Central Administration and the Rise of Local Institutions: Evidence from Imperial China*

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Abstract

In this paper, I study whether a strong centralized state facilitated the development of local institutions in Imperial China from 1000 A.D. to 1900 A.D. I exploit plausibly exogenous variation in the state administrative capacity in the local area induced by regime changes. Using a prefecture-level panel dataset, I find that local institutions flourished when the state administrative capacity was strong and prevalent. This is likely because a strong centralized state could better co-opt these local institutions, granting local institutions political power. Further investigation reveals that regions with relatively weaker state administrative capacity did not receive more public goods from the central state. This illustrates an important development issue: places with weak centralized states lack both state direct public goods provisions and local institutions to coordinate public goods provision and social capital formation and might face more developmental difficulties.

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1 Introduction

Local institutions, defined as institutions that are organized together with rules and norms created and enforced by social groups in the local region, have long been considered an important channel for developing social capital. These institutions shape individuals' beliefs and behavior, help to overcome the problem of achieving collective action, and affects cultural changes and social norm formation (Putnam, Leonardi, and Nanetti, 1994; Greif, 1994; Greif and Tabellini, 2010, 2017; Enke, 2019). Therefore, they can also have long-term implications for political behavior as well as economic and social development.

Most of these local institutions are considered informal institutions (Helmke and Levitsky, 2004).[1] Still, some are eventually developed as formal institutions with written rules and laws and providing public goods. These formalized local institutions manage to overcome social dilemmas and enjoy the benefit of cooperative solutions. However, what fosters the cooperative behavior among some communities and give incentives to establish these formalized local institutions?

This paper focuses on one possible explanation–the role of central administration–in the development of local institutions. Fukuyama (1995) and Putnam, Leonardi, and Nanetti (1994), among others, argue that a centralized state crowds out local institutions as the state performs its functions, including public goods provision, disaster relief, etc. The Norman State in southern Italy is an example of this. However, others, such as Streeck and Schmitter (1985), Vogel (1986), and Ostrom (1990) argue that the state can transform perceptions of the costs and the benefits of cooperation and thus lead to the provision of collective goods and emergence of local institutions. A more recent study, by Acemoglu and Robinson (2017), argues that this relationship can be ambiguous and depends on initial conditions.

Although a definite answer to this relationship that suits all contexts might not exist, this paper provides one of the first empirical investigations of the relationship between the central administration and the development of local institutions in Imperial China. There are two main challenges to investigating this question empirically. The first is to measure the emergence of formalized local institutions. These formal local institutions can exist in many different ways and function in many different forms, making it hard to measure their existence and systematically compare the variation across space and time.

Powerful clans in Imperial China during the second millennium (about 1000 A.D. to 1911 A.D.) provides a good opportunity to measure formal local institutions systematically.

[1] Examples of informal institutions are shared values, social norms, taboos, customs, traditions, implicit codes of conduct etc.

The clan was the most important social organization in the core region of China during the second millennium (Greif and Tabellini, 2010, 2017; Xu and Yao, 2015; Fukuyama, 2012). A powerful clan in historical China was capable of giving the poor, the elders, the orphans, and members in need reliefs, educating the young, conducting religious services, building bridges, and constructing dams. It had its own rules on moral standards, property rights, justice, and was able to enforce them. In this paper, I consider a clan is powerful, and thus a formal local institution, if it has communal land. Having communal land meant that the clan had a source of communal funding and could provide communal goods and, therefore, could truly be considered a formal local institution.

The other challenge is to measure the strength of the central state administration and identify a plausibly exogenous variation of it since the local institutions might interact with the state strategically and might even be involved in state formation. To this end, regime switches during the second millennium in Imperial China also provides a good setup to tackle this problem. Each regime switch involves redrawing provincial boundaries and relocating provincial capitals. Areas closer to the provincial capital would have had stronger state influence; however, they might have lost this influence when they were moved away from the provincial capital due to regime switches. The provincial boundaries were more like "administrative accidents" rather than a result of delineation by human activities (Skinner, 1977); provincial capital relocations were mainly based on the concerns of military defense against invaders and information and resources transmission. Hence, such changes in the proximity to provincial capitals were plausibly exogenous to the local institutions, which allows me to use it as a proxy for the strength of the central state administration.[2]

I construct a prefecture-dynasty panel dataset of 267 prefectures in the core regions of China (China Proper) during the second millennium over three dynasties: Song, Ming, and Qing.[3] The panel feature allows me to include prefecture fixed effects which control for prefecture-specific effects on formal local institution establishments. This can help isolate the effect of state administrative capacity from other time-invariant factors such as culture and geography. I can focus on within prefecture variation and ask whether moving a prefecture closer to the provincial capital–and thus exposing to more state administration–increases or decreases the probability of establishing a new powerful clan (local informal institutions). To address the concerns that formalized local institutions might play a role in negotiating the

[2]Empirically, I show that changes in proximity to provincial capitals are not correlated with population density or clan land establishments in the previous dynasty.

[3]Please see the shaded area Figure A1 in the appendix for the China Proper region. There is one more dynasty–the Yuan dynasty–in the second millennium. It is not included in the analysis because of the unavailability of the data. Detailed discussions are provided in Section 2.

location of provincial capitals and provincial boundaries or that the state might strategically locate the provincial capitals and decide the provincial boundaries to better control the formal local institutions, I provide empirical evidence showing that the proximity was not correlated with the existing local institutions.

I find that formalized local institutions emerge where state administrative capacity is stronger (i.e., closer to the provincial capital). In particular, a one standard deviation increase in a prefecture's distance (in its natural logarithm) to its provincial capital reduces its probability of a formal local institution establishment by eight percentage points (p.p.), a twenty-five percentage change from its mean. Put differently, we can use Wuhan as an example.[4] It was a prefecture near the provincial border and was about 210 km away from its provincial capital (Jiangling Fu) in the Song dynasty, but it gained the provincial capital status in the Ming and Qing dynasties. This increases its probability of having local institutions (powerful clan) establishment by thirty p.p. This finding is still robust when controlling for population density, which can help isolate both the effect of population size and economic development. The result is also robust to various specifications, including using grid-level analysis as well as using models that take spatial autocorrelation into account.

What might explain the positive relationship? Like any large empire at the time, Imperial China faced difficulties in reaching the local regions and local people and governing the large Empire. The state often sought help from the local elites, co-opting local elites as agents and delegating tasks to them. This inevitably gave local elites more power and prestige (Mann, 1989), which incentivized local elites to invest in the local institutions to consolidate the power they had. Knowing that these local elites could eventually gain political power and eventually outgrow their role as agents and go against the state meant they had to evaluate this option carefully. More specifically, the state faced the following trade-off: on the one hand, it was easier for the state to monitor local elites to ensure their loyalty in areas with a stronger capacity (closer to the capital); while on the other hand, a strong capacity also meant that the state had less need to delegate these tasks as the state was able to administer the tasks directly (Levi, 1989). In this case, when the costs of monitoring the local elites increase drastically, or in other words, the net benefits of co-opting local elites diminish as the state's capacity decreases, we would observe these local institutions flourish when the state had relatively strong administrative capacity.

Further investigation shows that regions that are further away from their provincial capitals and thus had weaker state influence not only had fewer formalized local institutions

[4]It was called E zhou in the Song dynasty and Wuchang prefecture in the Ming and Qing dynasties.

for public and club goods provision, but also did not experience more directly public goods provision—school academies–from the imperial state. This suggests that weak state presence constrained their ability to have formal local institutions to develop social capitals and limit their access to goods and services, which might have had long-term implications for social and economic development.

To the best of my knowledge, this paper is the first to show the complementaries between state administrative capacity and the development of local informal institutions empirically using unique historical panel data during the second millennium in imperial China. This paper provides first empirical evidence to the state and civil society debate by showing the possible complementarity. Acemoglu and Robinson (2017) call this complementarity inclusive institutions. Their model shows that this equilibrium point can be reached when the state and the civil society are initially in balance, which triggers an ongoing competition between the two, whereby they both become stronger. This paper empirically shows a similar but slightly different story: a relatively strong centralized state (but not absolutely strong since it is still limited in its capacity to rule local regions) creates incentives for the civil society to grow in its administrative process.

More broadly, this paper contributes to understanding the long-term legacy of historical institutions. Many scholars have discussed that social capital is the channel through which historical institutions have made a long-run impact on contemporary outcomes (Dell, Lane, and Querubin, 2018; Chaudhary, Rubin, Iyer, and Shrivastava, 2020; Lowes, Nunn, Robinson, and Weigel, 2017) (could cite more, maybe some earlier ones here). Dell, Lane, and Querubin (2018) finds that a historically strong state has a long-run effect on local cooperation and civic engagement cross-sectionally. This paper complements their findings by showing a contemporaneous effect using a historical panel dataset, which supports their arguments on the persistent effect. Xue (2020) shows that historical state repression impedes social capital, which has persistent long-run effects. This paper complements her finding and shows that the state administration process can also incentivize locals to invest in social capital.

This paper is also related to broad literature on state co-options. Existing literature has shown the importance of co-opting the local elites in helping local governance and the effectiveness of co-opting local elites in managing conflicts and tax collection (Balan, Bergeron, Tourek, and Weigel, 2020; Basurto, Dupas, and Robinson, 2020; Acemoglu, Reed, and Robinson, 2014; Acemoglu, Cheema, Khwaja, and Robinson, 2020; Mustasilta, 2019). This paper illustrates one unintentional and possibly positive outcome of co-option: the development of local institutions. This is possibly one mechanism through which co-opting local

elites has been found very effective in administering local affairs: co-opted local elites also invested in local people to consolidate the power and prestige that they received from being a state agent. Additionally, the literature finds that the state could tap local organizations and local power to aid the development of the state (Satyanath, Voigtländer, and Voth, 2017; Acemoglu, Reed, and Robinson, 2014). This paper shows that this can also aid the growth of local organizations.

Additionally, this paper also provides new insights into understanding Imperial China's political logic in state-building and the state-elite relationship (Wang, 2021b,a; Chen, Wang, and Zhang, 2021; Sng, 2014; Bai and Jia, 2021). This paper highlights the role of the centralized state in developing local institutions and illustrates the logic behind co-opting the local institutions when governing local regions.

Lastly, this paper also makes a contribution to the literature on costs of being located far away from the state administrative centre. Existing literature has documented the economic disparity caused by greater distance (Asher, Nagpal, and Novosad, 2018; Fafchamps and Wahba, 2006; Feyrer, 2009). This paper implies that being away from the administrative centre not only has economic costs but also social costs. It could prevent local cooperation and thus social capital formation.

The rest of this paper proceeds as follows. Section 2 provides a brief background on regime switches and associated provincial boundary changes and provincial capital relocations, as well as the clan as a local institution. Section 3 gives an overview of the data used in this paper. The empirical framework and empirical results are presented in Section 4 and Section 5 respectively. Section 6 concludes.

2 Background

In this section, I will provide brief background on the provincial boundaries changes and provincial capitals relocations involved in regime switches, and the clan as a local institution. During the second millennium there were four Imperial regimes: the Song (960—1279), the Yuan (1279–1368), the Ming (1368–1644), and the Qing (1644–1911) (see Figure 1 for a timeline). The Yuan dynasty is not included in this paper because the clan, in particular, clan land had very limited development during the Yuan dynasty, and therefore, the clan land data is not available for the Yuan dynasty.[5]

[5]According to Zhang (1991), there was a pause in clan land growth throughout the Yuan dynasty, with fewer than ten well-known clan land establishments. This would result in a lack of spatial variation for the analysis.

2.1 Regime Switches, Provincial Boundaries, and Capitals

2.1.1 Levels of Administrations

The three-tier administrative system (county-prefecture-province) has been very stable since the Song dynasty (960 A.D.). The central state directly appointed and rotated officials at all levels, although provincial governors often played a role in recommending promotion, demotion or removal of their subordinate officials. The "hometown avoidance" rule was employed when appointing officials at all levels to avoid nepotism. Officials were not assigned to their hometown province, and they will not be appointed close to where their family members are appointed (if any).

The province is the top tier of the administration system. The provincial capital is the most crucial node through which the central state can connect with local regions within the province.[6] It serves two primary roles: (i) the central administration for fiscal affairs, judicial affairs, and welfare issues within a province. (ii) transferring resources and information between the central government and all the prefectures within a province. The provincial-level administration is often seen as representing the emperor. Provincial governors are responsible for supervising prefecture prefects' and county magistrates' performance. They send out supervisors to monitor and evaluate prefects' and magistrates' administration regularly. The *Yong Zheng* Emperor once said: "the provincial governors are representing me as the emperor to govern the local matters. So do the vice-governors who are also representing me as the emperor to carry out my orders."

