State Formation and Bureaucratization: Evidence from Pre-Imperial China

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Abstract

How does one build a centralized bureaucratic state? A dominant view is that wars incentivize rulers to directly extract resources, thereby increasing state capacity. The Chinese empire, one of the earliest states to develop a centralized bureaucracy, can provide useful insights. Using hand-collected data, I present the first systematic evidence on patterns of warfare and state-building in pre-imperial China. I then develop an incomplete contract model to study ruler’s and agent’s incentives at war, and demonstrate that ownership of land and type of military conflict both affect state-building. External military pressure dampens centralization, as land-owning agents have more to gain from a successful defense, and therefore become more committed. Under certain conditions, centralization is more aggressive at offense, as non-land-owning agents are more willing to participate in attacks because they have less to lose. A decrease in the agents’ bargaining position also facilitates state-building. Empirical tests and historical examples are consistent with model predictions.

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1 Introduction

Building strong, functioning states has been a key objective of rulers and statesmen throughout human history. From ancient Egypt and medieval Europe, to premodern Japan and present-day Middle East, one can find many examples of success, and plenty more of failure. Yet, the question of how to build a centralized bureaucratic state has long remained a puzzle to both aspiring state-builders and scholars (Tilly 1992; Finer 1997; Ertman 1997).

The creation of a centralized bureaucratic state has profound implications for economic development. States play an important role in the provision of public goods (Besley and Persson 2011; Hoffman 2015), and can enhance the protection of property rights and encourage productive investments through limiting the use of violence (North et al. 2009; Bates et al. 2002; Olson 1993; Sánchez de la Sierra 2019). The impact of state institutions on economic growth is also determined by the configuration of administrative power within the state (De Lara et al. 2008; Greif 2008). Every state administration involves the delegation of authority, and for a state to be strong, incentives of the ruling body and its agents must be aligned to a certain extent.

Through what processes, then, do centralized bureaucratic states form? Existing theories of state formation primarily draw from European history, and place a heavy emphasis on the role of warfare. The common argument is that wars incentivize rulers to build up their extractive capacity and create fiscal infrastructures (Hintze 1975; Tilly 1985, 1992; Olson 1993; Besley and Persson 2009), and that wars and military competition forces state to adopt more efficient bureaucratic forms (Lewis 1990; Weber 1978).

The Chinese empire, on the other hand, had received much less attention in the literature. As one of the longest-lived autocratic regimes, imperial China serves both as a case of global importance in its own right, but also as a valuable case for understanding the formation and robustness of centralized bureaucracies. In the seventh century B.C., China was composed of over one hundred autonomous regional states (zhuhou guo 诸侯国) ruled by

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1A state, as defined by Weber (1958), is a monopoly on the legitimate use of physical force within a given territory.

2Weber (1978:954) suggests that the ideal type of rational bureaucracy is characterized by qualifications-based appointment and promotion of officials, hierarchical organization and monitoring of officials based on written regulations, payment of salaries in money and officials who do not own their positions (Kiser and Cai 2003; Swedberg and Agevall 2005:19). It should be noted that no premodern administration ever reached such standard (Eich 2015:93).

3Political theorists have extensively studied the selection of state agents, credible commitment and power-sharing among ruling elites, and how these affect the administrative forms of the government (Egorov and Sonin 2011; Acemoglu et al. 2010; Myerson 2008; Gehlbach et al. 2016; Boix and Svolik 2013). Others examine the roots of state-building through the lens of history, using as context premodern Europe (Hintze 1975; Tilly 1992; Mann 1993), Japan (Ikegami 1997; Jansen 2002) and Latin America (Centeno 2003; Arias 2013), and at times with a comparative perspective (Wong 2000; He 2013).
warlords and their vassals. Since then, the process of centralization and bureaucratization took off and continued for the next five centuries, accompanied by constant warfare among the regional states and frequent conquests of the weak by the powerful. This process eventually consummated in the birth of the Chinese empire in 221 B.C. that was consolidated under and “administered by a centralized bureaucratic government” (Creel 1964:155; Finer 1997:13,87,90). Remarkably, many of the institutional innovations developed then were to persist for the next two millennia, even though the first empire collapsed within fifteen years of its founding.

In this paper, I study patterns and mechanisms of state-building in pre-imperial China. I hand-collect novel datasets on wars, administrative divisions and administrators over the Spring and Autumn Period (770–481 B.C.) and the Warring States Period (480–221 B.C.), and present the first systematic evidence on warfare and state-building in pre-imperial China. First and foremost, I show that the association between war and state-building in this period is positive and statistically significant, which is consistent with conventional theory. I demonstrate that the major regional states of the time achieved different degrees of state-building, and that the relationship between warfare and state-building varied across states.

Then, I develop an incomplete contract model of land ownership to study the mechanisms via which different types of warfare affect state-building. In this model, the ruler appoints an agent to manage a land domain. He can give the administrator a fief contract or a county contract, the key distinction between which is ownership of the domain. Following the literature on incomplete contracts, ownership is defined as the residual right of control over domain resources (Grossman and Hart 1986; Hart and Moore 1990). Under the fief contract, the administrator claims ownership to the domain, receives its taxable income, and organizes military actions. Under the county contract, the ruler retains ownership of the domain and receives its income; the administrator collects taxes and organizes military actions on behalf of the ruler, and receives wage payments in return. In other words, the fief contract corresponds to decentralization, while the county contract corresponds to centralization.

In the model, military conflicts are divided into two types: defense from external threat, and attack on others. I separately examine the incentives and strategic interactions between the ruler and his agent in defensive and offensive settings. In a defensive game, the two players face an invasion from a foreign enemy, and invest in military spending for self-defense. In an offensive game, they invest in military spending to attack a foreign enemy. If the war is won, both survive and consume their corresponding payoffs; and if the war is lost, the agent dies. Thus, the agent can also opt out of conflict, if he does not find it worthwhile.

This model generates three testable predictions. First, state-building is less likely to happen in regions that face greater external threat. The ruler optimally responds to greater
threats by conceding land ownership to his agent, so that the latter sees a larger incentive to defend the domain as he now has more to gain from a successful defense. Second, under certain conditions, county agents are more willing to undertake military attacks, especially against weak enemies, when prize from war is low. This is because a non-land-owning county agent has less to lose in a failed attack than a fief agent. This shows that, under some conditions, land ownership affects agent’s defense and offense incentives in opposite directions. Third, centralized counties are more likely to have agents with lower outside options, which is an indication of smaller bargaining power. This is because the county contract produces smaller gains for the agent.

I take these predictions to data, and demonstrate that they are consistent with empirical findings. To verify the first two results, I use data on bureaucratic counties and vassal fiefs in the states of Jin and Chu (two of the most powerful regional states in the Spring and Autumn Period). Consulting a set of historical atlas, I map them to their contemporary locations, and determine whether they were on the state border, and if so, the neighbors they had. I show that an administrative unit that was located near the state border at the time of establishment is at least 28% more likely to be a vassal fief, and an administrative unit that neighbored a militarily strong state or a nomadic tribe at the time of establishment is at least 39% more likely to be a vassal fief. This result is robust to controlling for geographical characteristics including elevation and terrain roughness, and distance to capital city. In addition, I find no evidence that distance to capital city, which proxies for the cost of monitoring and transportation, affected which type of administrative units was instituted. This is valid to the degree that Chu and Jin were not extremely large states.

Then, from the war dataset, I identify military attacks initiated by Chu and Jin, and map war sites to their contemporary locations. I show that, compared with vassal fiefs, bureaucratic counties are associated with 1.85 to 3.3 additional attacks happening within a radius of 51-100 miles, with a mean of 4.59, and 3.21 to 4.22 additional attacks within a radius of 101-150 miles, with a mean of 6.13. No evidence suggests that counties are associated with a greater number of attacks within a radius of 50 miles. This is consistent with the second prediction from the model, as longer-range attacks are generally associated with expensive logistics and therefore smaller net gains. In addition, I demonstrate that these results are driven by attacks against militarily weak states.

In addition, from the dataset on administrators, I use the political prominence of an administrator’s clan lineage to proxy for his bargaining power. I determine if an administrator

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4This is in part similar to Gennaioli and Voth (2015) for the case of Western Europe.
5This also bears historical relevance to Tudor England, where the House of Percy had maintained a powerful presence in Northumberland for centuries.
held membership to a clan, and if so, I categorize the type of his clan based on the offices held by predecessors in his direct patrilineal line, and whether the founding ancestor of his clan is known. I demonstrate that a county administrator is about 20% less likely to be a member of a large noble clan, and around 32% to be a member of a small clan or to have no clan membership at all.

I further discuss these predictions in the historical context of a few major regional states of the Spring and Autumn Period for which data on vassal fiefs are unavailable. I argue that the slow development of state-building in Zheng, Song and Wey can be attributed to their proximity to the military superpowers at the time. The fact that Zheng and Song were situated in parts of the central plain that had historically been targets of military contention due to their strategic importance (Wang 1988; Ma 2008) was also important. I briefly discuss historical evidence on the role of county troops in Chu’s military expansion. In addition, I argue that the bargaining power of nobles in Chu and Qin, which were military superpowers, affected their state-building process. Chu had a relatively weak noble class and was an early state-builder. The Qin likely possessed a small supply of individuals qualified for administrative work, whose strong bargaining position may have delayed Qin’s state-building efforts. At the end, I include a discussion of how my findings relate to European history.

This paper contributes to a large strand of literature in economics and political science which studies the relationship between war and state formation (e.g. Dincecco et al. (2011); Karaman and Pamuk (2013); Becker et al. (2019)). Some scholars recognize that state-building may not be uniform across space, and that the relationship between war and state-building is not homogeneous across states and time. For example, Gennaioli and Voth (2015) shows that war can stifle state-building when money is not crucial for military success, and Centeno (1997) argues that war does not lead to state-building when alternative taxable resources are available and support from local actors is weak. While most studies analyze rulers’ incentives to centralize and go to war, my paper supplements this literature by examining the incentives of the ruler as well as his agent. I introduce the incomplete contract framework to demonstrate that land ownership can affect both parties’ incentives at war and state-building.

In particular, this paper adds to the literature that studies state formation in pre-imperial China. Kiser and Cai (2003) postulates that warfare facilitated bureaucratization by decimating the Chinese aristocracy and killing “the main barrier to administrative reform.” Hui (2005) contends that political centralization in China is a product of the self-strengthening

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5 However, Zhao (2004) suggests instead that wars were more likely the consequence, rather than the cause of, bureaucratization in China.

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reforms adopted by the regional states. Building on this argument, Zhao (2006, 2015) postulates that political centralization and proto-bureaucratization in China was the consequence of prolonged, inconclusive warfare between competitors of similar strength, an environment in which only intensification could produce decisive outcomes. My paper contributes to this literature by providing the first quantitative analysis on patterns of warfare and state-building in this era, and proposing a theory to explain why centralization happened in some regional states but not others.

Scholars have also explored alternative factors that can explain state-building. Gennaioli and Voth (2015) emphasizes the effect of fiscal resources on military strength and states’ internal cohesion; Ko et al. (2018) and Koyama et al. (2018) examine the impact of the number and direction of external threats and the size of the affected state; Michalopoulos and Papaioannou (2014) and Sng (2014) demonstrate that state institutions and extractive capacity decline in regions that are distant from the capital. My paper adds to this literature by demonstrating that the type of war can affect state-building, because the agent has different incentives in defense and in offense. Moreover, I show that land ownership can produce asymmetric effects on agent’s defense and offense incentives.

This paper is structured as follows. Section 2 outlines the relevant historical and institutional background. Section 3 describes the data and presents summary statistics and patterns. Section 4 develops a model based on this framework, and presents key results. Section 5 tests and discusses model results using historical data and examples. Section 6 concludes.

2 Historical and Institutional Background

In this section, I provide a brief overview of the history of Western Zhou, the Spring and Autumn Period and the Warring States Period, and highlight important institutional developments.

2.1 Western Zhou: 1041–771 B.C.

The Western Zhou was located in present-day central China. The King of Zhou maintained a royal domain of his own, and established a number of regional states for purposes of peacekeeping and local administration.\(^7\) The rulers of the regional states—dukes (gong

\(^7\)In Western Zhou, the concept of a state is very different from nowadays. A regional state comprised of a handful of cities and the land surrounding the cities, and there existed no clear borders between states
公)—were kinsmen of the King and were given the powers to administer local affairs, collect taxes, and maintain independent armed forces. Similarly, dukes appointed their sons and kinsmen to be high-officials (qing 卿) and ministers (dafa 大夫), collectively called the qing-dafa, and assigned to each qing-dafa a domain over which he enjoyed the aforementioned powers.

