158*** (1.6833)	0.7924 (1.6771)
Centralization × temperature	−21.3396*** (6.9948)	−1.5523** (0.6364)	−13.4857*** (5.1721)	−1.3388*** (0.3839)
Precipitation	−0.1301 (0.5357)	−0.2692 (0.5427)	−0.4478 (0.4984)	−0.1861 (0.5304)
Centralization × precipitation	0.9682 (1.2406)	0.1062 (0.0878)	1.6135 (1.2535)	0.0669 (0.0611)
settler attack	−1.1332* (0.5946)	−0.7190 (0.5766)	−1.1960** (0.5661)	−0.5505 (0.5358)
Centralization × settler's attack	4.3384** (1.7954)	0.1972 (0.1433)	3.0685** (1.3937)	0.0699 (0.0577)
N	350	350	546	546
AIC	338.1560	353.9532	400.3462	389.3901
BIC	376.7354	392.5325	443.3724	432.4163
Log likelihood	−159.0780	−166.9766	−190.1731	−184.6950

Note: The unit of analysis is nomadic group-year. Columns 5 and 6 include 175 Mongol-years and 175 Manchurian-years. Columns 7 and 8 include 371 Mongol-years (1470–1840) and 175 Manchurian-years (1470–1644). The table displays coefficients and standard errors (in parentheses). Group fixed-effects are estimated but not reported. Cubic polynomial approximations are estimated but not reported. Two-tail tests.
*$p < .10$.
**$p < .05$.
***$p < .01$.

high level of centralization (see the AME graphs in the Online Appendix). Second, precipitation is a poor predictor for the dependent variable in all four models. Finally, the negative constituent term of settlers' attack and the positive interaction term between centralization and settlers' attack in models 5 and 7 also explain why the Mongols and the Manchurian responded to settlers' invasion differently: centralized institutions facilitated the military counterattack against Ming for the Manchurian.

Alternative model specifications. Considering that there may exist some lag effect of climate shocks and settlers' attacks, I add—in the Manchu and pooled sample analysis—the first-order temporal lags of temperature, precipitation, and settlers' attack and interact them with the current period measure for centralization. I also include the temporal lags of precipitation and temperature in the Mongol analysis. The key findings remain robust to using dynamic specifications. Detailed discussions and results are attached in the Online Appendix.

The likelihood of nomadic invasion may not be a linear function of the climatic variables (Raleigh and Kniveton 2012). For robustness checks, I include the quadratic terms of temperature and precipitation as predictors. The quadratic term of temperature in the Mongol analysis is statistically significant at 99 percent and has a negative sign, indicating that while moderate temperature did facilitate military offense for the decentralized Mongols, such pattern did not hold beyond certain threshold. When the temperature was extremely high, the Mongols were unlikely to attack the settlers too. The inverse U-shaped relationship between temperature and the probability of Mongol invasion does not necessarily falsify Hypothesis 1. First, the results still confirm that, due to the lack of sufficient mobilization capacity, the Mongols were less likely to initiate a conflict when there was a negative climate shock than when the climate was moderate. Second, as the predicted probability graph suggests, the predicted probability of Mongol invasion has a wide confidence interval for high range of temperature due to the lack of sufficient observations (see the Online Appendix). Since there is only weak evidence for the argument that beyond a certain threshold the effect of temperature becomes negative, we should interpret the quadratic results cautiously. I also include quadratic terms of temperature and precipitation in the analysis of Manchurian invasion and interact them with the centralization variable. The key finding that the effect of temperature decreases and becomes negative as the level of centralization increases does not change. Precipitation and its quadratic terms are both poor predictors for nomadic invasion. In sum, the quadratic specification results confirm that compared to decentralized entities, centralized ones are more likely to initiate external conflicts under the impact of negative climate shocks. The results may also imply that when the temperature is extremely high, both centralized and decentralized entities are unlikely to attack, though the evidence is weak due to the lack of sufficient observations.

Finally, I estimate linear probability models with dynamic specifications. The estimation strategy is similar to that applied to time series data with a continuous dependent variable. The results remain basically the same. The detailed discussions and results can be found in the Online Appendix.