Prefecture prefects and county magistrates receive orders from their provincial leaders and focus on local issues, including local peace and security, tax collection, population registration, and judicial affairs. As a higher level administrative officials, prefecture prefects take care of more significant issues than county magistrates. For example, county magistrates only adjudicate very minor crimes, and most cases have to be settled in the prefecture court. In case of major crimes, the provincial governors need to be consulted and make the final decision, while a death sentence requires approval from the central government. On the other hand, due to the "hometown avoidance" rule, these prefects and magistrates are unfamiliar with local conditions and usually faced difficulties reaching the local populations. Therefore, they heavily rely on local elites to carry out their administrative duties (Chu, 1962; Bai, 2003).

[6] Figure A2 shows the location of provincial capitals in all three dynasties.

2.1.2 Regime Switches, Provincial Boundary Changes and Provincial Capital Relocations

Each regime change involves redrawing provincial boundaries and some relocation of the provincial capitals. Hence, the proximity changes used in this paper come from these two sources of variation: the province the prefecture belongs to and the capital it is distant from. In what follows, I will discuss the determinants of such changes.

Provincial Boundary Changes

Provincial boundaries were drawn at the beginning of each dynasty when the new rulers had very little knowledge of the local conditions. Those borders usually persisted until the end of the dynasty, with only very few exceptions that change in between (Tan, 1982; Bai and Jia, 2021).

During early Chinese history, almost all levels of administrative boundaries and/or territory boundaries followed natural boundaries such as rivers or mountains. This is known as "following the forms of mountains and rivers". The Song dynasty (960–1279 A.D., the first dynasty in my sample) also adhered to this principle when drawing the provincial boundaries.

In the Yuan dynasty (1277—1368 A.D.), when the Mongols rose to power, they adopted another principle, known as "*interlocked like dog's teeth*", which means including rivers and mountains within provinces. This is mainly to prevent regional power holders (such as provincial governor, duke, military commissioners, etc.) gaining too much local autonomy and posing a military threat while keep the administrative costs low (Ge, 1985; Zhou, 1998; Sng, Chia, Feng, and Wang, 2018).[7]

Figure A3 uses the Yangtze River as an example. The Yangtze River was used to create provincial boundaries during the Song dynasty (Pre-Yuan, the left panel), while in the Ming and Qing dynasty (Post-Yuan, the middle and right panels respectively), the Yangtze River was interlocked within the province. Zhou (1998, 2013) documents many other examples, including the *Qin* Mountain and the *Taihang* Mountain.

This principle was inherited when the following regimes–the Ming dynasty (1386–1644 A.D.) and the Qing dynasty (1644–1911 A.D.)–came into power. Provincial boundaries in late Imperial China that were widely considered as "administrative accidents", as they seldom coincide with culture or any human and economic activities in the local regions (Skinner, 1977; Zhou, 1998, 2013). The location of provincial boundaries was merely to prevent provincial

[7]See the Appendix II for a detailed discussion on the logic of both principles and why principle changed in the Yuan dynasty.

power-holders (provincial governors) who had military power to challenge the emperor's supremacy, instead of concerning local conditions.

Note that this change in the principle of drawing provincial boundaries resulted in significant changes from the Song dynasty to the Ming dynasty. The Qing dynasty preserved most of the Ming dynasty's provincial boundaries but dividing three provinces that were considered too large in half.[8]

Locations for Provincial Capitals

As one major role of provincial capitals is to connect the central government with all prefectures within the province, proximity and connectivity become a primary concern when choosing provincial capitals. Bai and Jia (2021) illustrates that the central state would weigh the trade-off between governing a province (proximity to all prefectures within the province and hence centroid of the province) and connecting to the central state for transferring and delivering resources and information (proximity to national capital) and choose the provincial capitals that balance the two. Hence, as the provincial boundary changes, the provincial capitals would require relocation.

As provincial capitals are the centers for any fiscal and judicial affairs, geographically suitable to accommodate frequent and high volume visitors is an important factor to consider. Hence, provincial capitals are usually located on a plain with low elevation and beside rivers or canals which gives nature advantages for transportation. Also, they must be agriculturally suitable so as to produce sufficient food for traders, visitors and bureaucrats are also very important. Close to rivers also ensures sufficient water supply for irrigation (He, 2009; Guy, 2017).

Military defence is another major concern when choosing provincial capitals. Prefectures that geographically have military defence advantages, such as at the foot of a hill and besides a major river, are the primary candidates for provincial capitals (Guy, 2017).[9] As such, any invaders would not easily conquer any provincial capital. For example, Xi'an has three sides surrounded by the mountains while its east side faces Yellow River. Guiyang, the capital for Guizhou province, shares similar features. Almost all provincial capitals have a major river nearby. This is probably because rivers give all key benefits mentioned above.[10]

[8]This includes dividing *Jiangnan* province into *Jiangsu* province and *Anhui* province (this case is depicted on Figure A3); dividing *Shangxi* province into *Shangxi* province and *Gansu* province; and dividing *Huguang* province into *Hunan* province and *Hubei* province.

[9]Major rivers in China flow from the west to the east, while all the external military threats come from the north side. Therefore, a major river would stop the enemy's invasion rather than facilitate their arrival.

[10]In my data, only three provincial capitals across three dynasties do not contain a major river. One of the three is a coastal city.

2.2 The clan

A clan consists of several patrilineal households who trace their origins to a *self-proclaimed* common male ancestor. In some cases, they were not blood-related. During the late Qing dynasty, some households with distinct surnames who knew that they did not share the same ancestor also identified themselves as a clan.[11] The lineage head–who oversees all internal affairs, including justice and fiscal-related issues–is often a well-reputed person within the clan. He usually is a local elite who passed the civil exam and earned gentry status.

The clan as a local institution has been shown to have positive short and long run effects. These include serving as risk sharing institutions and promoting economic development, deterring government land taking and other government expropriations, as well as promoting local governance and administering public goods provision when democratic election was introduced. (Chen and Ma, 2021; Cao, Xu, and Zhang, 2020; Zhang and Zhao, 2014; Xu and Yao, 2015). In what follows, I provide a brief overview of the development of Chinese clan and its institutional roles.

Clan Development Since Song

The clan is deeply rooted in Chinese history, although it was solely aristocratic and noble-based for a long period. It is the privilege of the aristocracy to hold activities such as ancestor worship rites and genealogies. However, by the end of the Tang Dynasty (618–907 A.D.), wars and massive migrations had destroyed the social structure, aristocracy, and nearly all existing clans. Order was not restored until the Song Dynasty was several decades old. The Song philosopher *Zhang Zai* (1020-1077) was known to be the first to stress the role of clans to restore social order. A few decades later, *Zhu Xi* (1130-1200), a well-known philosopher, authored the book Family Rites (*Jia Li*). In this work, he provided practical guidelines for establishing clans, such as constructing ancestor temples, worshipping ancestors, and establishing communal clan land. This guideline was considered very influential in Chinese history and was widely followed.

Meanwhile, the rise of *Keju* (a civil system used to choose officials) since the Song Dynasty created a large room for clans to flourish and turned clans into commoner-based. Firstly, *Keju* selected virtually all levels of government officials based on merit rather than family background. People who passed the entry-level of the civil exam would be admitted to the gentry class and would be entitled to various benefits and privileges, including tax exemption,

[11] There were even cases that several households even altered their surnames so as to claim themselves to be a clan.

corvee labour exemption, and high social status.[12] In addition, as the intergenerational succession of rank, advantages, and power, and hence aristocracy, were broken down by this exam system, the social standing, authority, and privilege obtained through the civic test became less stable. This gave additional incentives for those who reaped these benefits after passing the civil exam began to invest in their clan to strengthen their social standing, with the hope of helping other members in the lineage pass the exams and support themselves. *Liu Zai*, who obtained *Jinshi* (the highest degree) in the Song dynasty's civil exam, has expressly said that "investing in a clan is the only way to retain wealth."

Therefore, from the Song dynasty, the clan became commoner-based. Many commoners started to organize their clans following *Zhu Xi*'s guidelines. A typical clan would have their own rules enforced by their lineage head. Justice and local affairs are usually dealt with in the lineage hall, and local officials would not intervene. Different households within a clan would help each other with farming, cultivation, and other economic activities. An organised clan would document members' accomplishments and contributions in their clan genealogy with a goal to encourage individuals to contribute to their clan and incentivise collectiveness.

A small percentage of clans held communal assets (communal clan land is the most common asset). This provided them with communal funding for lineage hall repairs, large-scale worship ceremonies, poor and disaster relief, clan school operation, and other organized public or club goods provision. The lineage head would be in control of funding, and clan members may request relief funds when needed. As Fei (1986) describes, "[A clan] it is a community inside a society". The clan then became a core part of the civil society as a support system, safety net, and many other collective actions.

The clan's development was constrained throughout the Yuan dynasty, due in part to the nature of the Mongolian ruling regime. During the Yuan dynasty, only a few parcels of clan land were documented. According to Zhang (1991), there was a pause in clan land growth throughout the Yuan dynasty, with fewer than ten well-known clan land establishments.

During the Ming and Qing dynasties, clan and clan land growth flourished. Clans were prevalent across China at the end of the Qing dynasty (Feng, 2008).[13]

[12]Historical China divided people into four classes: scholar, farmer, artisan, and merchant. Educated scholars who passed the civil exam would obtain high social status in society. They were the highly respected group in society. High social status could be reflected in many aspects. For example, commoners must greet officials on bended knees, while gentries don't.
Corvee labour: during the Imperial China, the state would often need labour for military and construction projects such as roads, canal, irrigation system, etc. Hence, the state would regularly conscript free labour (corvee labour) and local people had obligation to meet the state's demand by law. However, the scholars who passed the civil exam, and often their family members, were exempted from it.

[13]Even though the Qing dynasty, similar to the Yuan dynasty, was also ruled by ethnic minorities, but they were known to be more integrated to ethnic Han culture and therefore, the clan can still be prosperous

Communal Clan Land

Having a communal land means that a clan had a stable source of communal fund to provide club goods and public goods. In this paper, it is also used as a measure for strong clans.

The first clan land was established by *Fan Zhongyan* (989-1052 A.D) in 1049 A.D. He donated his personal land to his clan. It began in two counties in the Suzhou prefecture, sized about 6 *mu* (Zhang, 1991).[14] The goal was to "help members regardless of relationship. Everyone could have food and clothing, as well as funds for weddings or funerals." (Zhang, 1991). Since then, more and more clans followed suit and began to create clan land. Most of the clan land was donated by one or a few clan members, who will get respect, status, and power in return.

Establishing clan land is frequently viewed as a necessary strategy for unifying clan members and consolidating elite's authority. Qing philosophers *Fang Bao* and *Gu Yanwu* both believe that the clan land from Fan, which was also expanded by the future generations and eventually reached around 5000 *mu*, is the key reason why Fan's descendants are all well off and their clan were effective in preserving internal orders as well as influential in external affairs (Fang, 1985; Gu, 1998).

Clan land was usually lent out for others to cultivate and receive rent, but sometimes it can also be collectively cultivated by the clan members. In either case, the return from the land would be put into a communal fund. The state made it illegal for any clan member to sell their communal clan land. Any attempt would be severely punished (Xu, 1957; Huai, 1999).

State and Clan

The progress of Centralisation during imperial China and the expansion of the territories resulted in larger demand on bureaucratic officials. The fiscal capacity, on the other hand, did not allow for a massive expansion in statesmen (Zelin, 1992).[15] In such a scenario, the state was forced to rely on local institutions such as clans, and coordinate with local elites.

Consequently, the states and emperors attempted to coordinate and enhance the benefits of founding clans and lineage heads, even though they were not directly involved in clan formation. There were many such examples. During the Song dynasty, emperors allowed

during the Qing dynasty.

[14] *mu* is a unit for land size. 1 $mu = 666.67m^2$

[15] In fact, Imperial China had a relatively low proportion of government officials, as has been extensively reported.

and encouraged commoners to record genealogy and form clan trusts. In the Qing dynasty, the Emperor *Kangxi* stated in *Sacred Edict of the Kangxi Emperor* that "establish lineage temple for worshipping ancestor, clan schools for educating next generations, clan land for having funds to relieve the poor and compile genealogy for connecting the distant".

Meanwhile, the Imperial states build their economic system and govern human interactions using Confucianism, which places a strong emphasis on filial piety. This also legitimises clan rules and clan orders. For example, the law was written such that sons must obey their parents, while juniors have to obey their elders; seniors' faults would be forgiven, but juniors' mistakes would be punished harshly. In certain ways, governments enacted laws that bolstered the clan hierarchy and favoured local elites within a clan, giving the elderly, the lineage head, and other local elites authority, status and prestige.