Dukes and their qing-dafa were permitted to establish lineage clans in their respective domains, and those clans formed the basis of the noble class. Male members of the nobility received proper education and military training, and were the elite warriors of the Western Zhou regime and its regional states (Huang 1998). Similarly, participation in politics was generally restricted to members of the nobility, and offices were largely hereditary (Li 2008; Zhu 1990).

Overall, the duke and the nobility shared a rather symbiotic relationship. The duke relied on the high-officials and ministers and their clans to rule the regional states. The qing-dafa held offices in the duke’s administration and provided services such as policy-making and counseling. They were also responsible for managing the affairs of their domains, and in times of need, they supported the duke with private armies for purposes of peacekeeping and defense from nomadic tribes (Yang 2003). In turn, noble clans relied on the duke to maintain their political status and associated material wealth. Nominally, a high-official or a minister received fiefs as payment for their services and as reward for making outstanding contributions to the duke (Hsu 1965; Zhao 1990). As long as member(s) of the clan held ministerial office(s) in the regional state administration, which was generally possible since offices were largely hereditary, that clan would be able to keep its domain along with its political and administrative privileges (Zhu 1990).

### 2.2 Spring and Autumn Period: 770–481 B.C.

Following the collapse of the Western Zhou government in 771 B.C. and the relocation of the capital to the east, the old political order, in which dukes of the regional states obeyed the command of the King of Zhou, also broke down. Regional states found themselves in an environment of increasing uncertainty, and the Spring and Autumn Period that ensued was characterized by frequent, albeit small-scale, warfare among those regional states.

At the beginning of the Spring and Autumn Period, political conditions in the regional states remained largely unchanged. Over the next few centuries, signs of bureaucratization (Zhao 1990). Even by the fall of the Western Zhou in 772 B.C., its “eastern domain was still not densely populated, and there were unclaimed lands scattered about... a major state could find plenty of open space among the existing states” (Hsu 1999:550). The state of Zheng (郑), for example, was able to relocate itself to a piece of unclaimed territory in the east prior to the collapse of the Western Zhou government.
emerged in a number of regional states. The expansion of the political power of noble clans led to political centralization in the sense that power was becoming concentrated in the hands of a few. In 562 B.C., the three largest noble clans in the state of Lu (鲁) divided the duke’s standing army into three divisions and each claimed command of one division; in 514 B.C., the six largest noble clans in the state of Jin (晋) exterminated the largest branches of the duke’s clan and formed a ruling coalition where the leader of each clan would take turns to rule as the head of state, and by 403 B.C., three of the six clans collectively exterminated the others, and agreed to divide Jin into the states of Han, Zhao and Wei.

A new unit of administration—the county (县) —emerged in the Spring and Autumn Period. At the beginning, counties were predominantly converted from conquered states and regions. Counties in the states of Jin and Chu (楚) were situated on the state border, their armed forces were under the duke’s direct command, and their tax revenue was submitted to the duke for military use (Yang 1981; Tan 2005). By 532 B.C., there had been forty-nine counties established in Jin, and at least eighteen in Chu (Zhao 1990; Gu and Zhu 2001; Zhou and Li 2009). Later on, the ruling class moved beyond simply converting conquered states and regions into counties, and began to transform existing territory into counties. In 635 B.C., Duke Wen of Jin (晋文公) established eight counties on a domain that was rewarded to him by the King of Zhou, and two of the eight counties were explicitly known to be duke-controlled administrative divisions (Zhou and Li 2009). In 514 B.C., six powerful noble clans in the state of Jin joined forces to exterminate two large branches of the duke’s clan, transformed their landholdings into ten counties, and appointed bureaucrats to be county magistrates (Zhou 2005).

The offices of county magistrates exhibited bureaucratic features. Appointments were made directly by the duke; the office was not hereditary even though some appointees were still members of the nobility, and had no military or taxation powers attached to it. In the state of Chu, it was possible for a county magistrate to be promoted to the Minister of War in the central administration if he demonstrated sufficient talent (Gu and Zhu 2001).

During the Spring and Autumn Period, the scale and intensity of wars were relatively small since soldiers were primarily composed of members of the aristocracy. The main instruments of war were chariots, and major weapons such as spears, dagger-axes, swords and arrows were usually made of bronze (Yang 1998:303). In a typical battle, chariots of opposing states would be deployed on both sides of an open plain and arranged in certain tactical formations, and combat would begin when armies were within range. The outcome of the battle would be determined as soon as one side manages to break its’ enemy chariot.

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8In the 7th century B.C., the states of Qi and Chu were known to have armed forces of around twenty to thirty thousand warriors (Yang 1998:309).
formation. Thus, wars were in general small and brief (Hsu 1965:63-64; Lewis 1990:243).

2.3 Warring States Period: 480–221 B.C.

As many of the smaller regional states became conquered by powerful ones, military contention among the survivors visibly intensified. The Warring States Period was characterized by large-scale warfare, extensive reforms and political consolidation in the remaining states. The seven dominant powers during this era were Qin, Qi, Chu, Yan, and the three states of Han, Zhao and Wei which split from the Jin.

The county as a bureaucratic administrative unit became widely adopted and much more structured. Cantons (xiang 乡) were established as a lower-level administrative unit to counties and governed villages and households; commanderies (jun 郡) were established as a higher-level administrative unit and governed the counties themselves. Another notable difference is that, in the Warring States Period, counties were created in a bottom-up manner by grouping nearby villages together; whereas in the Spring and Autumn Period, counties were created in a top-down manner by converting conquered territory (Zhou 2005). A county now had artificially delineated boundaries as opposed to natural ones, and its magistrate either had a fixed term or could be replaced at the ruler’s will. The magistrate was responsible for both civil and military affairs, though Qin counties adopted a separation of civil and military offices after the reforms of Shang Yang (商鞅) in 356 B.C. (Yang 1998).

Across all regional states, individual merit became an important consideration in the selection of bureaucrats.⁹ As a result, many of the old noble clans became replaced by a “rising new nobility awarded rank in return for meritorious service to the state in government or warfare” (von Glahn 2016:58).¹⁰ The ownership of fiefs became non-hereditary, but owners retained only economics powers as their political powers were curbed by the state. On the other hand, the shi class of the Warring States period comprised of peoples of mixed origins—declined nobles, professional warriors, and peasants and artisans who made an effort to climb up the ranks. They were bright, knowledgeable individuals who served social and political elites, and their success was a result of personal talent rather than familial connections (Zhu 1990).

By the end of the Warring States Period, the Qin had developed a rather sophisticated bureaucracy. Elaborate rules governed selection, promotion, and advancement of officials.

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⁹ For example, Shang Yang’s reforms in the Qin created a “system of merit based on service to the state that would supersede the privileges of the old nobility” (von Glahn 2016:56).

¹⁰ Zhong Lian (仲连) of Zhao, Shen Buhai (申不害) of Han and Zou Ji (邹忌) of Qi all promoted meritocratic selection and developed a set of rules to evaluate the performance of state officials. Wu Qi (吴起) of Chu implemented policies that curbed the privileges of old noble lineages.
their ranks and salaries, and performance (Yates 1995). Across every regional state, officials would submit budgets and forecasts on grain storage, cultivated land, taxes, household registrations to the King at the start of the year, and their end-of-year performance would be evaluated based on these numbers (Yang 1998). They faced demotion for bad performance, and fines and punishments for misreporting and violating rules (Pines et al. 2014).

The nature of military conflict also experienced significant changes. On one hand, the basis of military recruitment expanded to include peasants towards the end of the Spring and Autumn Period, resulting in a considerable increase in the size of armies. Troops mainly comprised of infantry and mounted soldiers instead of chariots, and battles were fought in fields and at strongpoints instead of open plains. Therefore, the scale and duration of wars both escalated (Yang 1998). On the other hand, bronze weapons slowly became substituted by iron weapons, and this long, extended process came to a completion only in the Western Han (202 B.C.–A.D. 8). This was made possible by the development of technologies that enhanced the flexibility and durability of cast iron in early Warring States Period (Bai 2005).

3 Data Description and Patterns

In this section, I document empirical patterns on wars and the establishment of counties throughout the Spring and Autumn and Warring States Periods. I begin by describing the construction of the main datasets used in the analysis.

3.1 Data Sources

Counties. Data on counties in the Spring and Autumn and Warring States Periods are digitized from Zhou and Li (2009), which is a comprehensive study of regional and local administrative divisions in China. For each regional state, it contains information on the year and location in which the state created a county, the name of the county, the present-day county-level location of the county, the reason for creating the county if applicable, and whether the county was taken over by another state and when. From 750 to 221 B.C., a total of 240 counties were created by 16 distinct states (counting the three that split from Jin as separate states).

Fiefs. Data on vassal fiefs in the state of Jin in the Spring and Autumn Period are compiled from Ma (2007), a study on the historical geography of Jin. Data on vassal fiefs in the state
of Chu in the Spring and Autumn Period are compiled from Tian (2017), a study on the noble clans in Chu. For each fief, these sources contain information on its latest date of establishment and the present-day county in which it is situated. From 772 to 496 B.C., there are a total of 26 Jin fiefs, 28 Jin counties, 11 Chu fiefs and 30 Chu counties for which dates and locations of establishment exist.

Wars. To construct the dataset on wars and conquests, I use the Catalogue of Historical Wars. There are 695 recorded inter-state wars during the Spring and Autumn Period and the Warring States Period. For each war, the Catalogue contains information on its time, present-day county-level location, duration, the participating states, the initiator states, and the target states. It also records the outcome of each war for all participants—whether they won, lost, had an indeterminate outcome, conquered a state or became conquered by a state.

Administrators. Using Ma (2007), Tian (2017) and Zhou and Li (2009), I extract every known administrator for the vassal fiefs and bureaucratic counties in the state of Jin and Chu. Information on their clans and family trees is digitized from genealogies of the Spring and Autumn clans. Information on their first and last years of activity are obtained from the chronicle of Zuo’s Commentary. Zuo’s Commentary is one of the two primary textual sources used by historians to study the Spring and Autumn Period (Gu and Zhu 2001:27). For each year between 722 and 468 B.C., it recounts important political, diplomatic and military events from the perspective of the state of Lu, at times with a great amount of detail. The Commentary adopts the following format: each chapter corresponds to a specific year, and a chapter begins with an entry from the Spring and Autumn Annals for that year, followed by a narrative which elaborates on this entry. Below is an excerpt from Year 17 of Duke Huan (695 B.C.), translated by Durrant et al. (2016:129-131):

Annals In summer, in the fourth month, on the bingwu day (16), we did battle with Qi troops at Xi.

Zuo In summer, we did battle with Qi troops at Xi: this was a border dispute. At that time, the men of Qi had encroached upon the Lu borders, and a border official had come to report this. Our lord said, “In the affairs of border regions,

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12 Sources: Chang (2002); Yao, Yanqu. Chunqiu Huiyao (Institutional History of the Spring and Autumn Period).


14 The other source is the Spring and Autumn Annals, which is the official chronicle of the State of Lu and was written by Confucius. It is included in the Five Classics of Chinese literature.
take care to maintain the integrity of the border and prepare for the unexpected. Meanwhile, complete all the preparations there, and when something happens, then fight. What is there to come calling about?”

3.2 States and Their Geography

Historians do not have direct evidence on the exact number of regional states established by the King of Zhou, but many believe that there may have been more than two hundred. Approximately one-hundred and forty-eight states appeared in the *Spring and Autumn Annals* and *Zuo’s Commentary*. Many of the smaller states became annexed by powerful neighbors during the Spring and Autumn Period, and around twenty-two survived into the Warring States Period (Yang 1998:278).

Figure 1: Major States of the Spring and Autumn Period.

Notes: This is a map of the major states of the Spring and Autumn Period. States that are boxed in blue are the focus of analysis for this paper. Source: Hsu (1999:548).

Figure 1 displays a map of the major states of the Spring and Autumn Period, showing that they were located in modern-day central China and their arena of activities was the
Yellow River basin and the eastern peninsula. States boxed in blue maintained continuous activity throughout the majority of the Spring and Autumn and Warring States Periods, and are the focus of analysis for this paper. States whose names are capitalized—Qi, Jin, Chu, Qin—were the militarily strong states. All of them survived into the Warring States Period.