Alternative measurements. I also check the sensitivity of the results using alternative measurements for the dependent and independent variables. First, in the analysis of Manchurian invasion, I use an alternative measure for the dependent variable. The new dependent variable, Manchurian invasion, takes the value of 1 only if it was targeted at the Ming Dynasty instead of the Korean settlers and 0 otherwise. The major findings remain robust. Second, I use an alternative coding for the dichotomous centralization variable: it takes the value of 1 from 1616 when Nurhaci founded the Hou Jin Dynasty that resembled settler dynasties of the Han Chinese. The AME graph suggests that prior to 1616, temperature has a statistically significant (at 95 percent level) and positive effect on the probability of Manchurian invasion to Ming, and the effect becomes negative at 99 percent level after 1616. Finally, I use a different measure for precipitation in both analysis. Following Bai and Kung (2011), I use a dummy variable—levee breach along the Yellow River—to proxy for high precipitation and drought records in North China to proxy for low precipitation. All findings generated from these alternative measurements meet my theoretical expectations and are not substantially different from the previous results.

Reverse causality. To address the concern that external conflicts were simultaneously affecting the Manchurian state building process, I use the temporal lags of the number of banners to proxy for the level of centralization. Using the first, second, or third order temporal lag generates essentially the same results as the baseline: as the level of centralization increases, the marginal effect of temperature on the probability of Manchurian invasion decreases and becomes negative. Again, centralization moderates the effect of temperature on nomadic invasion. But no similar pattern can be found for the effect of precipitation.

Conclusion

The findings of this article suggest that environmentally vulnerable societies like the nomads have the willingness to plunder a richer area in order to address the resource scarcity problem caused by negative climate shocks. However, depending on their mobilization capacity—which is influenced by the level of centralization, they may or may not be able to launch an attack. Mobilization capacity is of great importance for military actions, particularly under the impact of negative climate shocks when the opportunity costs of war are larger (Devlin and Hendrix 2014). Thus, when negative climate shocks occur, societies with low mobilization capacity are unable to implement their military strategy even if they are eager to initiate a conflict. In addition to affecting mobilization capacity, centralized institutions can enhance extractive capacity as they can help generate stable income to be taxed from the population when there is no negative climate shock. As a result, when the temperature is moderate, societies with centralized institutions have little incentive to attack, while societies without centralized institutions are more likely to initiate a conflict as the climatic conditions are suitable for warfare.

I use two comparisons to identify the moderating effects of political institutions: the comparison between the Mongols and Manchurian, and the comparison of the Manchurian before and after they adopted centralization. Based on the regression results presented above, we can conclude that the Mongols whose political system was highly decentralized were unlikely to initiate an attack against the settlers when the temperature was low. On the other hand, the Manchurian after 1583 were better at mobilizing manpower and other resources for war even under the impact of negative climate shocks, as they had established more advanced and more centralized institutions thanks to the effort of Nurhaci and his son Hongtaiji. In addition, centralized institutions could generate stable income that discouraged them from attacking the settlers when the climate was moderate. Therefore, the probability of Manchurian invasion was negatively associated with the temperature after they embraced centralization. The findings are robust to various measurements, model specifications, and endogeneity concern.

This article adds to the effort of linking East Asian history and contemporary international relations theory. Kang, Shaw, and Fu (2016) and Kang et al. (2019) construct data sets on the conflicts in premodern East Asia, centering on China, Korea, and Vietnam. As the application in this article suggests, historical East Asian data could be used to formulate and test meso-theories on political institutions and conflict behavior. Future work could explore the relationship between state building and war and the relationship between war and long-run economic growth using the East Asia data (Dell, Lane, and Querubin 2018).

Acknowledgments

I would like to thank Joshua Alley, Timm Betz, Chong Chen, Zhiwu Chen, William Clark, Darong Dai, David Fortunato, Ronan Tse-min Fu, Matthew Fuhrmann, Florian Hollenbach, Hwalmin Jin, Michael T. Koch, Quan Li, Austin Mitchell, John Niehaus, Yohan Park, Amy Pond, Idean Salehyan, Mingsi Song, Ahmer Tarar, Wei-chieh Tsai, Guy D. Whitten, Youlang Zhang, participants of The 2018 Texas Triangle International Relations Conference, participants of The Sixth Annual International Symposium on Quantitative History, and two anonymous reviewers for their helpful comments.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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Supplemental Material

Supplemental material for this article is available online.