As a return, clans carried out duties including tax collection, social orders, and peace within the clan, among other things, as well as local public goods provisions such as dams, roads, bridges, etc. (Feng, 2008)

3 Data

3.1 Clan land data

The clan land data are collected by Li and Jiang (1998), including information on prefectures or counties of which newly established clan land was located during the Song, Ming, Qing dynasties.[16] The primary information of these historical clan lands was recorded in various places, including local gazetteers, clan genealogies, biographies, and others. Most of these were recorded by private sectors such as genealogies, biographies, while local official records such as county or prefecture gazetteers also contributed some.

However, this data is not a census for all the clan land, even though Li and Jiang (1998) has exhausted all the resources they had access to compile the list. As a result, there would be measurement errors in counting how many clans had clan land in each prefecture in each dynasty. To address this, I use a binary variable, which takes the value of one if a prefecture has at least one recorded clan land established in the corresponding dynasty, to indicate a *historical prefecture with strong clans*.

Figure 2 depicts the spatial distribution for historical prefectures with strong clans in each

[16]See Figure A4 in the appendix for a snapshot example of the raw data for the Ming Dynasty. Li and Jiang (1998) did not collect for the Yuan dynasty. This is probably because clan land did not develop much during the Yuan dynasty, as mentioned previously.

dynasty (i.e., prefectures with at least one clan land recorded in the corresponding dynasty). Firstly, we observe that more prefectures had strong clans over time, which is consistent with other historians' views (Zhang, 1991; Feng, 2008; Chang, 1994). Moreover, it shows that these historical prefectures with strong clans are particularly prominent in southeastern China, where clan culture is generally known to be prevalent. Nevertheless, there is also variation in northern and northwestern China.

3.2 Administrative Boundaries and Provincial Capitals

Administrative boundaries, including both prefecture and provincial levels, and provincial capitals for Ming and Qing dynasties are provided by The China Historical Geographic Information System (CHGIS, 2016). I digitize Song prefecture and provincial boundaries from *The Historical Atlas of China* (Volume VI) (Tan, 1982), which is the most comprehensive as well as the most widely-used map for historical China.[17]

In this study, I restrict my study area to the core region of China (which is often called China proper by historians, see Figure A1 for reference), where more than 98% of the population is ethnic *Han*, and clans are the relevant local institutions. China proper regions include territories within the Great Wall to its north, the thick tropical rainforests of Indochina to its south, huge mountain ranges—including the Himalayas—to its west, and bounded by the Pacific Ocean to its east. Typically, it was referred to as Qing eighteen provinces or Ming fifteen provinces, which are equivalent to nineteen provinces and four province-level municipalities in today's P.R. China.[18]

3.3 Prefecture Panel Construction and Proximity to Provincial Capital

Although prefecture boundaries were relatively stable over regimes, there were also many changes. To construct a prefecture panel, I map prefecture boundaries in each dynasty to a fixed one–P.R. China 2010–in the analysis.

I then define strong clan existence in a prefecture for each dynasty using the following two measures: (i) a dummy variable indicates a prefecture is a clan prefecture if historical prefectures with strong clans cover more than 50% of its territory; that is, historical prefectures cover the majority of a prefecture's land with strong clans. I also explore alternative

[17]The Historical Atlas of China is also the base map for the CHGIS project.

[18]That is today's China excluding Liaoning province, Jilin province, Heilongjiang province, Inner Mongolia, Tie-bat, Xinjiang, and Qinghai. All territories in the Song dynasty are within the China Proper regions.

thresholds to show that the results are robust to different cutoffs. (ii) a continuous variable, ranging from 0 to 1, measures the proportion of a prefecture that overlaps with the historical prefectures with strong clans in the original dynasty. In a robustness check, I also map historical prefectures into fixed grids whose size is close to the average prefecture size. The results are very close, both qualitatively and quantitatively.[19]

To calculate the proximity from a prefecture to its provincial, I need to assign each prefecture in P.R.China 2020 to a historical province in each dynasty. Due to the prefecture boundary changes, it could be the case that a prefecture in the base layer (P.R. China 2010) spans more than one province in each dynasty. In such cases, I allocate the prefecture to the province that has the biggest share of its territories.[20]

Proximity is thus defined as the negative value of the natural logarithm of the linear distance between the prefecture centroid to the provincial capital of the assigned historical province in each dynasty.[21]

3.4 Auxiliary Data

Population density data is digitized from Liang (1980), *Historical Statistics of Population, Land and Taxation in China* and Ge (2013) *China Population History*. These books provide prefecture-level population density data. In this paper, I use the population density of the years 980, 1394, and 1776, which are the earliest available data is the year for the Song, Ming, Qing dynasties.[22] To construct the prefecture-dynasty panel, I then calculate a weighted average population density based on the area covered to map population density from the historical prefecture to the base layer (P.R.China 2010).

$$PopDen_{it} = \frac{\sum_{j=1}^{J} Area_{ijt} * PopDen_{jt}}{Area_i}$$

Clan genealogies data is from *the Comprehensive Catalogue of Chinese Genealogies* edited

[19]The result for grid-level analyses can be found in Table A1 in the Appendix.

[20]Results are the same if I assign the prefecture to the province based on where the prefecture centroid locates.

[21]In the Song dynasty, to avoid provincial leaders gain too much power, the emperor divided provincial capital duties into judicial and fiscal and might allocate to different capitals. Indeed, half of the provinces have two provincial capitals. In this case, I use proximity to fiscal capital because it is the major capital, and it is more stable Tan (1982). Moreover, the clan measure – clan land – is more related to fiscal administration. My results still hold if I use the proximity to judicial capitals (see Table A2 in the appendix).

[22]These years correspond to the 21st year, the 26th year, and 134th of each dynasty.

by Wang Heming (Wang, 2009). Wang Heming and his team have cataloged roughly 51,200 genealogy books from the end of the first millennium (the beginning of the Song Dynasty) to the present day in a print registry. This effort represents the most comprehensive registry of known Chinese clan genealogies to date. The data are collected from local and national archives and libraries, private holdings, and overseas collections, including all 10,000 microfilmed genealogy records archived by the Genealogical Society of Utah – the most extensive overseas collection of Chinese genealogy. This collection can therefore be considered as a census for Chinese genealogy.

The data used in this paper is digitized by Dincecco and Wang (2021), which extracts information on each clan's location, the year that the genealogy book was compiled, the number of volumes in the genealogy books, the lineage original ancestor's location, and their migration year. I use this dataset to complement my clan land data to further investigate the clan migration history and clan activities at an intensive margin. Specifically, I extract two information and construct the corresponding prefecture-dynasty panel: (i) prefecture and the dynasty that the genealogies were compiled; (ii) the dynasty that the ancestor migrated to the local where the genealogy was compiled. [23]

Agricultural suitability indexes data, provided by FAO (2012) GAEZ data portal version 4, are also used in this paper as control variables. The data are originally available at grid level, which can be mapped into fixed boundaries used in the analysis and give a cross-sectional variation. These suitability indexes use a rain-fed water supply and a low level of inputs.

3.5 Summary Statistics

Table 1 presents the summary statistics. Strong clans became more prevalent over dynasties. Recall that, I define the proximity as the negative value of the natural logarithm of the linear distance between the prefecture centroid to its provincial capital. The Song dynasty had relatively close proximity as it had smaller territory but was divided into more provinces. In contrast, on average, the Ming dynasty had the furthermost proximity given its smallest number of provinces. Population density increased over time, as expected. Notice that, even though the historical prefectures are mapped onto fixed boundaries of P.R. China 2010, the Song dynasty had twenty-five fewer prefectures as its whole territory does not cover

[23] This data provides the county which the clan locates in P.R. China, which allows me to construct the panel data in P.R.China 2010 layer directly.

the entire China Proper regions (see Figure 2 for details; the top left panel shows that the Song dynasty does not cover some of the western territories in the China Proper regions).

4 Empirical Framework

In the empirical analysis, I exploit plausibly exogenous changes in proximity derived from the re-division of provincial boundary and relocation of provincial capitals over the dynasty to examine the relationship of central administration–measured by the proximity to the provincial capital–and the rise of local institutions, strong clans. In this section, I start by showing a stylized example using the raw data and follow by introducing the empirical specification using the prefecture-level panel data.

4.1 A Stylized Example

Figure 3 depicts a stylized example in the raw data in today's *Hebei* and *Shandong* Provinces. The provincial boundaries are grey in both dynasties, and clan prefectures are shaded in color (blue in Song and green in Ming). The dots (triangle in Song and pentagon in Ming) are the corresponding provincial capitals.

The left panel of the Figure 3 shows the case in the Song dynasty. The highlighted prefecture (dark blue boundary) is *Daming fu*, which is also the provincial capital for its province *Hebeidong Lu*. In the Song dynasty, it is considered as a historical prefecture with strong clans based on my data.

In the Ming dynasty, this prefecture was divided and administrated by two provinces (*North Zhili* and *Shandong* Provinces), but it is relatively far away from either provincial capital (the right panel of the Figure 3). There is no more strong clan (clan land) establishment recorded in the data. On the other hand, prefectures towards its east were relatively far from their provincial capitals in the Song dynasty, but they became much closer to its provincial capital. Meanwhile, we also observe strong clan (clan land) establishments in those prefectures in the Ming dynasty.

4.2 Empirical Specification

To examine the relationship between the central administration and the establishment of local informal institutions, I construct a prefecture-level panel dataset (as described in

Section 3) and employ the following difference-in-difference specification:

$$Clan_{ijt} = \beta_1 ln(Proximity)_{ijt} + \alpha_i + \lambda_j^t + \theta X_i \times \gamma_t + \varepsilon_{ijt} \quad (1)$$

where $Proximity_{ijt}$ is the negative value of the natural logarithm of the linear distance (in 100 km) for prefecture i to its provincial capital in province j in dynasty t, and $clan_{ijt}$ is, as mentioned in Section 3.3, either a dummy variable that indicates whether *historical prefectures with strong clans* cover at least 50% of a prefecture's territory in the base layer, or a continuous variable measures that the proportion of prefecture i's territory (in 2010 base layer) is covered by *historical prefectures with strong clans* in dynasty t.

Province fixed effects λ_j^t account for province-specific administrative effects in each dynasty. Recall that each dynasty redivided the provincial boundaries. Thus, the province fixed effects are dynasty-varying, and dynasty fixed effects are nested within the province fixed effects. α_i are the prefecture fixed effects, which account for any location-specific time-invariant characteristics, such as clan culture, ideology, etc.

As my analysis covers a long time span (around 1000 A.D. to 1911 A.D.), I additionally include interaction terms of prefecture's geographic and agricultural characteristics (X_i) and dynasty fixed effects $X_i \times \gamma_t$ as controls to allow the impact of these prefecture characteristics X_i to vary across dynasties. X_i includes the average slope, elevation, longitude, latitude, and dummies indicating whether the prefecture contains a major river, whether a prefecture is a coastal city, and agriculture variables including crop suitability of wheat, rice, fox millet, maize, and sweet potato. The first three are the major old-world crops, while the latter two are the new-world crops introduced to China during the late Ming dynasty to the Qing dynasty. These agricultural variables can also account for the effect of different agriculture practices on family ties and preference for collective actions (Ang and Fredriksson, 2017).

The coefficient of interest here is β_1. An important assumption is that the changes in the proximity to provincial capitals induced by boundaries redrawn and provincial capitals relocated are exogenous to strong clan (i.e., clan land) establishments. This is based on the idea that the provincial boundaries were "administrative accidents" and did not coincide with human or economic activities. I will validate this assumption in several ways in Section 5.2, by showing that proximity is neither correlated with population density nor the location of strong clans in the previous dynasty.

The standard errors are clustered at the prefecture level for the baseline analysis. Alternatively, I also use standard errors that allow for spatial dependence within various radius following Conley (1999). A spatial autoregressive model is used to address potential concerns

for spatial autocorrelation.

5 Results

5.1 Main Results

Table 2 reports the estimates of Equation (1). The dependent variables of columns (1) and (2) use the dummy measure (i.e., it takes the value of 1 if at least 50% of a prefecture in the base layer is covered by historical clan prefectures), while columns (3) and (4) use the continuous measure (i.e., the proportion of a prefecture's area in the base layer that is covered by historical prefectures with strong clans). Columns (1) and (2) include prefecture fixed-effects and province (in each dynasty) fixed effects; columns (3) and (4) additionally control for prefectures' geographic and agricultural characteristics interacting with dynasty fixed effects.

The results suggest that local institutions grow where state administrative capacity is stronger (i.e., closer to the provincial capital). In particular, the point estimate from column (2) suggests a one standard deviation increase in a prefecture's proximity to its provincial capital increases its probability of formal local institution establishment by eight p.p., a twenty-five percentage change from its mean. Put differently, we can use the stylized example depicted in Figure 3 as an illustration. Part of the prefecture highlighted in blue boundaries is mapped to today's *Handan* prefecture. Moving away from the provincial capital in the Ming dynasty reduces its probability of having formal local institutions (strong clan) establishment by ten p.p. As the stylized example illustrated, no formal local institution was established in the Ming dynasty.