3.3 Patterns of Wars and State-Building

In this subsection, I first present summary statistics on wars and state-building. I then verify that there exists a positive relationship between the two, which is consistent with the predictions of the classical theory. As discussed previously in Section 2, counties are bureaucratic administrative units from which rulers directly extracted resources. In my analysis, I use the number of counties as a measure for the degree of state-building.

3.3.1 Warfare

Figure 5 displays ten-year averages of annual wars, annual conquests, number of participants in each war, number of wars that each state participated in, and number of militarily active states throughout the Spring and Autumn and Warring States Periods. The number of militarily active states experience a steady decline over time, as smaller states became conquered by powerful states. Consistent with this observation, the average number of wars per year over the Warring States Period appear to be less than the Spring and Autumn Period. The number of participants in wars remains relatively steady, except during the 6th century B.C. Meanwhile, the number of wars that each state took part in exhibited an upward trend throughout the Warring States Period, signaling an increase in the intensity of warfare.

3.3.2 Counties

Panel A of Table 1 contains a summary of the data on counties. The number of newly created counties has been steadily rising over time, indicating an increasing tendency towards state formation. Into the Warring States period, counties were established across a majority of the states, often as a deliberate measure to centralize control. Among the 161 counties whose dates of construction are unknown, 123 were established by Qin throughout the Warring States period.

15 For example, Prime Minister Shang Yang of the state of Qin instituted forty-one counties and restructured county-level administrations as part of his self-strengthening reforms.
Meanwhile, the major states of the Spring and Autumn Period display stark differences in their degrees of centralization. In Panel B of Table 1, I display the number of counties established by Jin, Chu, Zheng, Song and Qin.\textsuperscript{10} It is clear that Jin and Chu were the early state-builders. The Qin, which eventually unified China in 221 B.C., engaged in aggressive state-building only since the beginning of the Warring States Period. In contrast, Zheng and Song each established only one county prior to their eventual conquests by Han in 385 B.C. and Qi in 286 B.C. respectively. They have visibly fallen behind in the state-building process.

Now, I briefly discuss the cases of Lu, Wey and Qi, which are among the major states that the analysis focuses on. The states of Lu and Wey had no records of the xian (county), but their cities (yi 邑) exhibited exactly the same features as counties (Zhou and Li 2009:290-91). Cities were of two types—ones that were controlled by the Duke, and ones that were controlled by powerful qing-dafu; the administrators of those cities were also selected by the Duke and by the qing-dafu respectively. Lu had 9 such cities on record by 516 B.C., while Wey had 2. According to Zhou and Li (2009), the possibility that the state of Qi instituted counties of the same nature as Qin and Chu in the Spring and Autumn Period was quite small (p.293). Into the Warring States Period, the Qi was recorded to have many counties, but information on the names, locations and dates of establishment only exist for 24 of those counties (p.313). For this reason, I exclude Lu and Wey from the scatter plots in Section 3.3.3.

3.3.3 Relationship between Wars and State-Building

Using the dataset on wars, I decompose the 501 years between 722 and 222 B.C. into sixteen 30-year periods and one 21-year period. For the states of Chu, Jin, Zheng, Song, Qin, Wu, Yue, Zhao, Yan, Han and Wei, and for each time period, I compute the total number of wars that each state was involved in and the number of new counties that each of them created. I apply log transformation to both variables. To deal with zeros in the observations, I add one to each variable, and then apply the logarithm.

Panel (a) in Figure 6 shows the scatter plot of the transformed variables.\textsuperscript{17} Panel (b) adds a fitted line to the scatter plot. The slope is estimated from a simple regression between

\textsuperscript{10}As described in Section 2, the Jin split into the three states of Zhao, Han and Wei in 403 B.C. Thus, from the mid Warring States Period onwards, I display the number of counties instituted by each of those states in the exact order of Zhao, Han and Wei under the same column as Jin. Since the Zheng became conquered by the Han in 375 B.C., the cells for mid and late Warring States Periods are not applicable to Zheng.

\textsuperscript{17}I exclude Lu and Wey because they had cities instead of counties, and no accurate data exist on the dates of establishment of those cities. I assume that the state of Qi had zero counties during the Spring and Autumn Period according to Zhou and Li (2009:293).
the two transformed variables with state fixed effects and a period fixed effect indicating
whether the observation belongs to the Spring and Autumn or Warring States Period.

While the overall relationship between conflict and state-building is positive and statis-
tically significant, we can observe from the scatter plot that this relationship varies across
states. For a number of states that constructed very few or zero counties, there exists almost
no association between wars and state-building. Meanwhile, the states of Chu, Qin, Jin and
its descendants display a positive correlation between warfare and the establishment of new
counties.

This evidence suggests that warfare produces heterogeneous effects on state-building
for different states. In the next section, I use a theoretical model to examine different
mechanisms via which warfare impacts state-building.

4 Model

In this section, I develop a simple model of the choice between political decentralization and
centralization.

4.1 Setup and Gameplay

In this model, there is one ruler,\(^\text{18}\) \(R\), and one administrator, \(A\). The game is one-shot, and
consists of two stages: in stage 1, the ruler chooses an administrator to manage a landed
domain \(D\), and gives him a contract; in stage 2, an armed conflict transpires. Payoffs are
consumed at the end of stage 2.

**Stage 1.** The self-interested ruler appoints an administrator for domain \(D\). Domain \(D\)
produces taxable output of size \(t\), and yields a ruler-specific benefit of \(\alpha\).\(^\text{19}\) \(A\) is responsible
for collecting taxes and organizing military actions, and has outside option \(v\).

\(R\) gives \(A\) a contract, which can be of two types: a fief contract or a county contract. The
key difference between the two contracts lies in the ownership of \(D\): under the fief contract,

\(^{18}\text{In historical reality, the “ruler” of a state can adopt a broader interpretation than just the duke. In other}
\text{words, the “ruler” embodies one individual or a group of individuals who have the ability to dictate state}
\text{affairs. In the state of Jin, for example, state politics were controlled by a coalition of powerful noble clan}
\text{leaders for a hundred years before the three most powerful clans exterminated the rest and “bureaucratized”}
\text{their domains.}\n
\(^{19}\text{This benefit could derive from the ability to hold strategic positions such as high grounds, natural}
\text{barriers or choke points, to manage important natural resources such as forests, rivers or mineral ores, to}
\text{collect information about things happening in and around the domain, or simply to institute a trusted}
\text{subordinate in a place so that he can support the ruler in times of need.}\n
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the administrator claims ownership of $D$, and is called a *vassal*; under the county contract, the ruler claims ownership of $D$, and $A$ is now a *bureaucrat*.

In an incomplete contract setting, ownership of land entails residual right of control over its resources in contingencies not governed by explicit contracting (Grossman and Hart 1986; Hart and Moore 1990). In particular, this includes the right of control over human resources, meaning that the owner has the right to permit or exclude others from using her asset (Hart and Moore 1990). Contract incompleteness arises when it is costly to specify actions and payments in every contingency (Hart 1988).

I argue that the incomplete contract framework is relevant in the context of political delegation in pre-imperial China. Firstly, in a premodern society with less advanced communication technologies, it is difficult to monitor local conditions and to precisely specify military investment and actions in each contingency. For example, chariots and cavalry are more effective in the field, and infantry is more suitable for mountainous regions. In other words, military configuration should vary according to the nature of the battleground and the type of enemy troops, which makes it difficult to be specified in advance. Secondly, the ability of the owner of domain $D$ to exclude others from using it is in line with the notion of a bureaucracy, which consists of officials who “do not own their positions” (Kiser and Cai 2003; Swedberg and Agevall 2005:19).

Going back to the model, I assume that a vassal claims all tax income $t$ from his fief. In a similar spirit as Hart et al. (1997), I assume that a fraction $\lambda \in [0, 1]$ of the tax income from domain $D$ is embodied in the bureaucrat’s human capital. For example, if the bureaucrat possesses detailed knowledge about local conditions and productive activities, then a fraction of the income from tax collection requires his participation. Since the remainder $1 - \lambda$ can be realized without him—the ruler can simply replace him and find someone else to do the job—the bureaucrat gets $\lambda t$ for his labor.

Features of the fief and the county contracts are summarized as follows.

1. *Fief contract*: $R$ grants ownership of $D$ to $A$. The vassal claims tax income $t$, and chooses military investment $m$ for stage 2.

2. *County contract*: $R$ withholds ownership of $D$, and claims tax income $(1 - \lambda)t$. The bureaucrat receives a wage payment of $\lambda t$, and chooses military investment $m$ for stage 2.

The ruler receives the ruler-specific benefit $\alpha$ under both contracts. The cost of military investment $m$ is borne entirely by the administrator. An important assumption here is that many choices of $m$ can be made without constituting a violation of the contract. This is because the contract itself is sufficiently incomplete.
The county contract is associated with state-building, as it involves the centralization of military and fiscal powers at the hands of the ruler. The fief contract, on the other hand, is associated with decentralization.

**Stage 2.** After A has been appointed, an armed conflict takes place. This can either be: a) external invasion from an enemy state $e$, or b) a ruler-initiated attack on an enemy state $e$. The enemy state has military investment $m_e$. In Case a), a defensive game is played, in which $A$ is expected to defend domain $D$. In Case b), an offensive game is played, in which $A$ is expected to organize the military attack. $A$ can also opt out of conflict, in which case he forfeits any potential gain he may receive from winning.

The outcome of an armed conflict is binary: success or failure. In line with the literature on conflict (Dixit 1987; Hirschleifer 1995; Skaperdas 1996), I use the context success function to model the ruler’s probability of winning a military conflict against state $e$, which depends on the military investment of both sides:

$$P(m, m_e) = \frac{m}{m + m_e}.$$  

Under different contracts, successes and failures produce different consequences for $R$ and $A$, which will affect their incentives to participate in conflict. I assume that, when the military mission fails, $A$ dies and receives no payoff. This implies that $A$ will be inclined to avoid conflicts for which the probability of winning is low.

To be more specific, the benefits and costs associated with success and failure of defense and offense are outlined as below.

a) Defense: if successful, the owner of $D$ retains control, and both $R$ and $A$ consume their payoff. If failed, $D$ becomes conquered and taxable output is usurped by the enemy; $A$ dies and receives zero payoff, and $R$ derives no gains from $D$.

b) Offense: if successful, a prize of $t_e$ is obtained. Following a similar rationale as for tax income, under the county contract, $R$ gets $(1 - \lambda)t_e$, and the bureaucrat gets $\lambda t_e$; under the fief contract, $R$ receives $(1 - \gamma)t_e$, and the vassal receives $\gamma t_e$, where $\gamma \in [0, 1]$ and $\gamma > \lambda$. If failed, no prize is obtained. $A$ dies and gets nothing, and $R$ receives his due payoff from $D$—under the county contract, he gets $\alpha + (1 - \lambda)t$, while under the fief contract, he gets $\alpha$.

Now, I discuss the possibility for $A$ to opt out of conflict. I model this zero-conflict outcome through $A$’s military investment decision. More specifically, $A$ can avoid conflict by choosing $m = 0$, in which case he stays alive and gives up any potential gains he may receive from winning. In the defensive game, this means that a vassal forfeits the ownership
of and income from domain $D$, a bureaucrat forfeits his wage payment, and both get their outside option $v$. In the offensive game, this means that $A$ forfeits any possible prizes from war victory. That is, a vassal retains ownership of and income from $D$, and a bureaucrat keeps his wage payment.

The gameplay is summarized in Figures 2 and 3, for defense and offense respectively. Actions are indicated in blue. The ruler’s and the administrator’s payoffs are listed at the end of each node.

Throughout the analysis, I maintain the following assumptions for the model.
Assumption 1. $m_e < t$.

Assumption 2. $\gamma > \lambda$.

Assumption 1 says that the enemy state cannot be too strong. As will be clear in the ensuing subsection, this is largely a functional assumption to ensure that the county contract can be feasible. Assumption 2 says that a vassal receives a larger proportion of the prize from winning an attack than a bureaucrat. Recall that $\lambda$ is the fraction of gains embodied in the bureaucrat’s human capital. A vassal should undoubtedly receive a higher share because he invests both his human capital and physical resources into the attack.