Notes

1. See *UN News*, available at: https://news.un.org/en/story/2018/07/1014411.
2. The Manchurian people originally relied on hunting and fishing (yulie), which was economically more backward than the animal husbandry of the Mongols. This is so because hunting and fishing involved no production process, and its yields were highly unstable (Liu 2007, 121-22). Agriculture slowly developed in the Manchu area as a result of their exchanges with the Chinese and Korean settlers, but the shift from hunting and fishing to farming did not happen until the early seventeenth century after the Manchurian state was built (Liu 2007, 164). Note that primitive agriculture also emerged in the Mongol society, particularly in areas close to the Great Wall from which most nomadic invasions were initiated. For example, a scholar in Ming Dynasty recorded that under Altan Khan's reign, who ruled the Southern Mongolian tribes from 1542 to 1582, Han immigrants reclaimed 10,000 qing of farming land (1 qing is approximately 667 m^2) in Yuntian and Fengzhou (Qu 2006, volume 8). In a word, both the Manchurian and the Mongols—thanks to their proximity to the agricultural zone—to some degree diversified their income sources to partially overcome the instability of yields from hunting and fishing and animal husbandry. Heave reliance on animals and a certain level of diversification is a commonality between the two peoples in the economic domain (Liu 2007, 121).
3. Fixed-effects model specifications can account for unobservable group-specific time-invariant features. Thus, the unobserved heterogeneity between the two peoples does not necessarily impede statistical inference. See the empirical analysis below.
4. For example, the so-called Great Chief (juqiu) of Jurchen tribes, Li Manzhu, owned only 100 households directly despite that there were over 1,700 households in his tribe (Liu 2007, 60). After Li Manzhu was killed by the Korean, his son asked for support from other tribal leaders to revenge for his father but was declined. This event is a good indication that the Manchurian tribes at that time were independent of each other. There existed no higher authority upon them (Liu 2007, 9).
5. There was only one Mongol invasion in 86 of the 114 years with conflicts, two invasions in twenty-five years, and three invasions in three years. The Manchurian invasion to Ming and Korean settlers occurred only once in the twenty of the twenty-nine years with conflicts.
6. This variable is temperature anomaly with respect to the mean of 1368–1840, the sample years of our empirical analysis. The original data reported by Shi, Yang, and Gunten (2012) are deviations with respect to the mean of 1961–1990. Using different baselines generate exactly the same estimation results (except for the intercept) as using the absolute temperature level because anomalies with respect to different baselines are all perfectly correlated with the absolute temperature level. Hence, this measure can be interpreted as the

absolute level of temperature. The data are accessible at: https://www1.ncdc.noaa.gov/pub/data/paleo/contributions_by_author/shi2012b/shi2012china.txt.

7. The data are accessible at: https://www.ncdc.noaa.gov/paleo-search/study/5421.
8. When Nurhaci was young, he had been involved in the cross-border trade between the Chinese settlers and Manchurian, through which he became heavily influenced by the Confucian culture. He was even able to read and speak Chinese (Yan 2006). At that time, the settlers' culture was more advanced, with a polity much more centralized and well-organized compared to the nomads. In 1583, his father and grandfather were accidentally killed. Thereafter, Nurhaci became the leader and gradually unified and reformed the Manchurian society by importing the advanced culture and institutions of the settlers. Simply put, the process of centralization took off as a result of an exogenous shock.
9. For example, see Dincecco, Federico, and Vindigni (2011); Gibler (2010); Kiser and Cai (2003). Zhao (2004) questions the argument of Kiser and Cai (2003) and suggests bureaucratization in early China predated large-scale warfares.
10. The consistency of ordinary least squares estimator for endogenous interaction term is built on two assumptions (Bun and Harrison 2018). The first assumption is the exogeneity of temperature. This is a reasonable assumption in the context of nomadic invasion as temperature was largely exogenous to human activities before the Industrial Revolution. The second is that the endogeneity of political institutions as a result of any omitted variable bias must be independent of temperature. For this assumption to hold, we need to assume that climatic conditions and institutional change are irrelevant. This assumption is also reasonable, as short-term variation in temperature and precipitation is unlikely to change institutions fundamentally. To address the concern that either assumption is violated, I perform robustness checks using the first- and higher-order lag(s) of the centralization variable (i.e., the number of banners), which are exogenous to both current period conflict and climate. The major findings remain unchanged.
11. For more details on the correlation between the two regions' precipitations, please refer to the Online Appendix.

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