This result is consistent with Dell, Lane, and Querubin (2018) where they exploit a similar setting in Asia. By leveraging a cross-sectional variation in historical strength in state governance, they find that villagers who experienced stronger state governance in the past exhibit more civic engagement and better organize public goods and redistribution through civic society. They hypothesize that this is because historical strong state governance crowd in local cooperation and local collective actions, and these norms persist even after the differential formal state governance disappeared. My result complements their findings by providing direct evidence showing that a strong historical state can indeed crowd in local institutions, which was the heart of local cooperation and collective action using a unique historical panel dataset.

5.2 Threats to Identification

Economic Development and Population Size

Could these results be capturing the effect of economic development or population size on formal local institutions instead of central administration? In other words, economic development or population density might be omitted variables. It might be the case that clans simply grew in more economically developed regions, and provincial capitals were also relocated to those regions. Alternatively, people might find it more efficient to cooperate in a prefecture with a more dense population.

In either case, the population density data, which can also be used as a proxy for economic development, can help address the concerns. I first regress the earliest available population density data in each dynasty on the proximity to see whether provincial capitals are strategically relocated to economically developed and/or populated places, conditional on prefecture fixed effects. The earliest available population density is the best proxy for the conditions when the provincial boundaries were drawn. The results show that this is not the case (columns (1) and (2) of Table 3).[24]. Regardless, I also additionally control for the earliest available population in each dynasty when estimating Equation (1). Results are still consistent with previous findings (columns (3)-(6) in Table 3).[25]

Reverse Causality

Alternatively, would it be the case that the new provincial capitals were chosen, or the provincial boundaries were redrawn so that provincial capitals were closer to places where clans were very powerful to control them better? If so, the results suffer from reverse causality. This is not very likely as many scholars have argued that the administrative boundaries were not coincided with human activities (Skinner, 1977; Zhou, 1998, 2013); while provincial capitals were mainly determined by geography for the purpose of information and resources transmission and military defense.

Nevertheless, I conduct a forward lag test in which I assign Ming dynasty proximity to Song's clans and Qing proximity to Ming's clans to see whether the proximity is correlated with the previous dynasty's clan. Table 4 presents the results, which reassure us that the prefecture's proximity changes are likely to be exogenous to the local clan power.

[24]The earliest available population data is the year of 980, 1394, and 1776 for each respect dynasties. These years correspond to the 21st year, the 26th year, and 134th of each dynasty. This result still holds when excluding the Qing dynasty (see Table A3 in the appendix).

[25]Note that even the earliest population density for each dynasty might be an outcome of the proximity changes (e.g., selective migration or population booming). Thus, it might be a bad control, and the results from columns (3)-(6) in Table 3 should be interpreted with caution.

Sample Selection

There are two major concerns associated with sample selection. One is associated with Li and Jiang (1998)'s data collection process. They might face difficulties in reaching a particular prefecture for data collection. In this case, this effect will be captured by prefecture fixed effects.

The other is about historical data recording bias or survival bias. In this case, prefecture fixed effects are also helpful. For example, suppose a particular prefecture might have had a hard time preserving historical archives for various reasons (such as the archive did not survive during the early communist era). This effect will be captured in prefecture fixed effects.

However, this concern can also be prefecture-dynasty varying so as not to be captured by prefecture fixed effects. For example, each dynasty's records might be easier to preserve when a prefecture was closer to the provincial capital. Alternatively, it might be the case when there were more incentives to take the record when a clan is located in a prefecture close to the provincial capital. However, if this is the main driving force for the results shown on Table 2, we should expect the results are more salient among provinces that were close to Imperial Capitals.

To this end, I amend Equation 1 by adding an interaction term between proximity and a dummy variable indicating if a prefecture belongs to the province whose distance from Imperial capital is below the median level in the dynasty. We would expect this coefficient to be positive and significant if the results are indeed driven by the aforementioned data recording bias or survival bias. Table 5 does not find such an effect.

5.3 Mechanisms

5.3.1 State Co-option

So far, I have established a positive relationship between central state administrative capacity and the development of local institutions. In what follows, I will discuss how state co-option can be a key driving force for this complementary relationship and its implications.

In ancient times, the central state faced many challenges to rule a geographically large and culturally diverse empire, such as Imperial China. It was almost impossible for the central state to aggregate information from all local regions and dealt with issues in time (Morris and Scheidel, 2009). Furthermore, limited fiscal capacity constrained the state's ability to appoint a leviathan of officials to handle all administrative tasks (Sng, 2014).

As a result, the state often has to delegate many duties, such as tax collection, peace-keeping, local public goods provision, to local elites, who have better knowledge of the local conditions and are better connected with local people, and hence can better understand and adapt to changing local conditions. Local elites then invest in local institutions to consolidate their power and social status, making it easier for them to carry out those duties.

However, co-opting local elites to perform administrative duties and hence giving ample room for local institutions to flourish inevitably grants local elites political power. Empowered local elites might eventually withdraw from their role as agents and fight against the state. Therefore, the state has to incur costs to monitor these local elites while enjoying the benefits co-option brings.

Therefore, the state faces a trade-off when co-opting local elites, which varies on the level of state administrative capacity (i.e., proximity to provincial capitals). On the one hand, it is more costly for the state to monitor local elites to ensure their loyalty in areas where the state has a weaker capacity (far from its provincial capital). While on the other hand, a weak state administrative capacity also means that the state has more needs to delegate these tasks as those are the regions that the state faces more difficulties in administration (please see Appendix I for a simple model, which illustrates this trade-off more formally).

This suggests it is theoretically ambiguous on whether a state would be more likely to co-opt local elites when it has a strong administrative capacity. The empirical findings show that the state co-opted more when it had a strong presence during Imperial China. This reveals that the state considers the costs of monitoring the local elites to increase drastically, and thus the net benefits of the local institutions decline as state presence becomes weaker.

5.3.2 Alternative Mechanisms

Selective Migration

It could be the case that more people migrated to places near the provincial capitals, and those migrants invested more in clans to make their clans more powerful when facing the external challenges in the new environment. To assess this, I exploit the migration information in the genealogies data to see whether among the clans that eventually had genealogies, their founding ancestors indeed moved closer to provincial capitals. I use the number of clans' founding ancestors migrated to prefecture i in province j during dynasty t (in natural logarithm) as the dependent variable.[26] Results are shown in Table 6 and do not support the

[26]To account for some prefectures with zero founding ancestors migrated to in a dynasty, I add 1 to the number of clans migrated before taking the natural logarithm.

selective migration story.

Enemy Elimination

Another hypothesis is that clans might tap on the state's power to eliminate other clans and, thus, become more powerful. Indeed, there were many cases of armed inter-clan conflicts towards the end of the Qing dynasty (Du, 2008). As such, in prefectures that had more state presence, some clans could use state power to eliminate other clans and gain power. If this were the case, we would expect that there would be fewer organized clans in prefectures that were close to the provincial capitals over a dynasty.

Another hypothesis is that clans might tap on the state's power to eliminate other clans and, thus, become more powerful. Indeed, there were many cases of armed inter-clan conflicts, especially towards the end of the Qing dynasty (Du, 2008). In prefectures with more state presence, some clans could use state power to eliminate other clans and gain power. If this were the case, we would expect that there would be fewer organized clans in prefectures that were close to the provincial capitals over a dynasty.

Of course, the enemy elimination can work in a different way: warfare between clans might be more likely to happen where state capacity is weaker since the state could not intervene to stop the warfare. Since the conflict sapped the vitality among all active clans, no strong clans emerged when the state administrative capacity was weak (far from provincial capitals).

In this case, we would expect the main results to be more salient in the Qing dynasty as inter-clan conflicts were most known during the Qing dynasty. To check this, I add an interaction term between the proximity and an indicator variable for the Qing dynasty and Table 7 shows this is not the case.

5.4 Public Goods Provision

Knowing that local institutions flourished when the state had a more substantial administrative capacity, one might wonder whether the state inserts more direct administrations in the areas where they had weaker capacity, even though it was harder to do so? To see this, I check the state's public goods provision–schools. Would the state provide more schools in regions with weaker capacity and, therefore, no local institution to delegate these tasks?

First four columns in Table 8 uses county schools. Unlike academy schools built by private and local forces, county schools were administered by the Imperial State. County schools receive fundings from the state and are mainly used to educate local people for the civil

exam purpose. Columns (1) and (2) use the number of county schools per capita established in each dynasty, while columns (3) and (4) use the number of county schools per capita in operations in each dynasty. The results show that there was no differential in county schools provision across regions.[27]

Of course, it could be the case that the state does not discriminate public goods provision directly, but rather through regional bureaucrats. Although regional bureaucrats during Imperial China had limited roles in doing many administrative tasks since they were unfamiliar with local conditions due to the avoidance rule, they were still the state's front "face" of the state. Columns (5) and (6) in Table 8 evaluate the academy schools per capita that built by the regional bureaucrats. The results show that, if anything, these regional bureaucrats provided more academy schools when the state had a stronger presence.[28]

Taking together, this suggests that regions with weaker state presence suffer from inadequate provision of goods and services from the central state and lack formal local institutions to organize and help overcome collective action problems.

5.5 Robustness Checks

Spatial Autocorrelation

Figure 2 shows that clan prefectures are largely clustered in the southeast. This could firstly affect the standard error of the point estimates. Moreover, the spatial correlation might directly affect the process of forming a powerful clan (i.e., it is a spatial stochastic process), which means that the determinants of powerful clan formation are partly due to direct contagion. In this case, that the results in Table 2 also pick up some spatial noise, and as a result, the point estimates might also be biased.

I address the first concern by allowing spatial correlation in the error terms by using standard errors that allow for spatial dependence within various radius following Conley (1999). Results are shown on the Panel A of the Table 9. By varying different spatial correlation cutoffs (100km and 1000km), I show that the standard errors of the main coefficients do not vary much.[29]

[27] County-school data was not available for the Qing dynasty, which results in a fewer number of observations. Note that the major variation in proximity comes from the Song dynasty to the Ming dynasty, so missing county-school data for the Qing dynasty does not lose much variation other than through sample size.

[28] This might be because regional bureaucrats' performance was more likely to be observed and thus got rewarded. Alternatively, it could be that these regions had formal local institutions, and therefore, local people can have stronger bargaining power in asking regional bureaucrats to provide these public goods, as argued by Lee (1997).

[29] The standard errors changes very little by using other radius.

Regarding the second concern, I employ a Spatial Autoregression model, which modifies the original specification by adding a spatial lag for the dependent variable and a spatially-lagged error term. Results are shown on Panel B of the Table 9, and they are still consistent.[30]

Alternative Clan Data

If the positive relationship between the state administrative capacity and the development of local institutions is indeed due to state co-option, we should observe this relationship in both extensive and intensive margins since one clan, no matter how strong it is, would have limited capacity to carry out state delegated tasks. However, the measurement error in the clan land data counts from Li and Jiang (1998) prevents me from testing the hypothesis in the intensive margin.

In this case, I employ an alternative dataset–the Comprehensive Catalogue of Chinese Genealogies, which can be considered a census for Chinese genealogy–to see if the main results of this paper still hold. Compiling genealogy can also be regarded as a clan activity, which can be viewed as having a certain level of clan power (Dincecco and Wang, 2020). In fact, the correlations between the number of clans compiled genealogy (in its natural logarithm) and the two measures of strong clan prefectures (dummy and coverage) are significantly positive (see Table A4 in the appendix).[31]

I then use the number of clans complied genealogy (in its natural logarithm) as a dependent variable to estimate Equation (1), and we still see positive significant coefficients across different specifications (Table 10). This confirms that a strong state does crowd in the development of local institutions also at intensive margin.

Proximity to Imperial Capitals

In my main analysis, I use proximity to provincial capitals to measure the state's administrative capacity instead of proximity to Imperial capitals. All the imperial capitals were located on the relative east side of China. This causes less variation in the proximity to Imperial capitals, especially for those in the West. Furthermore, this also suggests that the proximity

[30]Table 9 has fewer observations from Table 2. This is because a strongly balanced panel is required to do a Spatial Autoregression model. The Song dynasty has a relatively smaller territory and, therefore, a few prefectures only exist in the Ming and Qing dynasty. These prefectures will not be in the sample when doing a Spatial Autoregression model.