Lastly, for ease of exposition, I define a contract to be feasible in equilibrium if the administrator receives an expected payoff that is greater than or equal to $v$, his outside option.

4.2 Defense Equilibrium

In this subsection, I analyze equilibrium contracts in the defense game. I begin with the fief contract.

Fief Contract. In defense, the vassal chooses military investment $m$ to solve:

$$\max_m \pi_{afd} = P(m, m_e)t - m. \tag{2}$$

Denoting the solution by $m_{fd}$, the first order condition for 2 is:

$$\frac{m_e}{(m_{fd} + m_e)^2}t = 1.$$

Which yields:

$$m_{fd} = \sqrt{m_e}t - m_e, \text{ where } t > m_e. \tag{3}$$

County Contract. In defense, the bureaucrat chooses $m$ to solve:

$$\max_m \pi_{acd} = \lambda P(m, m_e)t - m. \tag{4}$$

Denoting the solution by $m_{cd}$, we arrive at:

$$m_{cd} = \sqrt{\lambda m_e}t - m_e, \text{ where } \lambda t > m_e. \tag{5}$$
Letting $\pi_{afd}$ and $\pi_{acd}$ denote $A$’s payoff under the fief and the county contracts respectively, we immediately arrive at the following observation (see Appendix for proof):

**Proposition 1.** $m_{fd} > m_{cd}$; $\pi_{afd} > \pi_{acd}$.

This is rather intuitive because a vassal has more to gain from a successful defense—he receives the full amount of domain income from $D$, whereas a bureaucrat only gets a portion. Thus, a vassal optimally invests more in $m$, resulting in a higher probability of successful defense ($P(m, m_e)$ is increasing in $m$). This works to the ruler’s favor, since now $R$ has a higher chance of keeping the ruler-specific benefit, $\alpha$.

It is also obvious that $R$ always prefers that $A$ defends $D$. This suggests that the feasibility of the contract alone determines whether $A$ participates in defense. Proposition 1 suggests that the fief contract is more likely to be feasible than the county contract, because it gives $A$ a higher payoff. Moreover, Equations 3 and 5 show that, military investment $m$ under the fief contract is non-negative (that is, feasible) over a greater range of enemy strength, $m_e$. This is again quite intuitive—the vassal is more willing to take on stronger enemies than the bureaucrat because he benefits more from a successful defense. In summary:

**Proposition 2.** When $m_e \in (\lambda t, t]$, the fief contract is potentially feasible, while the county contract is not. When $m_e \leq \lambda t$, the fief contract is more likely to be feasible than the county contract.

Now, I move on to examine the ruler’s preferences when $m_e \leq \lambda t$. Clearly, $R$ will choose the fief contract if it is the only feasible one. Letting $\pi_{rfd}$ and $\pi_{rcd}$ denote $R$’s payoff under the fief and the county contracts respectively, the following proposition illustrates how the strength of the enemy state and the bureaucrat’s human capital affects ruler’s choice of contracts (see Appendix for proof).

**Proposition 3.** Suppose that $m_e < \lambda t$. Then:

a) For sufficiently large $m_e$, we have $\pi_{rfd} > \pi_{rcd}$. That is, the ruler prefers the fief contract over the county contract.

b) If $\alpha$ is not too large, $\pi_{rcd}$ is increasing in $\lambda$ for small $\lambda$, and decreasing in $\lambda$ for large $\lambda$.

Part a) of the above Proposition suggests that the ruler prefers the fief contract over the county contract for defense when the enemy state is militarily strong. This is natural if we examine the ruler’s trade-off: a county contract gives $R$ a higher income from $D$, but
a lower probability of successful defense according to Proposition 1. Thus, being able to receive a higher income from $D$ should be more important when the enemy is relatively weak, and a higher probability of successful defense should be more important when the enemy is relatively strong.

Part b) suggests that $R$’s payoff under the county contract, $\pi_{rcd}$, has an inverse $U$-shape in $\lambda$, where $\lambda$ represents the share of total gains embodied in the bureaucrat’s human capital. With a closer inspection of $R$’s payoffs, this result becomes quite intuitive. A rise in $\lambda$ increases the bureaucrat’s incentives to make military investment, leading to an increase in $R$’s expected tax revenue and ruler-specific benefit $\alpha$. At the same time, it reduces the tax income received by the ruler. Thus, when $\alpha$ is not large, it requires an intermediate level of $\lambda$ to optimally balance the three effects. In other words, the ruler likes to appoint a bureaucrat who is moderately capable, because a highly capable individual is too expensive, and a highly incapable individual has too little incentive to participate in defense.

Combining results from Propositions 2 and 3, we see that:

**Corollary 1.** The fief contract is more likely to prevail in the equilibrium when external threat, $m_e$, is large.

### 4.3 Offense Equilibrium

In this subsection, I analyze equilibrium contracts in the offense game. I begin with the fief contract.

**Fief Contract.** In offense, the vassal chooses military investment $m$ to solve:

$$\max_m \pi_{afo} = P(m, m_e)(t + \gamma t_e) - m.$$  \hfill (6)

Letting the solution be denoted by $m_{fo}$, we get:

$$m_{fo} = \sqrt{m_e(t + \gamma t_e)} - m_e, \text{ where } t + \gamma t_e > m_e.$$  \hfill (7)

**County Contract.** Similarly, the bureaucrat chooses military investment $m$ to solve:

$$\max_m \pi_{aco} = P(m, m_e)(\lambda t + \lambda t_e) - m.$$  \hfill (8)

Denoting the solution by $m_{fo}$, we have:

$$m_{fo} = \sqrt{\lambda m_e(t + t_e)} - m_e, \text{ where } \lambda(t + t_e) > m_e.$$  \hfill (9)
Equations 7 and 9 suggest that a vassal optimally makes a higher level of military investment than a bureaucrat. Again, this is because he has more to gain from a successful attack: he receives a bigger reward from the victory, and gets to stay alive to consume his income from $D$ (which is greater than the bureaucrat’s income from $D$). Thus, it naturally follows that $\pi_{afo}$, which represents the vassal’s payoff, is greater than the bureaucrat’s payoff $\pi_{aco}$. To summarize:

**Proposition 4.** $m_{fo} > m_{co}, \pi_{afo} > \pi_{aco}$.

Now, I turn to examine the administrator’s decision to participate in the attack. Recall that $A$ receives his income from $D$ if he chooses to avoid military conflict. That is, a vassal gets $t$ and a bureaucrat gets $\lambda t$. We see that a vassal chooses to engage in conflict if and only if

$$\pi_{afo} = P(m_{fo}, m_e)(t + \gamma t_e) - m_{fo} \geq t. \quad (10)$$

Similarly, a bureaucrat participates in conflict if and only if

$$\pi_{aco} = P(m_{co}, m_e)(\lambda t + \lambda t_e) - m_{co} \geq \lambda t. \quad (11)$$

This zero-conflict payoff produces two opposing effects on $A$’s participation decision. On the RHS, a higher payoff reduces $A$’s incentive to participate in the attack because then he would face the possibility of losing the war and therefore losing his domain income. On the LHS, it increases $A$’s payoff in the case of success, as well as inducing a higher level of military investment (which translates to a higher probability of winning) as $A$ now has a stronger incentive to avoid losing.

Looking at Equations 10 and 11 more closely, it is clear that the overall effect of a higher zero-conflict payoff on $A$’s participation decision crucially depends on the size and proportion of the prize that $A$ receives from a successful attack. Intuitively, when the prize is small, then an increase in the zero-conflict payoff would result in a small rise in the expected reward from the attack through its effect on the probability of winning. Thus, the increase on the RHS would likely outweigh the increase on the LHS, thereby dampening $A$’s incentives to participate in the attack.

This insight is formally stated in the Proposition below (see Appendix for proof):

**Proposition 5.** The vassal engages in the attack if $t_e \geq t^*_e$, and the bureaucrat engages in the attack if $t_e \geq t'_e$, where:

$$t^*_e = \frac{m_e + 2\sqrt{tm_e}}{\gamma}, \quad t'_e = \frac{m_e + 2\sqrt{\lambda t m_e}}{\lambda}.$$
Now suppose $\sqrt{\lambda} > \gamma$. Then for large $t$ or small $m_e$, we have $t'_e < t^*_e$. That is, when $t_e \in [t'_e, t^*_e)$, the bureaucrat engages in the attack, while the vassal does not.

This is illustrated in Figure 4, where the orange line indicates the range of $t_e$ over which the bureaucrat participates in the attack and the vassal does not. This result suggests that, if a bureaucrat can reap a relatively large proportion of the total gains, then he would be more likely than a vassal to attack a weak enemy when the war prize $t_e$ is small.

I now discuss the ruler’s preferences over the two contracts when both the vassal and the bureaucrat choose to participate in the attack. Given $A$’s optimal military investment, the ruler’s payoff under the fief and the county contracts, $\pi_{rfo}$ and $\pi_{rco}$, are as follows:

$$\pi_{rfo} = \alpha + (1 - \gamma) \left(1 - \sqrt{\frac{m_e}{t + \gamma t_e}}\right) t_e,$$

$$\pi_{rco} = (1 - \lambda) t + \alpha + (1 - \lambda) \left(1 - \sqrt{\frac{m_e}{\lambda (t + t_e)}}\right) t_e.$$

Those two equations show that there are three trade-offs that $R$ must consider when he selects a contract: (1) the county contract gives $R$ positive tax income from $D$, while the fief contract does not; (2) the county contract gives $R$ a larger share of the gains from a successful attack than the fief contract; and (3) the county contract yields a smaller probability of winning the attack compared to the fief contract (see Proposition 4). Given the functional forms, in general it is ambiguous which contract delivers a higher payoff to the ruler.
Lastly, I make a brief comment on how the administrator’s outside option, $v$, affects contract choices in equilibrium.

In both the defensive and the offensive game, the size of $v$ affects the feasibility of both the fief and county contracts. That is, an administrator with a smaller $v$ will accept a contract over a wider range of payoffs $\pi$. Recall from Propositions 1 and 4 that a bureaucrat always receives a lower payoff than a vassal. Thus, a decrease in $v$ would always work to the favor of the bureaucrat. To summarize:

**Proposition 6.** A decrease in the administrator’s outside option, $v$, makes the county contract more likely to be feasible, and thus to prevail in equilibrium.

### 5 Testing Model Predictions

In this section, I empirically test three predictions from Section 4 using historical data, and discuss them in light of historical examples.

#### 5.1 Counties versus Fiefs

I test predictions from Corollary 1 and Proposition 5 using data on fiefs and counties in the states of Jin and Chu, which are the only two states for which there exist data on both types of administrative units. I then discuss this prediction in the context of Zheng, Song and Wey, which were known to have extremely few counties, and which we could discern from the historical records were consistently under serious military threat.

A map of those fiefs and counties, of which there are a total of 95, is presented in Figure 7. Red units are counties, and green units are fiefs. Circles are units located on the state border at the time of establishment, and dotted circles are units located in-land. Smaller red dots are counties that were converted from fiefs, and were located in-land at the time of conversion. Purple castles indicate major transportation routes and natural passes. Black dots indicate nomadic tribes. All geographical coordinates are determined from Tan (1996), a historical atlas of China.

I define a county or a fief to be situated on the state border if it is within 25 miles$^{20}$ of the state border, or if there is an active foreign state or nomadic tribe less than 25 miles away from it.$^{21}$ For the state of Jin, I consult a set of historical maps contained in Ma

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$^{20}$I choose 25 miles because this is roughly the distance that can be covered by a walking horse in one day.
$^{21}$The second part of the definition is necessary because some nomadic tribes operate inside the borders of regional states.
(2007:238-254) to find state borders.\footnote{Note that states usually did not have clearly delineated borders during the Spring and Autumn Period. The maps provided in \citet{Ma2007} had estimated borders instead.} For the state of Chu, I find estimated state borders from \citet{Zuo2012}, which is a study on the historical geography of Chu.

I categorize the neighbors of Jin into large states, small states and nomadic tribes. I define Jin, Chu, Qin and Qi, which were known for their superior military powers, to be the large states; and all other states to be the small ones, including the Zhou.\footnote{\citet{Hsu1999}: “By the mid-seventh century B.C., the Zhou world was dominated by four powers: Qi, Jin, Qin, and Chu... while those states in the Central Plain, such as Zheng, Song, Lu, and Wey, were becoming ever less important in interstate politics.”} During the Spring and Autumn Period, nomadic tribes also posed serious military threats to regional states, and their locations are determined from \citet{Tan1996}. From Figure 7, we can see that the majority of Jin fiefs were located on its western side and formed a long insulation barrier against the Qin and a number of tribes; its bureaucratic counties, on the other hand, tended to border the smaller foreign states. Similarly, Chu fiefs tended to be located along its northern border.

I define an administrative unit to be in a high value location if it is next to a major transportation route or a natural pass. For the state of Jin, I determine transportation routes and natural passes using a list of major routes that connect the Jin to the outside world contained in \citet{Ma2007}. The Jin was initially situated on the western side of the Taihang Mountains, and began to take territory on the eastern side since 636 B.C. For this reason, I add to this list eight natural passes that were historically used to cross the Taihang Mountains.\footnote{They are the Junduxing Pass, Boyinxing Pass, Feihuxing Pass, Jingxing Pass, Fukouxing Pass, Baixing Pass, Taihangxing Pass and the Zhiguanxing Pass, and are collectively known as the “eight passes of the Taihang”.} For the state of Chu, I determine transportation routes and natural passes using a list contained in \citet{Zuo2012}.

Table 2 presents summary statistics of these variables for counties and fiefs separately.

### 5.1.1 Military Defense

First, I test the prediction from Corollary 1 in Section 4.2:

**Prediction 1.** The fief contract is more likely than the county contract to prevail when external military threat is large.

To do so, I estimate the following regression using the sample of data on vassal fiefs and bureaucratic counties instituted in the states of Jin and Chu between 772 to 496 B.C., and
employing both the linear probability model and the probit model.

\[ 1(Fief_{ij}) = \alpha + \sum_{j=1}^{n} \beta_k F_{ijk} + X_{ij}' \gamma + \psi_j + \epsilon_{ij} \] (12)

Here, \(1(Fief_{ij})\) is a dummy that is equal to 1 if administrative unit \(i\) in state \(j\) is a vassal fief, 0 if it is a bureaucratic county. \(F_{ijk}\) is a set of dummies representing the following features of administrative unit \(i\): whether it is located on the border, whether it is situated in a high value location, and the types of its neighboring states and tribes. \(\psi_j\) controls for state fixed effects. \(X_{ij}\) controls for geographical characteristics, and includes the logarithm of elevation (measured in feet) and a measure of terrain roughness computed using the relative topographic position metric. These statistics are obtained from and computed using ArcGIS datasets.

If Prediction 1 was correct, the coefficient estimate on the dummy indicating border status and/or large neighbor should be positive and significant. Table 3 presents the regression results. OLS estimates are displayed in odd-numbered columns, and probit estimates are displayed in even-numbered columns.

In Panel A, columns 1 to 4 show that an administrative unit that is located on the state border is between 28% to 32% more likely to be fiefs, and this result is statistically significant. Columns 5 to 8 add the dummy for high value locations. While results for border units remain robust, results from columns 5 and 6 suggest that an administrative unit that is in a key location is around 19% less likely to be fiefs. When controls are added, the statistical significance on the dummy for high value location disappears (columns 7 and 8), though the qualitative direction remains the same. This is likely because this dummy variable is highly correlated with geographical characteristics.

In Panel B, I break down border administrative units by the types of neighbors they have. The omitted category is in-land administrative units. Regression estimates show that a unit that neighbors a large state or a nomadic tribe is between 39% to 48% more likely to be fiefs. These results are statistically significant and robust to controlling for geographical characteristics. This provides stronger evidence that fiefs are more likely to transpire in regions under greater military threat, and is consistent with Prediction 1.

I now discuss Prediction 1 in the context of Zheng, Song and Wey. A closer look at Figures 1 and 7 shows that Zheng, Song and Wey are located near Chu and Jin, two of the militarily strong states. An examination of historical records further demonstrates that the three states were indeed consistently under serious military threat.

**Zheng and Song.** The states of Zheng and Song were situated in the central plain. Their
locations are “strategically essential for gaining control over military affairs in southern and northern China, and places such as Hulao of Zheng and Peng of Song were historically important targets of military contention” (Wang 1988:205). For instance, Chu and Jin engaged in repeated attacks against Zheng and Song, and even frequently intervened in the internal power struggles in Song (Ma 2008).

Zheng, on the other hand, was a powerful regional state during the reign of Duke Zhuang (744–701 B.C.), but soon began to decline amid a series of internal power struggles. It became vulnerable to incessant external threats since mid Spring and Autumn, and was often forced to switch allegiance between Jin and Chu (Hsu 1999). Year 2 and Year 3 of Duke Xuan from Zuo’s Commentary recounts a highly representative example (Durrant et al. 2016:589,601,603):

“In the second year, in spring, Gongzi Guisheng of Zheng received a command from Chu to attack Song... [Next year], the Prince of Jin attacked Zheng, advancing as far as Yan. Zheng and Jin made peace, and Fan Hui entered Zheng to swear a convenant... In summer, a Chu leader invaded Zheng: the latter had gone over to Jin.”

Moreover, Zhao (2015:120) examined Zheng’s history, and found that Zheng switched alliance between Chu and Jin for 13 times within the 97 years between 643 and 546 B.C.

**Wey.** The state of Wey had experienced a series of internal unrest by the mid Spring and Autumn Period. In 661 B.C., Wey was vanquished by the Di nomads, and was able to relocate and re-founded the state with the help of Qi. In a little more than 30 years, nomadic threat once again forced the duke of Wey to relocate. Power struggles among the nobility further weakened the state towards the end of the Spring and Autumn Period (Ma 2008). This suggests that Wey was a weak state compared to its neighbors.

Turning our attention to counties, summary statistics from Table 1 suggest that Zheng and Song were recorded to have established only one county each prior to their eventual conquests by Han in 395 B.C. and Qi in 286 B.C. respectively. As discussed in Section 3.3.2, cities in Wey were essentially no different from counties, and Wey was recorded to have created only two cities over the entire Spring and Autumn Period (Zhou and Li 2009:291).

Thus, the circumstances of Zheng, Song and Wey are consistent with the prediction that counties are less likely to be instituted when external military threat is high.
5.1.2 Monitoring Cost

The literature on bureaucracy identifies monitoring cost as an obstacle to bureaucratization (Kiser and Kane 2001; Sng 2014). Here, I test whether monitoring cost created additional obstacles to Jin and Chu rulers. I re-estimate Equation 12, adding to the regression a variable DistToCapital$_{ij}$ representing the distance between administrative unit $i$ in state $j$, and the capital city of state $j$ at the time of establishment of unit $i$. DistToCapital$_{ij}$ is computed in ArcGIS using geodesics over land surfaces. The unit of measurement is hundred miles.

Regression results are shown in Table 4. Odd-numbered columns display OLS estimates, and even-numbered columns display probit estimates. Columns 1 to 4 control for border status, and columns 5 to 8 control for neighbor types. All regressions include geographical characteristics. Except in column 3, coefficient estimates for distance to the capital city are by and large negative and statistically insignificant. Meanwhile, results for border status and neighbor types are robust to the addition of distance to capital—the signs remain unchanged and estimates remain statistically significant. Coefficient sizes on border status in the OLS model range from 0.35 to 0.38, which are not much different from results in Table 3. Thus, there is no evidence that the cost of monitoring or transportation affected the ruler’s decision to institute a particular type of administrative division. This result is valid to the degree that Jin and Chu were not exceptionally large states. The extent of external military threat, on the other hand, consistently proves to be an important factor of consideration.

5.1.3 Military Offense

Now, I test the prediction from Proposition 5 in Section 4.3:

**Prediction 2.** Suppose that $\sqrt{\lambda} > \gamma$. Then compared to fiefs, counties are more likely than fiefs to be associated with attacks against weaker enemies when the war prize is small.

To do so, I use the sample of data on fiefs and counties in Chu and Jin, as well as a subset of the war data that contains every attack that Chu or Jin initiated against some other state. For each war, I extract its location information from the *Catalogue of Historical Wars*, and determine the geographical coordinates of these locations using Tan (1996). For wars that do not have location information, I use the capital city of the state that is the target of attack. A map of those wars, along with fiefs and counties, is presented in Figure 8. Pins indicate war sites. Since I do not have data on war prizes, I use an administrative unit’s distance to war sites as a proxy, as long-range attacks usually involve expensive logistics and long expeditions, and therefore are associated with smaller net gains.

It is important to note that I do not observe parameters $\lambda$ and $\gamma$—the former is the share of gains embodied in the administrator’s human capital, and the latter is the share...
of the war prize claimed by the vassal. Thus, I first perform a test to see whether counties are associated with more attacks happening within a certain geographical range. I do so by estimating the following regression using OLS:

\[ NumWar_{ij} = \alpha + \beta_1 (County_{ij}) + \gamma OnBorder_{ij} + X'_{ij} \gamma + \log(Duration_{ij}) + \psi_j + \epsilon_{ij}. \] (13)

Here, \( NumWar_{ij} \) represents the number of attacks that were initiated by state \( j \) after the date of establishment of administrative unit \( i \), and took place within a certain distance from administrative unit \( i \) in state \( j \). \( Duration_{ij} \) denotes the number of years elapsed between the first year of establishment of administrative unit \( i \) and 471 B.C., the last year in the sample period. \( 1(County_{ij}) \) is a dummy that is equal to 1 if administrative unit \( i \) in state \( j \) is a bureaucratic county, and 0 otherwise. All other variable notations are the same as in Equation 12. I control for border status because border units are naturally less distant to attacks on foreign states.

Estimation results are presented in Table 5. Coefficient estimates for attacks within 50 miles (columns 1 to 3) are mixed and statistically insignificant. As distance to war sites increase, we see that counties are indeed associated with a greater number of attacks. Results in columns 4 to 6 show that, compared with fiefs, there are 2.28 to 3.29 more attacks happening within 51-100 miles of counties (with a mean of 4.42). Moreover, around 3.02 to 4.19 more attacks took place within 101 to 150 miles of counties (with a mean of 5.71). Those estimates are generally statistically significant at the 5% level.

The findings above do not seem to contradict implications from the \( \sqrt{\lambda} > \gamma \) assumption. Now, if Prediction 2 was indeed correct, then we should also observe a positive association between county status and the number of attacks against weak enemies. To examine this, I re-estimate Equation 13, using as dependent variables the number of attacks against weak and strong enemies within a certain distance. In a same manner as before, I define the four large states (Jin, Chu, Qin and Qi) and nomadic tribes to be strong enemies, and all other states to be weak enemies.

Regression estimates are displayed in Table 6. Panel A display results for the number of attacks against weak enemies, and Panel B display results for the number of attacks against strong enemies. We can see that, while counties are positively correlated with the number of attacks within 51-100 miles and within 101-150 miles, they are also associated with more attacks against weak enemies within exactly the same range (columns 3 to 6), and estimates are statistically significant. That is, the findings in Table 5 are likely to be driven by attacks against weak enemies. This is consistent with the prediction that bureaucrats are more likely than vassals to attack a weak enemy when the war prize—as proxied by distance to war site—
is small. Moreover, according to Panel B, no evidence suggests that attacks against strong
enemies also contribute to the results in Table 5. This is again consistent with Prediction 2.

This result also accords with the historical situation in Chu, where county-based troops
were known to have played a much more active role in military offenses compared to fief-
based troops. In particular, historical records documented a number of instances in which
troops from the counties of Shen, Xi, Qisi and Fanyang participated in offensive campaigns.
In contrast, fief-based troops made almost no appearance in chronicles except for the Ruo’ao
soldiers in early Spring and Autumn Period (Tian 2017:215).

5.2 Vassals versus Bureaucrats
Lastly, I test the prediction from Proposition 6:

Prediction 3. A decrease in $v$ is positively associated with the implementation of county
contracts in equilibrium.

I do so by using data on administrators in Chu and Jin. Since $v$ denotes the administra-
tor’s outside option, it reflects the size of the administrator’s bargaining power—the smaller
the value of $v$, the lesser the administrator’s bargaining power. I use the political prominence
of administrators’ clans to proxy for their bargaining power.