[31]To account for some prefectures have no clans compiled genealogy, I add one to the number of clans compiled genealogy before taking the natural logarithm.
The correlations between the number of clans compiled genealogy (in its natural logarithm) and the two measures of strong clan prefectures (dummy and coverage) in the raw data are 0.3016 and 0.3375, respectively, which is reasonably high given that the underlying source of data variations is entirely different.

to Imperial capitals is more likely to suffer from geographic influence despite comprehensive sets of control variables and thus be endogenous to local institutions development.

Nonetheless, suppose local institutions' formalization is indeed due to state administration. In that case, we should expect to see similar and, perhaps, even stronger effects when using proximity to imperial capitals as a proxy. Therefore, in Table 11, when I replace the main explanatory with proximity to Imperial capital, while the standard deviation of the proximity measures is relatively similar (0.80 for proximity to provincial capitals and 0.78 for proximity to imperial capitals), the size of coefficients are much larger.[32] Although the proximity to imperial capitals is not an ideal measure, this gives us more confidence that the results in Table 2 can be interpreted as the effect of state administration.

Alternative Threshold for Clan Prefecture

In the main analysis, I define a P.R. China 2010 prefecture as a clan prefecture (dummy) if more than 50% of its territory is covered by historical prefectures with strong clans in a given dynasty. To show that the results are consistent with different thresholds, I use various cut-off points to define the dependent variable. Results are shown on Figure 5. The top panel replicates column (1) in Table 2 while The bottom panel replicates column (2). We continue to see a robust positive relationship between the proximity and local institution developments.

6 Conclusion

This paper examines the role of centralized state administration on the development of local institutions in Imperial China from around 1000 A.D. to 1900 A.D. Imperial China provides two crucial advantages to study this relationship. Powerful clans, which are the most important local institutions across the whole China Proper region and over dynasties, allow me to measure local institutions across time and space systematically. Meanwhile, the changes in proximity to administrative centers resulted from regime switches during this period provide a plausibly exogenous variation in state administrative capacity in local prefectures.

Using a prefecture panel dataset of 267 prefectures over three dynasties, I find that local institutions flourish when state administrative capacity is stronger and more prevalent. This is because states with stronger administrative capacity were more likely to co-opt local elites

[32]The Ming dynasty had effectively two imperial capitals, one in today's Nanjing and the other in today's Beijing. I use the smaller distance to either capital when constructing the proximity.

and delegate administrative duties to them since the net benefits of doing so were higher. Co-opted local elites were empowered and invested in local institutions to consolidate the power, prestige, and privileges they received.

Moreover, further investigation shows that the state did not provide more public goods to regions with weaker administrative capacity and fewer formal local institutions. This suggests that peasants in those regions might suffer from inadequate goods and services provision.

This positive relationship might not be an affirmative answer in all contexts. Nevertheless, to the best of my knowledge, this research provides the first empirical evidence on this topic and showing this complementary relationship does exist. Going forward, it would interesting to test this relationship in different institutional settings, for example in Europe or in Africa. This would help understand the mechanism behind the state and local relationship better.

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Figures and Tables

Figure 1: Timeline

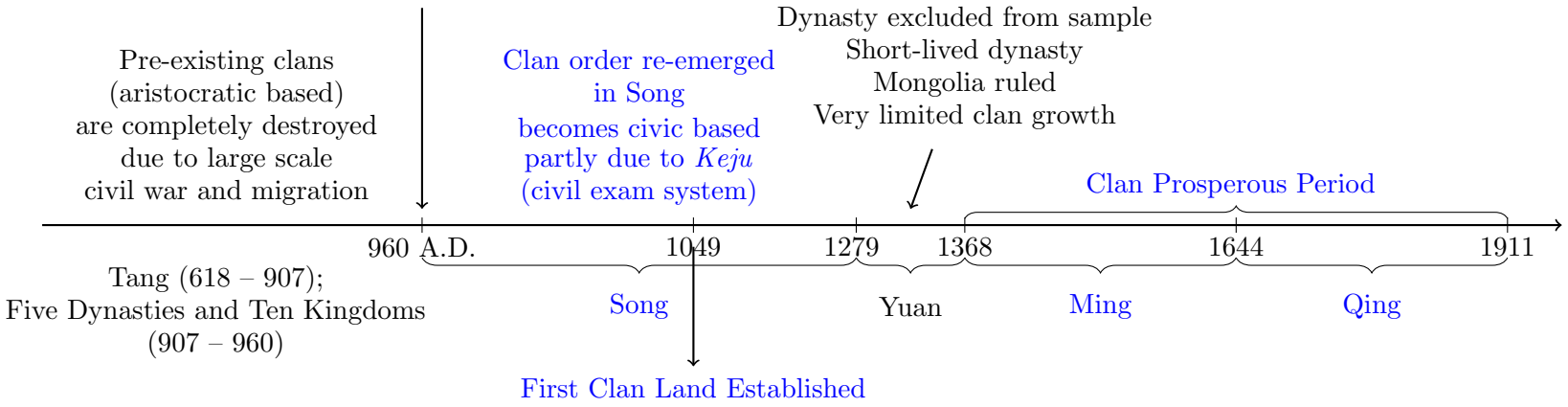


Figure 2: Spatial Distribution of Strong Clan Prefectures

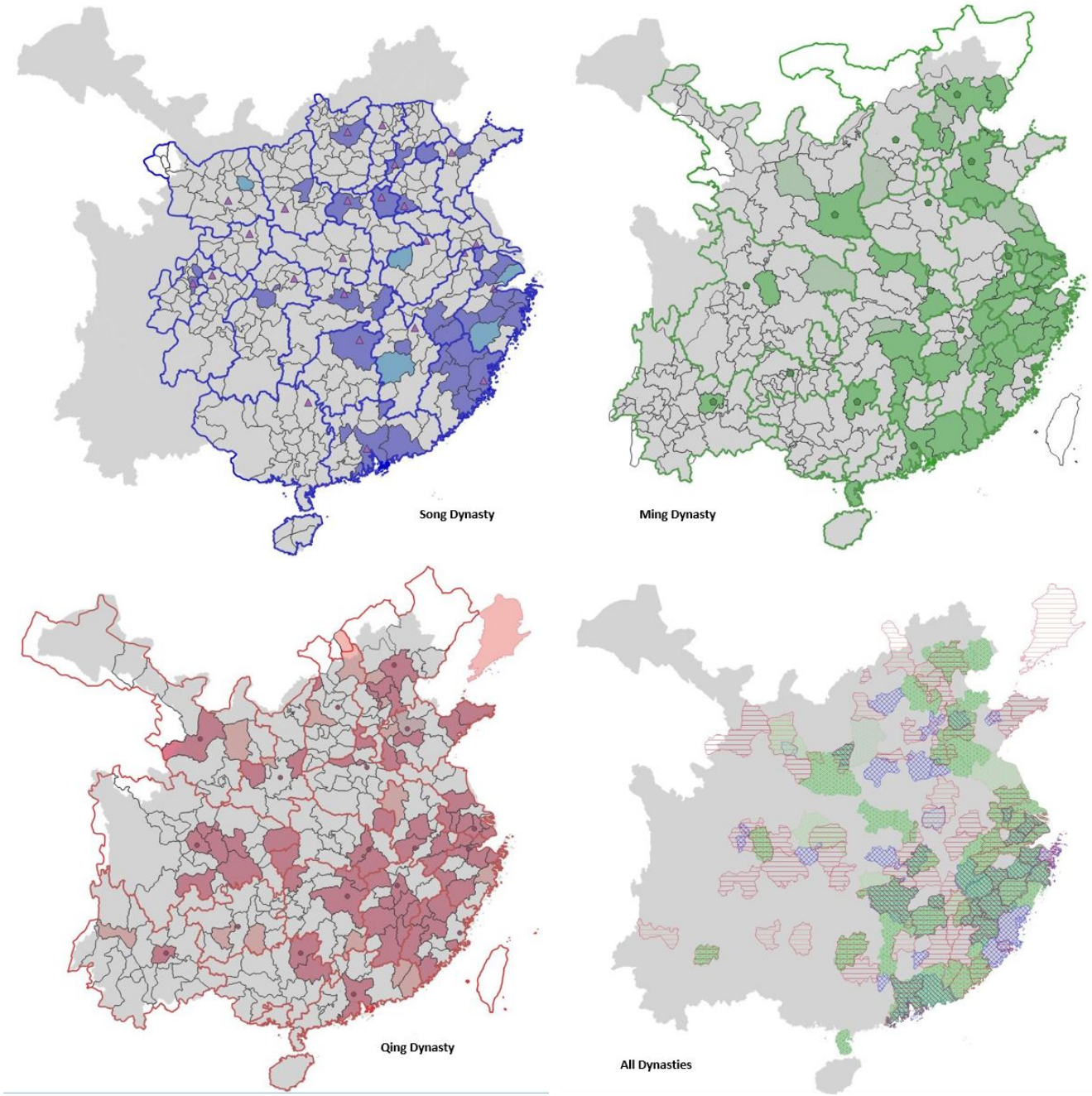
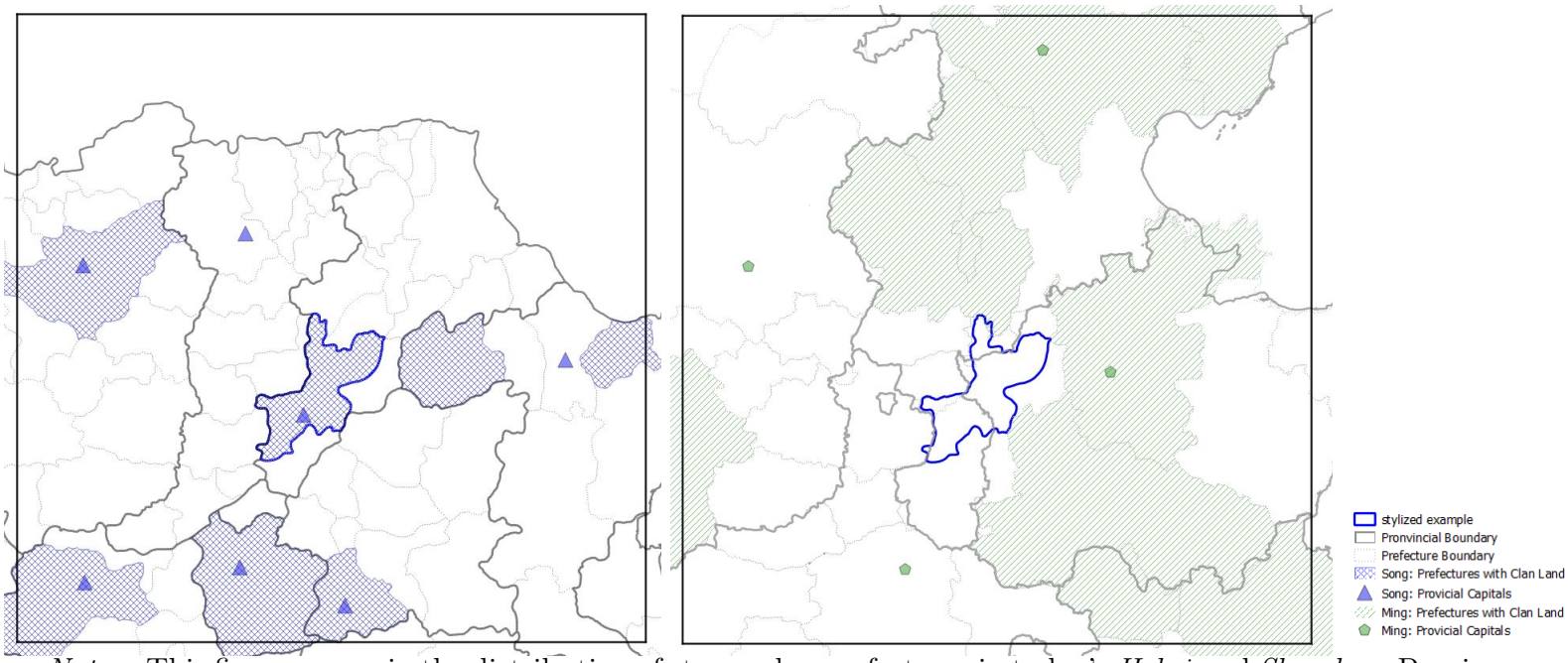
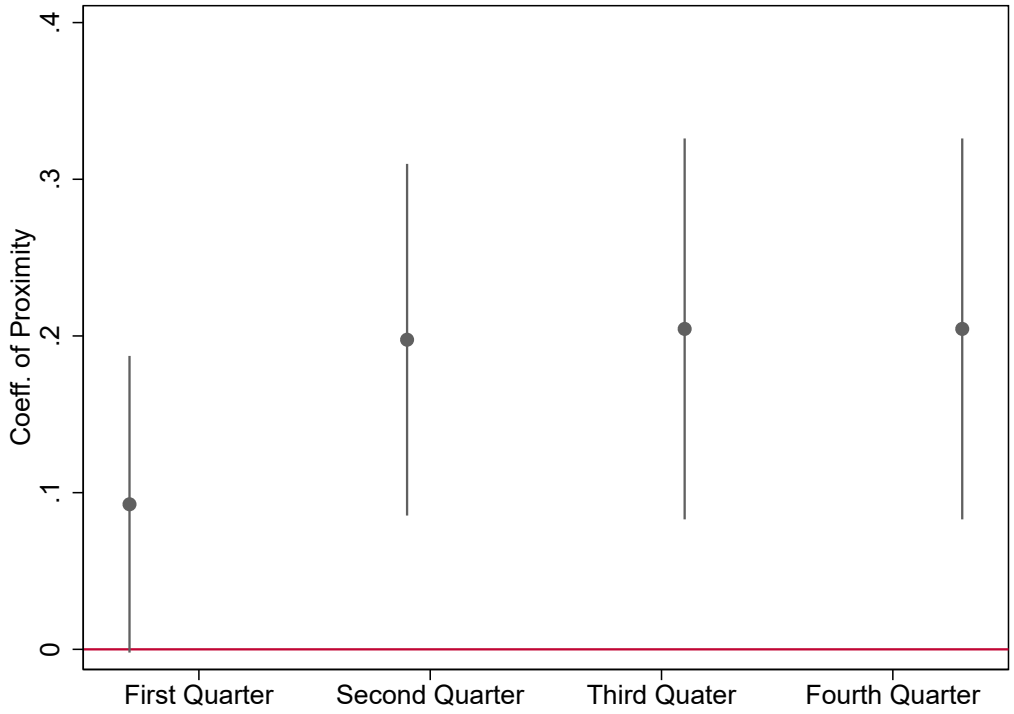