For each administrator, I determine whether he held membership to a clan, and if so,
the type of his clan. I categorize the types of clans in the following way: if there had been
a high-official ($qing$) within the last three generations of the administrator’s patrilineal line,
then his clan is a $qing$ clan.25 Otherwise, if the founding ancestor of his clan is known, then
his clan is large;26 if the ancestor is not known, then his clan is small. If an administrator
had fled to Jin or Chu from another state, then I denote him as a foreign exile, and classify
him as belonging to no clan.

I estimate the following regression using the linear probability model and the probit
model:

$$1(\text{ClanType}_{ij}) = \alpha + \beta 1(\text{County}_{ij}) + \psi_j + \epsilon_{ij}. \quad (14)$$

where $\text{TypeClan}_{ij}$ is a dummy for whether administrator $i$ in state $j$ holds membership to
a particular type of clan. All other variable notations are the same as before.

If Prediction 3 was correct, counties should be associated with administrators from weak
clans. That is, $\beta$ should be positive for $qing$ and large clans, and negative for small clans or

25In the Spring and Autumn Period, high-officials are the most prominent statesmen in every regional
state, and they had very powerful clans.

26A clan needs to have maintained a sufficient degree of activity and influence for its members to be able
to trace back to their common ancestor.
no clans.

Table 7 displays the baseline regression results. Odd-numbered columns show results from the linear probability model, and even-numbered columns show results from the probit model. While a bureaucrat is no more likely to come from a *qing* clan (columns 1, 2), he is indeed 19% less likely to come from a large clan (columns 3, 4), and 31.8% more likely to come from a small clan or belong to no clan (columns 5, 6). These findings are consistent with the prediction above.

Now, I examine Prediction 3 in the context of Chu and Qin, whose institutional particulars lend further support to this result.

**Chu.** In the state of Chu, the system of enfeoffment emerged only during late Western Zhou, much later than states in the central plain. Therefore, this system was relatively less developed, and Chu nobles possessed smaller and fewer fiefs compared to other states due to deliberate restrictions imposed by Chu rulers (Tian 2017:213-4). In other words, Chu nobles were economically and politically much weaker than their counterparts in other states.

As previously discussed, Chu engaged in aggressive state-building since early Spring and Autumn Period. Thus, its situation accords with Prediction 3.

**Qin.** Recall that Qin was among the four military superpowers of the Spring and Autumn Period, but it was explicitly known to establish counties only since the early Warring States Period (Zhou and Li 2009:288). I argue that this may be a result of the relatively strong bargaining position of qualified candidates for administrative appointment.

As is obvious from Figure 1, the state of Qin was situated on the periphery of the Central Plain. It was both geographically and culturally more distant from Zhou compared to regional states in the Central Plain. For one, the origins of the Qin ruling lineage remained obscure, whereas the ruling lineages of other regional states were known to be descendants of the Zhou royal house or the Shang nobles. On the other hand, the development of the writing script in the Qin proved to be relatively staggered: while other states saw a rapid transformation of the script since late Spring and Autumn as a result of the expansion of the usage and applications of writing, such development began in Qin only towards the mid Warring States Period (Qiu 1988:52). This suggests that the literate population in Qin were small, and persons qualified for administrative appointments had a stronger bargaining position.\(^\text{27}\) This may have contributed to the delay in Qin’s state-building.

\(^{27}\)See Chen (2019) for a discussion of the connection between literacy and administrative appointment.
5.3 Relevance to Europe

In this subsection, I briefly discuss how the above results relate to European experiences.

Knighthood and Local Defense. The first knights in Europe emerged in the Carolingian Age as well-equipped horseback warriors. Maintenance of armors proved to be costly, and knights remained rare for a period of time. However, when invasions from Vikings and Magyars became increasingly frequent since the 9th century, the feudal system burgeoned as civilians agreed that “heavy payment for the support for a knight perpetually in residence and on call was better than periodic exposure to devastating raids” (McNeill 1974:86). As a result, knights quickly grew in number, and formed a defensive barrier against the invaders. In return for their military service, knights were granted the rights to collect income from villages.

This story is largely compatible with the result that fiefs had a greater defensive purpose. In particular, it bears a great deal of similarity with the empirical finding in Table 3 that fiefs were more likely to be instituted in regions bordering nomadic tribes.

Supply of Experts. Ertman (1997) argues that the supply of expert personnel were important for state-building. When their skills were a scarce commodity, experts could exploit their strong bargaining position to “promote institutional arrangements like proprietary officeholding and tax farming” (p.27). In contrast, a greater supply of experts would improve the ruler’s bargaining position and facilitate the centralization of power. For example, medieval universities in the German lands continuously produced law graduates suitable for government service, who created little threat to the German princes (p.244).

This bears a certain resemblance to the situation of Qin outlined in Section 5.2, and is consistent with the result that a decrease in the outside option of administrators is conducive to the establishment counties.

Military Technology. Many works on state-building in pre-modern Europe emphasize the role of the Military Revolution. The invention of gunpowder in the 14th century led to the adoption of cannons, which could quickly destroy walls. In response, new methods of fortification were developed that could stand against cannons, thereby greatly extending the duration of warfare (Gennaioli and Voth 2015).

In contrast, there were relatively fewer changes to fortification technologies in pre-imperial China. Rammed earth had become the main construction material for building city walls since Western Zhou, and remained so in the next one-thousand years. Earth was stamped between flat wood boards, and blocks of earth would then be stacked together and made into walls (Ma 1998). In the Warring States Period, new construction techniques developed
from water dams enabled states to erect long defensive walls. Chu, Qi and Wei constructed walls along their state borders, and Zhao, Yan and Qin erected walls in the northern frontier to defend against nomadic invasion (Yang 1998:320-25). While the in-land walls were demolished by the First Emperor upon China’s unification, the latter were connected together to become the Great Wall of China.

On the offense side, as discussed in Section 2.3, bronze weapons were widely used in Western Zhou and the Spring and Autumn Period, and began to be replaced by iron weapons since early Warring States Period. Iron had an edge over bronze, because iron blades and spearheads were sharper and more durable, and iron ores were much more abundant.

Since fortification and weapon-making technologies remained largely unchanged throughout the Spring and Autumn Period, it was unlikely that they were related to the institutional roots of state-building and bureaucratization during this period. Thus, results proposed in this paper do not contradict the Military Revolution literature.

6 Conclusion

Wars, state formation, and state destruction are a recurring theme in human history. In this paper, I study the mechanisms of state-building in regional states of pre-imperial China. I hand-collect novel datasets on wars, counties, fiefs and administrators, and present the first systematic evidence on patterns of state-building in pre-imperial China. I develop a model of incomplete contract of land ownership to connect conflict with centralization. I show that, both in theory and in empirics, that defensive and offensive military needs produce opposite effects on state-building. I provide suggestive evidence that the supply of qualified candidates for administrative appointments is positively associated with centralization.

My analysis provides new insights into the driving forces and mechanisms of state formation, and findings derived in this paper exhibit historical relevance beyond pre-imperial China. For example, the result on fiefs as a defensive device is consistent with the rise of feudalism in Europe and the creation of military districts (fan zhen) in Tang China, while the evidence on the supply of experts is in line with Ertman (1997)’s theory for German lands. The latter is also related to the emergence of bureaucratic recruitment and selection in the imperial era, beginning with the introduction of academic examinations by Emperor Wu (141–87 B.C.), and consummated in the imperial examination system instituted by Emperor Yang of Sui in 605 A.D.

Going forward, the activity of and power struggles among nobles and political elites in Spring and Autumn China deserve closer scrutiny, as internal cohesion is often believed
to be conducive to state-building (Gennaioli and Voth 2015). This is empirically possible since historians have systematically compiled information on those political elites and their political activity were thoroughly documented in Zuo’s Commentary. More importantly, much work needs to be done to investigate how centralization in the regional states led to the unification of China by the first empire in 221 B.C. This will shed light on the institutional foundation of a political transition as monumental as the establishment of the first empire, as well as the remarkable institutional continuity that the Chinese Empire ultimately manifested.

References


Sng, Tuan-Hwee. 2014. “Size and Dynastic Decline: The Principal-Agent Problem in Late Imperial China in Late Imperial China 1700-1850.” *Explorations in Economic History*, 54: 107–127.


Figure 5: Ten-Year Averages on Wars, Conquests and Active States, 722-221 B.C.

Notes: This figure plots 10-year averages of the number of annual wars, number of annual conquests, number of participants in each war, number of wars that each state participated in, and number of militarily active states, from 722 B.C. to 221 B.C.
Figure 6: Scatter Plot of Log Wars against Log New Counties, 722-221 B.C.

(a) Observation by States

(b) Scatter Plot with A Simple Regression

Notes: This figure plots the log number of wars plus one against the log number of new counties plus one. Panel (a) displays the scatter plot by states. Panel (b) adds a fitted line to the scatter plot in (a).
Figure 7: Location of Counties and Fiefs in the States of Jin and Chu, 772-496 B.C.

Note: This figure presents the locations of fiefs and counties in the state of Jin from 772 to 496 B.C. Red units are counties, and green units are fiefs. Circles are units located on the state border, and dotted circles are units located in-land. Smaller red dots are counties that were converted from fiefs, and located in-land at the time of conversion. Red stars are capital cities. Purple castles are major transportation routes or passes. Black dots are non-Chinese tribes. Blue lines are rivers, taken from the World Rivers dataset. Names of neighboring states are displayed in black text.
Figure 8: Location of Counties, Fiefs and Self-Initiated Wars for the States of Jin and Chu, 772-471 B.C.

Note: This map presents the locations of fiefs, counties and self-initiated wars for the state of Jin from 772 to 471 B.C. Red units are counties, and green units are fiefs. Circles are units located on the state border, and dotted circles are units located in-land. Smaller red dots are counties that were converted from fiefs, and located in-land at the time of conversion. Blue pins are sites of Chu-initiated wars, and purple pins are sites of Jin-initiated wars. Blue lines are rivers, taken from the World Rivers dataset. Names of neighboring states are displayed in black text.
Table 1: Number of Newly Established Counties by Historical Period, 722-222 B.C.

**Panel A: All States**

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of New Counties</th>
<th>Number of States that Created Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early SA (772-674 B.C.)</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Mid SA (673-577 B.C.)</td>
<td>21</td>
<td>3</td>
</tr>
<tr>
<td>Late SA (576-481 B.C.)</td>
<td>32</td>
<td>5</td>
</tr>
<tr>
<td>Early WS (480-395 B.C.)</td>
<td>31</td>
<td>7</td>
</tr>
<tr>
<td>Mid WS (394-308 B.C.)</td>
<td>58</td>
<td>7</td>
</tr>
<tr>
<td>Late WS (307-222 B.C.)</td>
<td>89</td>
<td>10</td>
</tr>
<tr>
<td>Date Unknown</td>
<td>161</td>
<td>-</td>
</tr>
</tbody>
</table>

**Panel B: By Major States**

<table>
<thead>
<tr>
<th>Period</th>
<th>Jin</th>
<th>Chu</th>
<th>Zheng</th>
<th>Song</th>
<th>Qin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early SA (772-674 B.C.)</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mid SA (673-577 B.C.)</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Late SA (576-481 B.C.)</td>
<td>15</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Early WS (480-395 B.C.)</td>
<td>11</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Mid WS (394-308 B.C.)</td>
<td>5/7/14</td>
<td>3</td>
<td>-</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Late WS (307-222 B.C.)</td>
<td>17/6/14</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>39</td>
</tr>
<tr>
<td>Date Unknown</td>
<td>5/3/5</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>123</td>
</tr>
</tbody>
</table>

Notes: Panel A displays the number of new counties created and the number of distinct states that created those counties for each time period from 722 B.C. to 222 B.C. Panel B displays the number of new counties created by the states of Jin, Chu, Zheng, Song and Qin. SA is the abbreviation of Spring and Autumn, and WS is the abbreviation of Warring States. Since Jin was split into three independent states in 403 B.C., for Mid and Late Warring States Periods, I display the counties created by the descendant states Zhao, Han and Wei in this exact order under the same column as Jin. Since the Zheng became conquered by Han in 375 B.C., the cells for mid and late Warring States are not applicable to Zheng.
Table 2: Summary Statistics for Counties and Fiefs

<table>
<thead>
<tr>
<th>Variables</th>
<th>Counties</th>
<th>Fiefs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>Located on State Border</td>
<td>0.50</td>
<td>0.504</td>
</tr>
<tr>
<td>Neighbors a Large State</td>
<td>0.069</td>
<td>0.256</td>
</tr>
<tr>
<td>Neighbors a Small State</td>
<td>0.293</td>
<td>0.459</td>
</tr>
<tr>
<td>Neighbors a Nomadic Tribe</td>
<td>0.052</td>
<td>0.223</td>
</tr>
<tr>
<td>Neighbors a High Value Location</td>
<td>0.293</td>
<td>0.459</td>
</tr>
<tr>
<td>Distance to Capital City (Hundred Miles)</td>
<td>1.264</td>
<td>0.703</td>
</tr>
<tr>
<td>Elevation (Feet)</td>
<td>895.782</td>
<td>1030.232</td>
</tr>
<tr>
<td>Terrain Roughness</td>
<td>0.445</td>
<td>0.103</td>
</tr>
<tr>
<td>Observations</td>
<td>58</td>
<td></td>
</tr>
</tbody>
</table>

Notes: This table displays summary statistics of key variables. Columns 1 and 2 present statistics for counties, and columns 3 and 4 present statistics for counties.
Table 3: External Military Threat Faced By Noble Fiefs and Counties in Jin and Chu, 772-496 B.C.

**Panel A: Border Status**

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whether Administrative Unit is a Fief</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OnBorder</td>
<td>0.283***</td>
<td>0.805**</td>
<td>0.318***</td>
<td>0.916***</td>
<td>0.312***</td>
<td>0.917***</td>
<td>0.335***</td>
<td>0.988***</td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
<td>(0.295)</td>
<td>(0.097)</td>
<td>(0.317)</td>
<td>(0.095)</td>
<td>(0.307)</td>
<td>(0.097)</td>
<td>(0.323)</td>
</tr>
<tr>
<td>HVLocation</td>
<td>-0.193*</td>
<td>-0.588**</td>
<td>-0.157</td>
<td>-0.491</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.109)</td>
<td>(0.339)</td>
<td>(0.113)</td>
<td>(0.347)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
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<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Dep Mean</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
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<tr>
<td>Dep SD</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
</tr>
<tr>
<td>State FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tr>
<tr>
<td>Controls</td>
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<td>No</td>
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<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.127</td>
<td>0.175</td>
<td>0.156</td>
<td>0.193</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>OLS</td>
<td>Probit</td>
<td>OLS</td>
<td>Probit</td>
<td>OLS</td>
<td>Probit</td>
<td>OLS</td>
<td>Probit</td>
</tr>
</tbody>
</table>

**Panel B: Type of Neighbors**

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whether Administrative Division is a Fief</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LargeNeighbor</td>
<td>0.392***</td>
<td>1.181***</td>
<td>0.398***</td>
<td>1.278***</td>
<td>0.493***</td>
<td>1.616***</td>
<td>0.490***</td>
<td>1.663***</td>
</tr>
<tr>
<td></td>
<td>(0.154)</td>
<td>(0.426)</td>
<td>(0.122)</td>
<td>(0.410)</td>
<td>(0.132)</td>
<td>(0.527)</td>
<td>(0.129)</td>
<td>(0.516)</td>
</tr>
<tr>
<td>SmallNeighbor</td>
<td>-0.010</td>
<td>-0.020**</td>
<td>0.046</td>
<td>0.182</td>
<td>0.085</td>
<td>0.303</td>
<td>0.123</td>
<td>0.452</td>
</tr>
<tr>
<td></td>
<td>(0.108)</td>
<td>(0.341)</td>
<td>(0.113)</td>
<td>(0.371)</td>
<td>(0.117)</td>
<td>(0.375)</td>
<td>(0.119)</td>
<td>(0.394)</td>
</tr>
<tr>
<td>TribeNeighbor</td>
<td>0.480***</td>
<td>1.401***</td>
<td>0.475***</td>
<td>1.463***</td>
<td>0.479***</td>
<td>1.479***</td>
<td>0.468***</td>
<td>1.519***</td>
</tr>
<tr>
<td></td>
<td>(0.116)</td>
<td>(0.416)</td>
<td>(0.122)</td>
<td>(0.447)</td>
<td>(0.110)</td>
<td>(0.411)</td>
<td>(0.116)</td>
<td>(0.445)</td>
</tr>
<tr>
<td>HVLocation</td>
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<td>-0.870*</td>
<td>-0.225*</td>
<td>-0.815*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.113)</td>
<td>(0.456)</td>
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<td>(0.458)</td>
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<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Dep Mean</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
<td>0.389</td>
</tr>
<tr>
<td>Dep SD</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
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</tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Controls</td>
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<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<td>OLS</td>
<td>Probit</td>
<td>OLS</td>
<td>Probit</td>
<td>OLS</td>
<td>Probit</td>
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</table>

**Notes:** *** $p < .01$, ** $p < .05$, * $p < .1$. Robust standard errors in parentheses. This table presents the results from equation 12 using as the dependent variable a dummy that is equal to 1 if the administrative unit is a noble fief, 0 if it is a bureaucratic county. OnBorder is a dummy indicating whether the administrative division is located on the state border. HVLocation is a dummy indicating whether the administrative division is in a high value location—a major transportation route or a natural pass. LargeNeighbor is a dummy indicating whether the administrative division is located on the state border and neighbors a large state. SmallNeighbor is a dummy indicating whether the administrative division is located on the state border and neighbors a small state. TribeNeighbor is a dummy indicating whether the administrative division is located on the state border and neighbors a nomadic tribe. The omitted category in Panel B is in-land administrative units. Controls include the logarithm of geographical elevation and terrain roughness of the administrative division, which are obtained from ArcGIS datasets. Terrain roughness is calculated using the relative topographic position metric.
Table 4: Distance to Capital City for Noble Fiefs and Counties in the State of Jin and Chu, 772-496 B.C.

<table>
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<th>Variables</th>
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<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
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<tr>
<td>DistToCapital</td>
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<td>-0.283</td>
<td>-0.132*</td>
<td>-0.366</td>
<td>-0.084</td>
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<td>-0.331</td>
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<tr>
<td></td>
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<td>(0.233)</td>
<td>(0.075)</td>
<td>(0.251)</td>
<td>(0.070)</td>
<td>(0.228)</td>
<td>(0.073)</td>
<td>(0.244)</td>
</tr>
<tr>
<td>OnBorder</td>
<td>0.352***</td>
<td>0.981***</td>
<td>0.379***</td>
<td>1.088***</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
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<td>(0.103)</td>
<td>(0.349)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LargeNeighbor</td>
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<td>1.433***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td>(0.130)</td>
<td>(0.490)</td>
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<td></td>
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<tr>
<td></td>
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<td>(0.403)</td>
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</tr>
<tr>
<td>TribeNeighbor</td>
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<td>0.487***</td>
<td>1.531***</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
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<td>(0.443)</td>
<td>(0.114)</td>
<td>(0.437)</td>
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<td>-0.780*</td>
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<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
<td>0.490</td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Controls</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.191</td>
<td>0.216</td>
<td>0.259</td>
<td>0.290</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>OLS</td>
<td>Probit</td>
<td>OLS</td>
<td>Probit</td>
<td>OLS</td>
<td>Probit</td>
<td>OLS</td>
<td>Probit</td>
</tr>
</tbody>
</table>

Notes: *** p < .01, ** p < 0.05, * p < 0.1. Robust standard errors in parentheses. This table presents the results from equation 12 using as the dependent variable a dummy that is equal to 1 if the administrative division is a noble fief, 0 if it is a county under bureaucratic rule. DistToCapital is the distance to the capital city, measured in hundred miles. OnBorder is a dummy indicating whether the administrative division is located on the state border. KeyLocation is a dummy indicating whether the administrative division is in an important location – a major transportation route or a strategically defensive position. LargeNeighbor is a dummy indicating whether the administrative division is located on the state border and neighbors a large state. SmallNeighbor is a dummy indicating whether the administrative division is located on the state border and neighbors a small state. TribeNeighbor is a dummy indicating whether the administrative division is located on the state border and neighbors a nomadic tribe. Controls include the logarithm of geographical elevation and terrain roughness of the administrative division, which are obtained from ArcGIS datasets. Terrain roughness is calculated using the relative topographic position metric.
## Table 5: Number of Attacks Near Noble Fiefs and Counties in Jin and Chu, 772-471 B.C.

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) 0-50 Miles</th>
<th>(2) 51-100 Miles</th>
<th>(3) 101-150 Miles</th>
<th>(4) 51-100 Miles</th>
<th>(5) 101-150 Miles</th>
<th>(6) 51-100 Miles</th>
<th>(7) 101-150 Miles</th>
<th>(8) 51-100 Miles</th>
<th>(9) 101-150 Miles</th>
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</thead>
<tbody>
<tr>
<td>IsCounty</td>
<td>0.117</td>
<td>-0.115</td>
<td>-0.517</td>
<td>3.286***</td>
<td>3.209**</td>
<td>2.279*</td>
<td>4.175***</td>
<td>3.384***</td>
<td>3.018**</td>
</tr>
<tr>
<td></td>
<td>(0.536)</td>
<td>(0.585)</td>
<td>(0.534)</td>
<td>(1.210)</td>
<td>(1.347)</td>
<td>(1.220)</td>
<td>(1.291)</td>
<td>(1.190)</td>
<td>(1.251)</td>
</tr>
<tr>
<td>OnBorder</td>
<td>0.851**</td>
<td>0.752*</td>
<td>0.319</td>
<td>3.191***</td>
<td>3.159***</td>
<td>2.042**</td>
<td>2.343*</td>
<td>2.006</td>
<td>1.549</td>
</tr>
<tr>
<td></td>
<td>(0.427)</td>
<td>(0.446)</td>
<td>(0.409)</td>
<td>(0.952)</td>
<td>(1.010)</td>
<td>(0.900)</td>
<td>(1.398)</td>
<td>(1.387)</td>
<td>(1.449)</td>
</tr>
<tr>
<td>LogDuration</td>
<td>0.750***</td>
<td>0.816***</td>
<td>0.992***</td>
<td>3.599***</td>
<td>3.621***</td>
<td>3.940***</td>
<td>5.153***</td>
<td>5.377***</td>
<td>5.490***</td>
</tr>
<tr>
<td></td>
<td>(0.246)</td>
<td>(0.254)</td>
<td>(0.265)</td>
<td>(0.585)</td>
<td>(0.567)</td>
<td>(0.581)</td>
<td>(1.057)</td>
<td>(1.033)</td>
<td>(1.017)</td>
</tr>
<tr>
<td>Observations</td>
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<td>95</td>
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<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Dep Mean</td>
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<td>1.253</td>
<td>1.253</td>
<td>4.421</td>
<td>4.421</td>
<td>4.421</td>
<td>5.705</td>
<td>5.705</td>
<td>5.705</td>
</tr>
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<td>State FE</td>
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<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Controls</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.130</td>
<td>0.177</td>
<td>0.308</td>
<td>0.350</td>
<td>0.351</td>
<td>0.444</td>
<td>0.372</td>
<td>0.421</td>
<td>0.432</td>
</tr>
</tbody>
</table>

Notes: *** $p < .01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses. This table presents the results from Equation 13, using as the dependent variable the number of self-initiated attacks within the 0-50 mile, 51-100 mile and 101-150 mile rings. IsCounty is a dummy that is equal to 1 if the administrative unit is a bureaucratic county, 0 if it is a noble fief. OnBorder is a dummy indicating whether the administrative division is located on the state border. Controls include the logarithm of geographical elevation and terrain roughness of the administrative division, which are obtained from ArcGIS datasets. Terrain roughness is calculated using the relative topographic position metric.
Table 6: Number of Attacks Near Noble Fiefs and Counties in Jin and Chu, 772-471 B.C.