Figure 3: Stylized Example



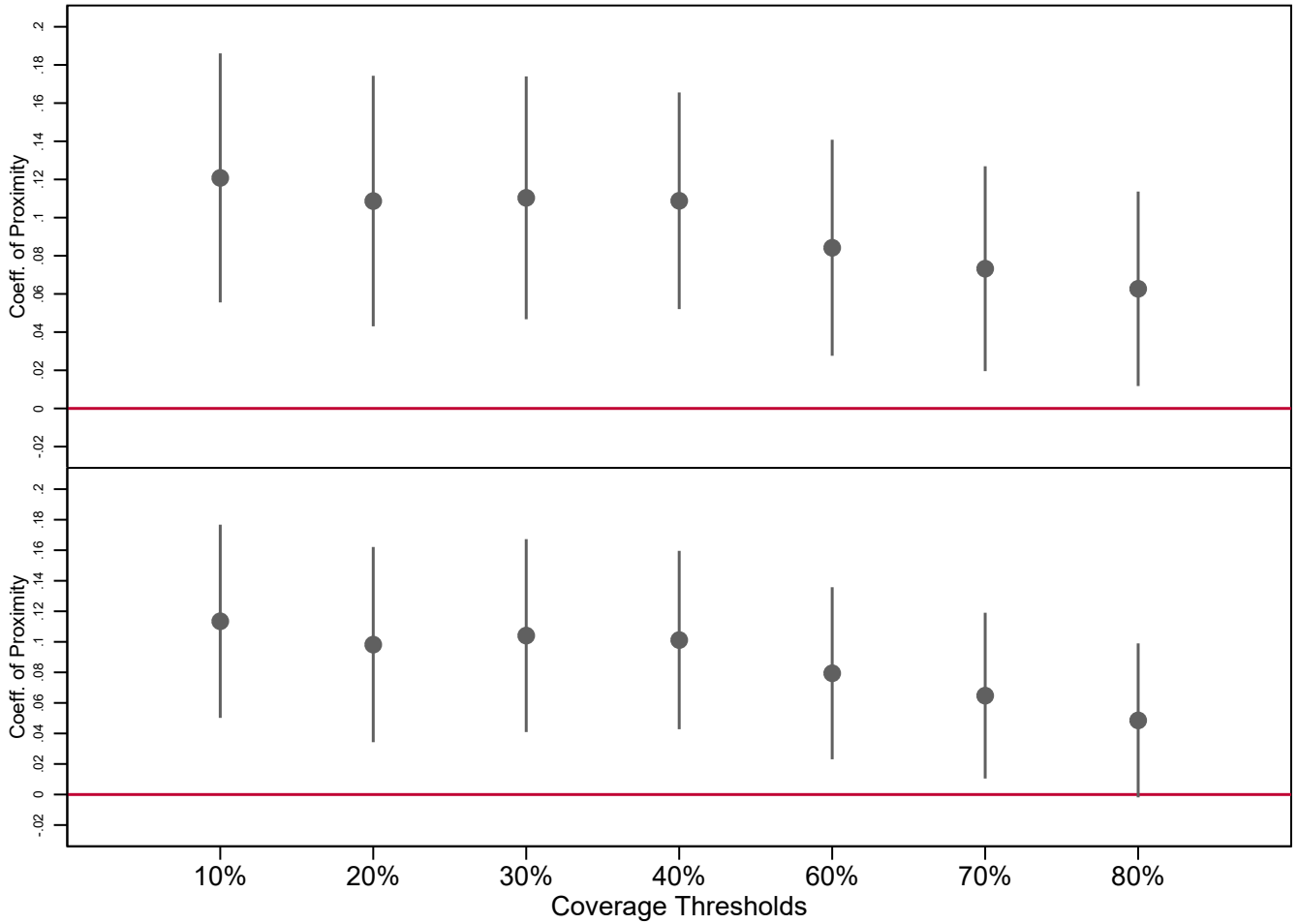
Notes: This figure zooms in the distribution of strong clan prefectures in today's *Hebei* and *Shandong* Provinces. The left panel shows the distribution in the Song dynasty and the right panel shows that of the Ming dynasty. The provincial boundaries are in grey color in both dynasties, clan prefectures are shaded in color (blue in song and green in Ming). The dots (triangle in Song and pentagon in Ming) are the corresponding provincial capitals.

Figure 4: Number of Clans Compiled Genealogy by Quarter



Notes: Each dynasty is divided into four equal lengths (four quarters). Point estimates (with 90% confidence intervals) for the number of clans compiled genealogy in each quarter are shown.

Figure 5: Alternative Threshold for Clan Prefecture



Notes: Point estimates (with 90% confidence intervals) are shown for each threshold used in defining the dummy measure of a clan prefecture.

Table 1: Summary Statistics

	Song	Ming	Qing	All
Raw Data				–
Number of Prefecture	335	245	266	–
Historical Prefectures with Strong Clans	39	53	81	–
Number of Provinces	24	15	18	–
Prefecture Panel				
Number of Prefectures	242	267	267	–
Proximity	-0.471	-0.608	-0.494	-0.526
	[0.851]	[0.786]	[0.762]	[0.800]
Clan Prefecture(dummy)	0.194	0.363	0.363	0.301
	[0.396]	[0.482]	[0.482]	[0.459]
Clan Coverage (Percentage)	0.204	0.361	0.368	0.315
	[0.338]	[0.429]	[0.399]	[0.399]
Population Density	0.119	0.288	1.164	0.537
	[0.112]	[0.443]	[1.046]	[0.811]

Notes: The top panel shows the statistics based on the raw data, while the bottom panel shows the summary statistics from the prefecture-panel dataset. Counts or variable means are shown in each column. Standard deviations are in brackets.

Table 2: Proximity and Clan Land Establishment

Dependent Variable:	Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)
Proximity (-ln(dist))	0.099***	0.094***	0.089***	0.081***
	(0.034)	(0.035)	(0.029)	(0.029)
Observations	776	776	776	776
R-squared	0.278	0.320	0.318	0.366
Number of Prefectures	267	267	267	267
Controls	N	Y	N	Y
Std. Dev. Proximity	0.800	0.800	0.800	0.800
Mean. Proximity	-0.526	-0.526	-0.526	-0.526
Dep. Var Mean	0.311	0.311	0.315	0.315

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. The dependent variable for columns (1) and (2) use a dummy measure which takes value of 1 if more than 50% of the prefecture's territory is covered by historical strong clan prefectures; while columns (3) and (4) use a continuous measure which equals to the percentage of the prefecture's territory is covered by historical strong clan prefectures. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Columns (2) and (4) additionally control for interaction terms of prefecture characteristics with dynasty fixed effects. Prefecture characteristics includes average slope, elevation, longitude, latitude, dummy variables indicating whether the prefecture contains a major river and a prefecture is a coastal city, as well as agriculture suitability indexes for wheat, rice, fox millet, maize and sweet potato.

Table 3: Economic Development

Dependent Variable:	Dynasty Earliest Pop. Density		Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)	(5)	(6)
Proximity (-ln(dist))	0.063	0.026	0.094***	0.092***	0.085***	0.079***
	(0.053)	(0.049)	(0.035)	(0.035)	(0.029)	(0.029)
Dynasty Earliest Pop. Density			0.085*	0.092*	0.068*	0.078*
			(0.046)	(0.052)	(0.037)	(0.043)
Observations	776	776	776	776	776	776
R-squared	0.831	0.884	0.283	0.324	0.322	0.370
Number of Prefecture	267	267	267	267	267	267
Controls	N	Y	N	Y	N	Y
Dep. Var Mean	0.537	0.537	0.311	0.311	0.315	0.315

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. Dynasty earliest population density refers to the earliest population density data available for each dynasty. The dependent variable for columns (3) and (4) use a dummy measure which takes value of 1 if more than 50% of the prefecture's territory is covered by historical strong clan prefectures; while columns (5) and (6) use a continuous measure which equals to the percentage of the prefecture's territory is covered by historical strong clan prefectures. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Even numbered columns additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Table 4: Forward Test (Reverse Causality)

Dependent Variable:	Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)
Next Dynasty's Proximity (-ln(dist))	-0.079	-0.009	-0.065	-0.009
	(0.063)	(0.064)	(0.054)	(0.055)
Observations	534	534	534	534
R-squared	0.386	0.426	0.424	0.475
Number of Prefectures	267	267	267	267
Controls	N	Y	N	Y
Dep. Var Mean	0.270	0.270	0.273	0.273

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. Next dynasty's proximity is used as the main explanatory variable (i.e, Ming dynasty's proximity to strong clan in the Song dynasty and Qing dynasty's proximity to strong clan in the Ming dynasty). The dependent variable for columns (1) and (2) use a dummy measure which takes value of 1 if more than 50% of the prefecture's territory is covered by historical strong clan prefectures; while columns (3) and (4) use a continuous measure which equals to the percentage of the prefecture's territory is covered by historical strong clan prefectures. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Even numbered columns additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Table 5: Data Selection Bias

Dependent Variable:	Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)
Proximity (-ln(dist))	0.115***	0.110***	0.096***	0.087***
	(0.040)	(0.039)	(0.034)	(0.033)
Proximity $\times \mathbb{1}_{<\text{Median Proximity to Natioanl Capital}}$	-0.068	-0.073	-0.027	-0.029
	(0.055)	(0.056)	(0.046)	(0.047)
Observations	776	776	776	776
R-squared	0.280	0.322	0.318	0.366
Number of Prefectures	267	267	267	267
Controls	N	Y	N	Y

Notes:

Table 6: Migration

Dependent Variable:	ln (# Clans Migrated +1)			
	(1)	(2)	(3)	(4)
Proximity (-ln(dist))	-0.054	-0.057	-0.048	-0.055
	(0.053)	(0.052)	(0.053)	(0.052)
Dynasty Earliest Pop. Density			-0.083	-0.065
			(0.081)	(0.093)
Observations	776	776	776	776
R-squared	0.641	0.669	0.642	0.669
Number of Prefecture	267	267	267	267
Controls	N	Y	N	Y

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. The dependent variable is number of clans that eventually had genealogies, their founding ancestors migrated to the prefecture in each dynasty in natural logarithm. Considering some prefectures might have none founding ancestors migrated in a dynasty, I add 1 to the number of clans before taking the natural logarithm. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Even numbered columns additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Table 7: Enemy Elimination

Dependent Variable:	Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)
Proximity (-ln(dist))	0.092**	0.096**	0.085***	0.084***
	(0.037)	(0.038)	(0.032)	(0.032)
Proximity $\times$ $\mathbb{1}_{Qing}$	0.021	-0.007	0.012	-0.010
	(0.049)	(0.053)	(0.038)	(0.040)
Observations	776	776	776	776
R-squared	0.279	0.320	0.318	0.366
Number of Prefectures	267	267	267	267
Controls	N	Y	N	Y
Dep. Var Mean	0.311	0.311	0.315	0.315

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. The dependent variable for columns (1) and (2) use a dummy measure which takes value of 1 if more than 50% of the prefecture's territory is covered by historical strong clan prefectures; while columns (3) and (4) use a continuous measure which equals to the percentage of the prefecture's territory is covered by historical strong clan prefectures. A dummy variable for the Qing dynasty is interacted with proximity, and it takes a value of 1 if observations are for the Qing dynasty and 0 otherwise. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Columns (2) and (4) additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Table 8: Public Goods Provided by the State

Dependent Variable:	ln(Number of Schools per Capita)					
	New Established County Schools		Total County Schools		Official Built Private Academies	
	(1)	(2)	(3)	(4)	(5)	(6)
Proximity (-ln(dist))	-0.003	-0.003	-0.003	-0.004	0.247*	0.236†
	(0.002)	(0.003)	(0.002)	(0.003)	(0.146)	(0.146)
Observations	504	504	504	504	776	776
R-squared	0.235	0.263	0.244	0.274	0.521	0.567
Number of Prefectures	267	267	267	267	267	267
Controls	N	Y	N	Y	N	Y
Dep. Var Mean	0.0202	0.0202	0.0211	0.0211	4.728	4.728

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. Columns (1)-(4) use data for Song and Ming dynasties only. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Even-numbered columns additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Table 9: Spatial Correlation

Panel A: Conley Standard Error								
Radius:	100 Km				1000 Km			
Dependent Variable:	Clan Prefecture (Dummy)		Clan Coverage (Percentage)		Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Proximity (-ln(dist))	0.099***	0.094***	0.089***	0.081***	0.099***	0.094***	0.089***	0.081***
	(0.027)	(0.026)	(0.021)	(0.020)	(0.029)	(0.034)	(0.023)	(0.025)
Observations	776	776	776	726	776	776	776	726
Number of prefectures	267	267	267	267	267	267	267	267
Panel B: Spatial Autoregressive Model								
Weighting Matrix:	Inverse Distance				Contiguity			
Dependent Variable:	Clan Prefecture (Dummy)		Clan Coverage (Percentage)		Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Proximity (-ln(dist))	0.100***	0.097***	0.086***	0.071**	0.104**	0.099**	0.083***	0.077***
	(0.035)	(0.036)	(0.029)	(0.029)	(0.037)	(0.036)	(0.030)	(0.030)
Lag Dep.Var	-0.097	-0.438	0.391	0.239	-0.074	0.105	0.083	0.127
	(0.477)	(0.560)	(0.333)	(0.388)	(0.267)	(0.234)	(0.192)	(0.187)
Lag Error	-0.050	-0.378	0.541	1.033***	0.431†	0.166	0.525***	0.446**
	(0.579)	(0.712)	(0.380)	(0.021)	(0.272)	(0.290)	(0.191)	(0.206)
Observations	726	726	726	726	726	726	726	726
Number of prefectures	242	242	242	242	242	242	242	242
Controls	N	Y	N	Y	N	Y	N	Y

Notes:Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. Top panel adjusts the standard errors by allowing for spatial dependence within various radius following Conley (1999).The bottom panel uses spatial autoregressive model by adding a spatial lag for the dependent variable and the error term. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Even-numbered columns additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Table 10: Alternative Clan Data

Dependent Variable:	ln (# Clans Complied Genealogy +1)			
	(1)	(2)	(3)	(4)
Proximity (-ln(dist))	0.228***	0.218***	0.212***	0.212***
	(0.074)	(0.077)	(0.073)	(0.077)
Dynasty Earliest Pop. Density			0.256**	0.203*
			(0.123)	(0.107)
Observations	776	776	776	776
R-squared	0.836	0.862	0.838	0.863
Number of Prefectures	267	267	267	267
Controls	N	Y	N	Y
Dep. Var Mean	0.908	0.908	0.908	0.908

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. All columns include prefecture fixed effects and province-by-dynasty fixed effects. The dependent variable is number of clans compiled genealogy (in natural logarithm). Considering some prefectures might have zero clan compiled genealogies in a dynasty, I add 1 to the number of clans before taking the natural logarithm. Even numbered columns additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Table 11: Proximity to Imperial Capital

Dependent Variable:	Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)
Proximity (-ln(dist) from Imperial Capital)	0.125**	0.189***	0.153***	0.201***
	(0.063)	(0.066)	(0.056)	(0.058)
Observations	776	776	776	776
R-squared	0.272	0.318	0.314	0.368
Number of Prefectures	267	267	267	267
Controls	N	Y	N	Y
Std. Dev. ln Distance	0.780	0.780	0.780	0.780
Mean. ln Distance	-2.007	-2.007	-2.007	-2.007
Dep. Var Mean	0.311	0.311	0.315	0.315

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Proximity to the Imperial Capital is used as the main explanatory variables. In case of the Ming dynasty, which effectively had two Imperial Capital, the closer proximity to either capital is used. Even numbered columns additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Appendix I: Model

To formulate the trade-off states faces in co-opting local elites, I develop a simple riot model, where peasants can choose to riot, and the state could either delegate the task of suppressing conflict to the local elites or suppress the conflict directly when it happens. Here, I focus on one specific role that the state often delegates to the local elites–peacekeeper–just as an example. Many other roles, such as tax collectors, would have very similar features and therefore share similar trade-offs.

The Set-up:

The local region is endowed with some wealth (W). The state would have to decide whether to let the local elites administer local affairs ($L = 1$ if co-opting local elites or $L = 0$ if not). The state's strength/presence is denoted as S. If the state employs local elites (i.e., $L = 1$), they have to incur monitoring costs $C(S)$ to ensure that the empowered elite will not defeat his role as an agent. This cost increases as state strength/presence decreases (i.e., $C'(S) < 0$). Once the decision has been made, an idiosyncratic shock (δ) would hit the local wealth. For simplicity, I assume that it follows a uniform distribution ($\delta \sim [-\frac{1}{2}\Delta, \frac{1}{2}\Delta]$). Local wealth will thus become $W^p = W + \delta$.

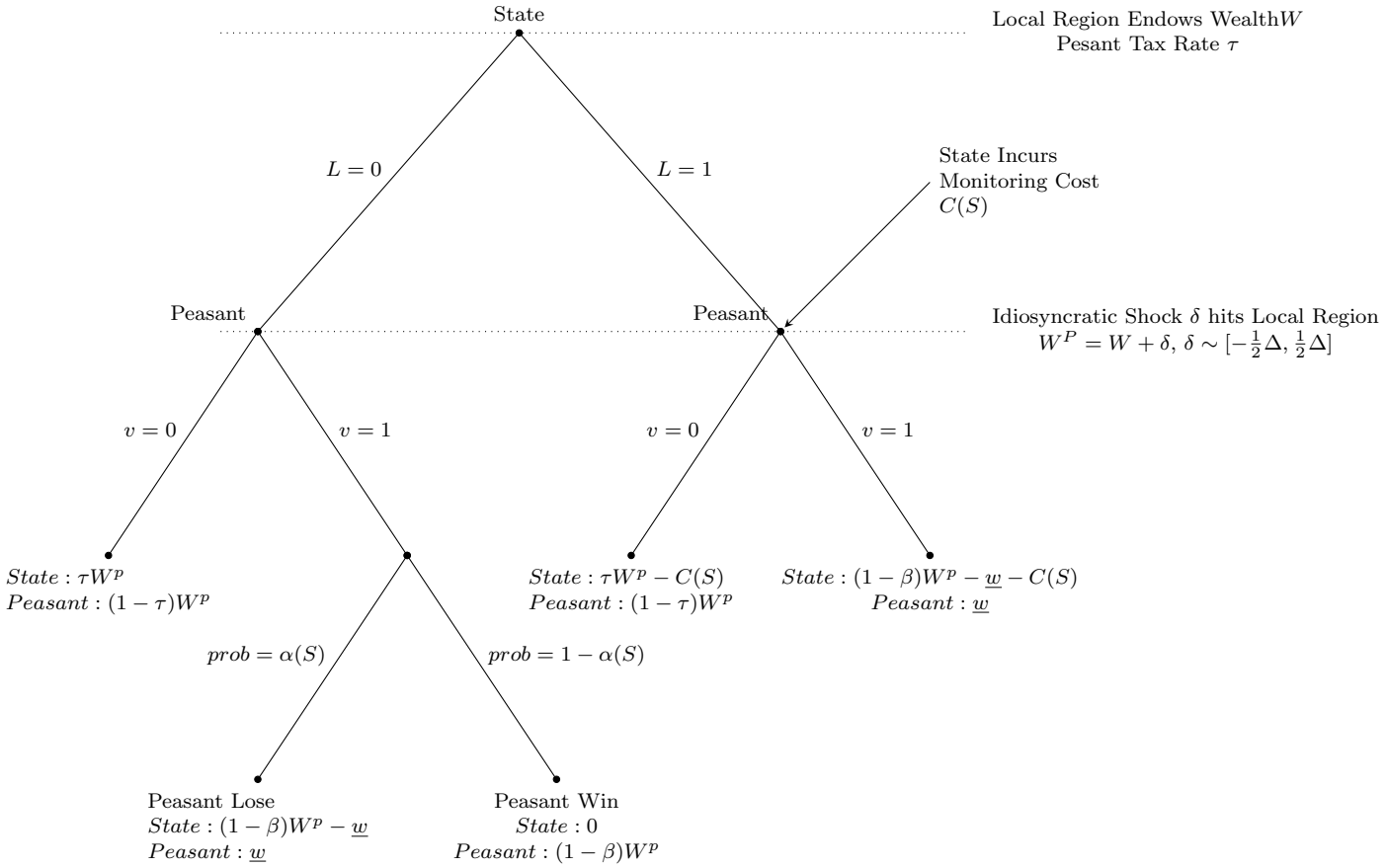
Peasants can choose to riot ($v = 1$) or not ($v = 0$). Rioting would give them a chance to get tax exempted if the peasants win. However, if they lose, they would be punished. The state would take all of their wealth except a bare minimum $\underline{w}$ for them. I assume $\underline{w} < (1 - \beta)(W - \frac{1}{2}\Delta)$; that is, peasants always have a lower payoff when they lose the conflict. Also, a fraction of the wealth β will be destroyed during a riot (assume $\beta < \tau$ so peasants will not always prefer peace). If they choose not to riot ($v = 0$), they will pay τ proportion of tax to the state, and the game ends.

If peasants riot and the state has co-opted local elites $L = 1$, then local elites would be the ones that manage the conflict. Because of the state monitoring, elites will always put effort into suppressing the conflict. In addition, I assume elites could always successfully suppress the conflict since they have more local information and are better connected with the peasants. However, the state would need to suppress the conflict directly if it has chosen $L = 0$. In this case, the state has a probability of $\alpha(S)$ to successfully suppress the conflict. I assume a stronger state/state with more presence will have a higher chance of winning (i.e., $\alpha'(S) > 0$). As mentioned previously, if the state wins, they will punish the peasants and take away all of their wealth except the bare minimum, while if the state loses, they will waive peasants' tax. To make sure that the state is absolutely conflict-averse, I assume $[\tau - \alpha(S)(1 - \beta)]W + \alpha(S)\underline{w} > 0$, for all S, so that state will not have monetary gains when

facing a conflict. Also, for peasants not always have a preference for violence over peace $\alpha(S) > \tau - (1-\alpha(S))\beta$ for all S (i.e., the probability that the state would win a conflict is above a threshold value) is required.

Finally, I assume $W > \frac{\alpha(S)\underline{w}}{\alpha(S)-\tau+(1-\alpha(S))\beta}$ and $W - \frac{1}{2}\Delta < \frac{\alpha(S)\underline{w}}{\alpha(S)-\tau+(1-\alpha(S))\beta}$ to make sure that neither conflict of peace is not always preferred by the peasant so we could focus on the interior solutions.