### Panel A: Attacks against Weak Enemies

<table>
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<tr>
<th>Variables</th>
<th>(1) 0-50 Miles</th>
<th>(2) 51-100 Miles</th>
<th>(3) 101-150 Miles</th>
<th>(4) 101-150 Miles</th>
<th>(5) 101-150 Miles</th>
<th>(6) 101-150 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>IsCounty</td>
<td>0.011</td>
<td>-0.381</td>
<td>3.046**</td>
<td>2.192*</td>
<td>2.849**</td>
<td>2.639**</td>
</tr>
<tr>
<td></td>
<td>(0.582)</td>
<td>(0.534)</td>
<td>(1.238)</td>
<td>(1.116)</td>
<td>(1.155)</td>
<td>(1.234)</td>
</tr>
<tr>
<td>OnBorder</td>
<td>0.552</td>
<td>0.129</td>
<td>2.666***</td>
<td>1.609**</td>
<td>1.443</td>
<td>1.165</td>
</tr>
<tr>
<td></td>
<td>(0.435)</td>
<td>(0.400)</td>
<td>(0.913)</td>
<td>(0.804)</td>
<td>(1.295)</td>
<td>(1.350)</td>
</tr>
<tr>
<td>LogDuration</td>
<td>0.726***</td>
<td>0.897***</td>
<td>2.986***</td>
<td>3.256***</td>
<td>4.583***</td>
<td>4.636***</td>
</tr>
<tr>
<td></td>
<td>(0.244)</td>
<td>(0.257)</td>
<td>(0.495)</td>
<td>(0.504)</td>
<td>(0.957)</td>
<td>(0.941)</td>
</tr>
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<td>Observations</td>
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<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Dep Mean</td>
<td>1.053</td>
<td>1.053</td>
<td>3.621</td>
<td>3.621</td>
<td>4.632</td>
<td>4.632</td>
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<tr>
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<td>2.195</td>
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<td>5.454</td>
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<td>7.027</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.161</td>
<td>0.292</td>
<td>0.319</td>
<td>0.423</td>
<td>0.396</td>
<td>0.401</td>
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</table>

### Panel B: Attacks against Strong Enemies

<table>
<thead>
<tr>
<th>Variables</th>
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<th>(2) 51-100 Miles</th>
<th>(3) 101-150 Miles</th>
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<th>(5) 101-150 Miles</th>
<th>(6) 101-150 Miles</th>
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</thead>
<tbody>
<tr>
<td>IsCounty</td>
<td>-0.126</td>
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<td>0.163</td>
<td>0.087</td>
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</tr>
<tr>
<td></td>
<td>(0.102)</td>
<td>(0.105)</td>
<td>(0.239)</td>
<td>(0.225)</td>
<td>(0.273)</td>
<td>(0.263)</td>
</tr>
<tr>
<td>OnBorder</td>
<td>0.200***</td>
<td>0.190***</td>
<td>0.492**</td>
<td>0.433**</td>
<td>0.563**</td>
<td>0.383</td>
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<tr>
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<td>(0.071)</td>
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<td>(0.222)</td>
<td>(0.217)</td>
<td>(0.237)</td>
<td>(0.247)</td>
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<tr>
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<td>0.090*</td>
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<td>(0.053)</td>
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<td>(0.166)</td>
<td>(0.174)</td>
<td>(0.180)</td>
</tr>
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<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Dep Mean</td>
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<td>0.800</td>
<td>0.800</td>
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<td>1.260</td>
<td>1.532</td>
<td>1.532</td>
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<td>Yes</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
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<td>R-squared</td>
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<td>0.179</td>
<td>0.344</td>
<td>0.381</td>
<td>0.377</td>
<td>0.417</td>
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</tbody>
</table>

Notes: *** $p < .01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses. This table presents the results from Equation 13, using as the dependent variable the number of self-initiated attacks against weak enemies (Panel A) and strong enemies (Panel B) within the 0-50 mile, and 51-100 mile and 101-150 mile rings. IsCounty is a dummy that is equal to 1 if the administrative unit is a bureaucratic county, 0 if it is a noble fief. OnBorder is a dummy indicating whether the administrative division is located on the state border. Controls include the logarithm of geographical elevation and terrain roughness of the administrative division, which are obtained from ArcGIS datasets. Terrain roughness is calculated using the relative topographic position metric.
Table 7: Clan Membership of Administrators of Noble Fiefs and Counties in the States of Jin and Chu, 772-496 B.C.

<table>
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<th>Variables</th>
<th>(1) Qing Clan</th>
<th>(2) Large Clan</th>
<th>(3) Large Clan</th>
<th>(4) Small/No Clan</th>
<th>(5) Small/No Clan</th>
<th>(6) Small/No Clan</th>
</tr>
</thead>
<tbody>
<tr>
<td>IsCounty</td>
<td>-0.129</td>
<td>-0.337</td>
<td>-0.190**</td>
<td>-0.559**</td>
<td>0.318***</td>
<td>1.130***</td>
</tr>
<tr>
<td></td>
<td>(0.094)</td>
<td>(0.251)</td>
<td>(0.080)</td>
<td>(0.255)</td>
<td>(0.085)</td>
<td>(0.313)</td>
</tr>
<tr>
<td>Observations</td>
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<td>119</td>
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</tr>
<tr>
<td>Dep SD</td>
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<td>0.465</td>
<td>0.426</td>
<td>0.426</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
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<td>0.127</td>
<td>0.145</td>
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<td>Probit</td>
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</tbody>
</table>

Notes: *** p < .01, ** p < 0.05, * p < 0.1. Robust standard errors in parentheses. This table presents the results from specification 1 using as dependent variables the types of clans to which administrators hold membership. IsFief is a dummy that is equal to 1 if the administrator is a warlord in charge of a noble fief, 0 if the administrator is a bureaucrat in charge of a county. Controls include the logarithm of geographical elevation and terrain roughness of the administrative division which the administrator manages, which are obtained from ArcGIS datasets. Terrain roughness is calculated using a metric called the relative topographic position. Columns (1) and (2) use a dummy indicating whether the administrator is member of a Qing clan. Columns (3) and (4) use a dummy indicating whether the administrator is member of a large clan. Columns (5) and (6) use a dummy indicating whether the administrator is member of a small clan, is member of no clan, or is a foreigner in exile.
Appendix A  Model Solution and Proofs

A.1  Contract Equilibrium Payoffs

A.1.1  Fief Contract

Equations 3 and 9 give the functional forms of $m_{fd}$. The equilibrium payoffs of $A$ and $R$ can be found by substituting $m_{fd}$ into their respective objective functions:

$$\pi_{afd} = P(m_{fd}, m_e)t - m_{fd} = t - 2\sqrt{m_e t} + m_e,$$

$$\pi_{rfd} = P(m_{fd}, m_e)\alpha = \left(1 - \sqrt{\frac{m_e}{t}}\right)\alpha.$$

A.1.2  County Contract

Similarly, I derive the equilibrium payoffs of $A$ and $R$ by plugging in $m_{cd}$ into their respective objective functions:

$$\pi_{acd} = \lambda P(m_{cd}, m_e)t - m_{cd} = \lambda t - 2\sqrt{\lambda m_e t} + m_e,$$

$$\pi_{rcd} = P(m_{cd}, m_e)[(1 - \lambda)t + \alpha] = \left(1 - \sqrt{\frac{m_e}{\lambda t}}\right)[(1 - \lambda)t + \alpha].$$

A.2  Proofs of Propositions

A.2.1  Proof of Proposition 1

First, $m_{fd} = \sqrt{m_e t} - m_e > \sqrt{\lambda m_e t} - m_e = m_{cd}$.

Now consider the function $\pi(m, x) = P(m, m_e)x - m$. Let $m^* = m^*(x)$ be the maximizer of $\pi$ with respect to $x$. Then by the Envelope Theorem:

$$\frac{\partial \pi(m^*(x), x)}{\partial x} = P(m^*, m_e) > 0.$$

Thus, $\pi_{afd} = \pi(m, t) > \pi(m, \lambda t) = \pi_{acd}$. 

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A.2.2 Proof of Proposition 2

Obvious.

A.2.3 Proof of Proposition 3

a) We know that

\[ \Delta \pi := \pi_{rfd} - \pi_{rcd} = \left( \frac{1}{\sqrt[4]{\lambda}} - 1 \right) \sqrt{\frac{m_e}{t}} \alpha - \left( 1 - \sqrt{\frac{m_e}{\lambda t}} \right) (1 - \lambda)t. \]

Taking a partial derivative with respect to \( m_e \) yields:

\[ \frac{\partial \Delta \pi}{\partial m_e} = \frac{1}{2\sqrt{m_e}t} \left( \frac{1}{\sqrt[4]{\lambda}} - 1 \right) \alpha + \frac{1}{2\sqrt{\lambda m_e}t} (1 - \lambda)t > 0. \]

This shows that the difference between \( R \)'s payoff under the fief contract and under the county contract is monotonically increasing in \( m_e \). Moreover:

\[ \Delta \pi(0) = -(1 - \lambda)t < 0, \]

\[ \Delta \pi(\lambda t) = \left( \frac{1}{\sqrt[4]{\lambda}} - 1 \right) \sqrt{\lambda} \alpha > 0. \]

By the Intermediate Value Theorem, there exists a \( m_e^* \in (0, \lambda t) \) such that \( \Delta \pi(m_e^*) = 0 \). Therefore, the ruler prefers the fief contract when \( m_e > m_e^* \).

b) Taking a partial derivative with respect to \( \lambda \):

\[ \frac{\partial \pi_{rcd}}{\partial \lambda} = \frac{1}{2\lambda} \sqrt{\frac{m_e}{\lambda t}} \left[ (1 - \lambda)t + \alpha \right] - \left( 1 - \sqrt{\frac{m_e}{\lambda t}} \right) t. \]

Note that we must have \( m_e \leq \lambda t \), that is, \( \lambda \geq \frac{m_e}{t} \). Then:

\[ \frac{\partial \pi_{rcd}}{\partial \lambda} \bigg|_{\lambda = \frac{m_e}{t}} = \frac{t}{2m_e} \left[ \left( 1 - \frac{m_e}{t} \right) t + \alpha \right] > 0. \]

Also:

\[ \frac{\partial \pi_{rcd}}{\partial \lambda} \bigg|_{\lambda = 1} = \sqrt{\frac{m_e}{t}} \left( \frac{1}{2} \alpha - t \right) - 1. \]
This is negative when
\[ \alpha < 2 \left( \sqrt{\frac{t}{m_e}} + t \right). \]

Thus, \( \pi_{rcd} \) has an inverse U-shape in \( \lambda \) when \( \alpha \) is not too large.

### A.2.4 Proof of Proposition 4

First, \( m_{fo} = \sqrt{m_e(t + \gamma t_e)} - m_e > \sqrt{m_e(\lambda t + \lambda t_e)} - m_e = m_{eo} \).

Following the same logic as in the proof of Proposition 1, we know that \( \pi_{afo} > \pi_{aco} \).

### A.2.5 Proof of Proposition 5

The bureaucrat participates in the attack if:

\[ \lambda t + \lambda t_e - 2\sqrt{\lambda m_e(t + t_e)} + m_e \geq \lambda t. \]

This is true if:

\[ \lambda t_e + m_e \geq 2\sqrt{\lambda m_e(t + t_e)} \]
\[ \Rightarrow (\lambda t_e - m_e)^2 \geq 4\lambda m_e t \]
\[ \Rightarrow t_e \geq \frac{m_e + 2\sqrt{tm_e}}{\lambda} =: t_e'. \]

Note that the other root is negative since \( m_e < 2\sqrt{\lambda tm_e} \).

Similarly, the vassal participates in the attack if:

\[ \pi_{afo} = P(m_{fo}, m_e)(t + \gamma t_e) - m_{fo} \geq t. \]

This is true if:

\[ (\gamma t_e - m_e)^2 \geq 4m_e t \]
\[ \Rightarrow t_e \geq \frac{m_e + 2\sqrt{tm_e}}{\gamma} =: t_e^*. \]

Again, the other root is negative because \( m_e < 2\sqrt{tm_e} \).

Now, I show that \( t_e' < t_e^* \) if and only if \( \sqrt{\lambda} > \gamma \). Suppose that \( t_e' < t_e^* \), then:

\[ \frac{m_e + 2\sqrt{\lambda tm_e}}{\lambda} < \frac{m_e + 2\sqrt{tm_e}}{\gamma}. \]
This is equivalent to:

\[ \gamma m_e + 2\gamma \sqrt{\lambda t m_e} < \lambda m_e + 2\lambda \sqrt{t m_e} \]
\[ \Rightarrow \sqrt{m_e}(\gamma - \lambda) < 2\sqrt{\lambda t}(\sqrt{\lambda} - \gamma). \]

By Assumption 2, \( \gamma > \lambda \). Thus this expression holds if and only if \( \sqrt{\lambda} > \gamma \). Moreover, it is obvious that this expression is more likely to hold when \( m_e \) is small or when \( t \) is large.

A.2.6 Proof of Proposition 6

Obvious.