The timing of events is summarized as follows:



Equilibrium:

Since peasants riot will never succeed when local elites are co-opted ($L=1$), peasants will only choose $v=1$, if $L=0$ and the expected payoff of rioting is greater than peace.

$$(1-\alpha(S))(1-\beta)W^p + \alpha(S)\underline{w} \geq (1-\tau)W^p$$

$$W^p = W + \delta \leq \frac{\alpha(S)\underline{w}}{\alpha(S) - \tau + (1-\alpha(S))\beta}$$

This gives probability of conflict $P(W, \underline{w}, \alpha, \tau, \beta) = \frac{1}{\Delta}\frac{\alpha(S)\underline{w}}{\alpha(S)-\tau+(1-\alpha(S))\beta} + \frac{1}{2}$

While state will have to weigh the trade-off between cost of monitoring the empowered local elites and the costs of direct mitigating the conflicts and offer $L = 1$ if:

$$\tau W - C(S) \geq P\{(1-\alpha(S)) * 0 + \alpha(S)\left[(1-\beta)W - \underline{w}\right]\} + (1-P)\tau W$$
$$C(S) \leq \underbrace{P\{\left[\tau - \alpha(S)(1-\beta)\right]W + \alpha(S)\underline{w}\}}_{\equiv X(W^i, \underline{w}, \alpha, \tau, \beta)}$$

Comparative Statistics:

The right-hand side of the above inequality illustrates the expected cost of attaining tax revenue (τW) absent the involvement of local elites and it can be shown that:

$$\frac{dX}{dS} = \frac{dX}{d\alpha(S)}\frac{d\alpha(S)}{dS} = \underbrace{\frac{dP}{d\alpha(S)}}_{<0}\underbrace{\frac{d\alpha(S)}{dS}}_{>0}\underbrace{\{\left[\tau - \alpha(S)(1-\beta)\right]W + \alpha(S)\underline{w}\}}_{>0}$$
$$+ P\underbrace{\left[-(1-\beta)W + \underline{w}\right]}_{<0}\underbrace{\frac{d\alpha(S)}{dS}}_{>0} < 0$$

Intuitively, when a state is stronger and thus has better technology to suppress conflict, this would deter peasants from starting the conflict (probability of conflict P would be lower). What's more, the expected cost of attaining tax revenue (τW) is lower for a strong state because a strong state is more likely to win a conflict and thus faces a smaller expected loss. Therefore, it is less costly for the state to suppress the conflict directly, suggesting less incentive to co-opt local elites.

The left-hand side of this inequality illustrates that a stronger state would have lower monitoring costs and thus prefers co-opting local elites.

Taking together,

$$\frac{dL}{dS} = \underbrace{\frac{dL}{dC(S)}}_{<0}\underbrace{\frac{dC(S)}{dS}}_{<0} + \underbrace{\frac{dX}{dS}}_{<0}$$

This illustrates the aforementioned trade-offs: a stronger state faces both costs in mitigating conflict directly as well as co-opting local elites to do so.

Appendix II: Additional Background

Two Principles of Drawing Provincial Boundaries

During the early history, it was a very natural choice to adopt the principle of "following the forms of mountains and rivers" to draw provincial boundaries since it serves many economic and political benefits. Firstly, natural boundaries usually coincide with the agricultural regions, which form different agriculture types and therefore different cultures and norms. In addition, it vastly lowers the administrative cost since crossing mountains or rivers would have resulted in huge transportation costs. Lastly and arguably most importantly, natural boundaries serve an essential role in military defense. For example, during the three Kingdoms period (220—280 A.D.), *Zhuge Liang*–the chancellor and later the regent of one of the three Kingdoms *Shu Han*–suggested to his King (*Liu Bei*) to occupy *Yizhou* (roughly today's *Sichuan* province), since mountains surround it. The hills create natural barriers to prevent the other kingdoms' attacks. This strategy indeed really helped. It is commonly acknowledged that *Shu Han* was a much smaller kingdom and had a relatively weak military. Still, *Shu Han* managed to sustain conflict with the other Kingdoms for a long period of time because its natural boundaries protected it.

However, despite the benefits of using natural boundaries, its drawbacks also became more evident and severe as national territories got larger. The most important one is the central state could easily lose control over the territories as regional power holders (such as provincial governor, duke, military commissioners, etc.) could take advantage of natural boundaries to isolate the territories from the central state. This happened many times in history. For example, a long period of war and chaos was experienced at the end of the Tang dynasty (618 – 907 A.D.) because governors or military commissioners gained significant autonomy, and many became warlords and defected from the central state. The central empire could not suppress them despite many attempts because the natural boundaries now became barriers for the central forces to regain control. The breakaway of and occupation of territories eventually led to the collapse of the dynasty.

One solution would be dividing the whole nation into many smaller provinces. This way could limit the power and autonomy each regional power holder can get. Hence, although the Song dynasty (960–1279 A.D.) had much smaller territories, it had many more provinces than any of the following dynasties. The shortcoming of this solution is also apparent: the administrative costs would be extremely high. Having more provinces means hiring more officials at each level.

This solution became very unattractive for the Yuan dynasty (1277—1368 A.D.) when

the Mongols came to rule, as their territories became immense. As a result, another principle is known as "*interlocked like dog's teeth*", which means including rivers and mountains within provinces, was adopted. The benefit of this new principle is that it can prevent the regional power-holders from gaining autonomy while keeping the administrative costs low. As a result, despite the humongous territories, it only had ten provinces.[33]

When the Ming dynasty and the Qing dynasty came into power, they mixed the two principles (more of the second principle), which also resulted in more provinces than the Yuan dynasty (15 provinces and 18 Provinces in China proper regions for the Ming dynasty and the Qing dynasty respectively).

[33]The Yuan dynasty had more than 1400 km^2 in its territories.

Appendix III

Figure A1: China Proper Regions

Notes: Prefectures for P.R. China 2010 are shown. The shaded areas are China proper regions.

Figure A2: Provincial Capitals

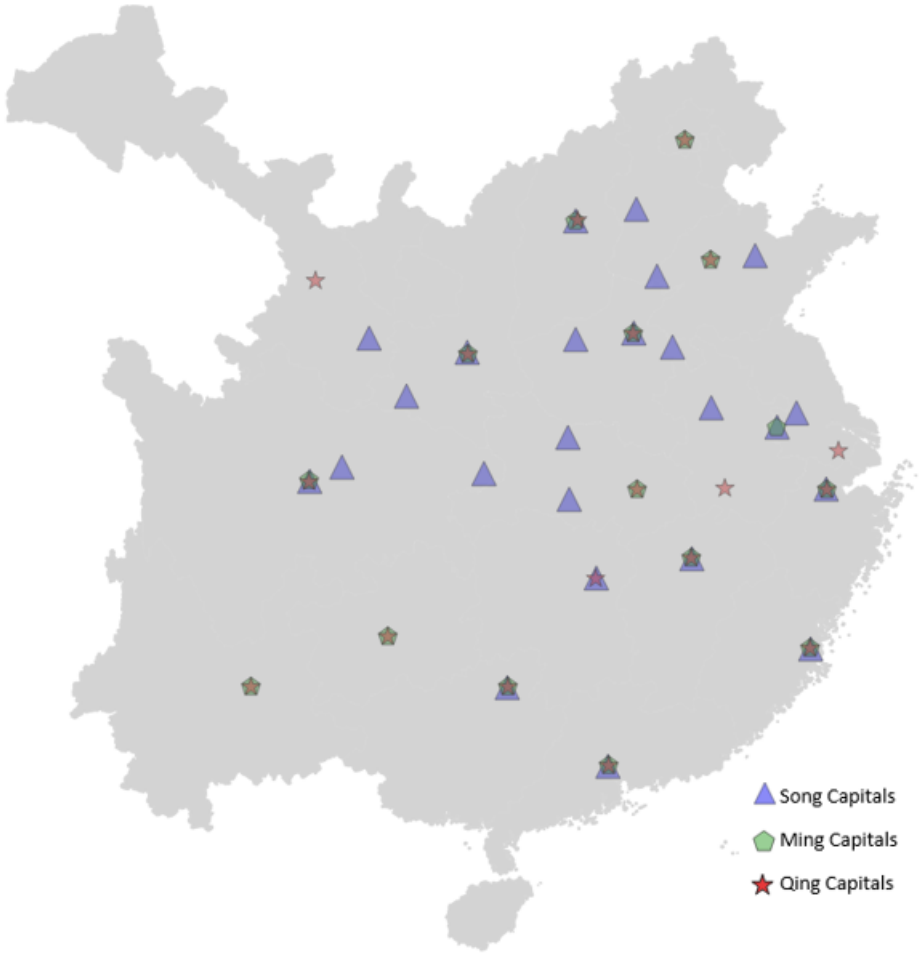
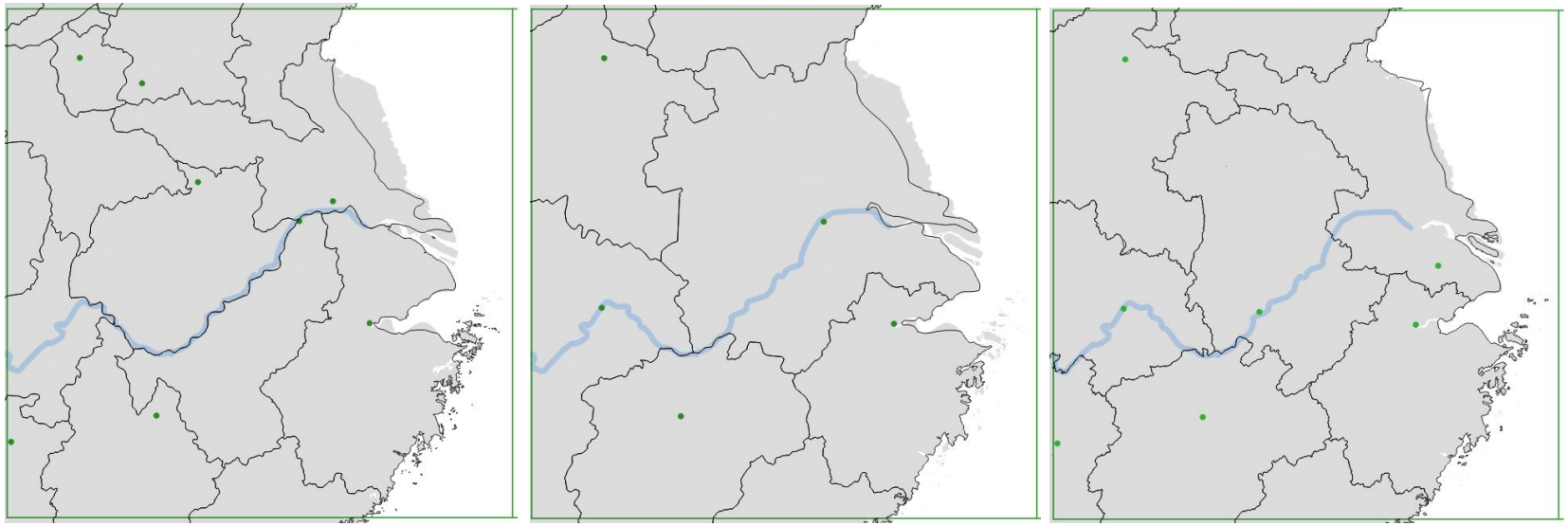


Figure A3: Yangtze Rive Regions



Notes: Grey boundaries are provincial boundaries for each dynasty. The blue line is the Yangtze River.

Figure A4: Raw Data

Emperor period | Location | contributor | area | Notes | Sources

年代	省县	建置人	面积(亩)	备　注	资料来源
嘉靖	宜兴	任卿	2800	置学田 1000 亩，义田 1000 亩，役田 800 亩。	《古今图书集成·学行典》，卷 243，《笃行部》。
明	宜兴县	陈一经(子官御史)		"置义塾义田，子于廷克成其志"。	《古今图书集成·学行典》，卷 249，《笃行部》。
	宜兴县	徐溥	800		张萱：《西园闻见录》。
明	宜兴县	吴驭(詹事府主簿)	200	"割上腴田二顷为祠田以赡宗族"。	《古今图书集成·学行典》，卷 249，《笃行部》。
	宜兴县	徐显卿	300	役田。	张萱：《西园闻见录》。
明末	上海?	唐锦端		"置义田若干亩"。	《古今图书集成·学行典》，卷 245，《笃行部》。
明后期	山阳县	丘氏		建祠堂以祀先祖，置祭若干亩。至清初"山阳丘氏之子弟多孝谨，守家法"。	《八旗文经》，卷 43。
万历	吴江县	沈氏	430		乾隆《吴江县志》，卷 37。
明	常州	伍某		义田，禁典卖。	李绂祯：《大拙山房集》，卷 56，《伍氏义田记》。
	常州府	吴情	1800	其中赡族十之三，助役占十之七(为乡人助役)	申时行：《常州府志》。
明	长洲县	徐某		义田，禁典卖。	张萱：《西园闻见录》，卷 5，《教睦·徐显卿·义田家训》。

identify at county level

Only identify at prefecture level

Translation

Emperor Period	Location	Contributor	Area	Notes	Sources
Jiaqing Emperor	Yixing	Ren Qing	2800		
Ming	Yixing County	Chen Yijing	.		
	Yixing County	Xu bo	800		
Ming	Yixing County	Wu yu	200		
	Yixing County	Xu Shiqing	300		
End of Ming	Shanghai	Tang Yaojing	.		
Later Ming	Shanyang County	The Qiu	.		
Wanli Emperor	Wujiang County	The Shen	430		
Ming	Changzhou	The Wu	.		
	Changzhou Prefecture	WU Qing	1800		
Ming	Changzhou County	The Xu	.		

Figure A5: Clans Genealogy

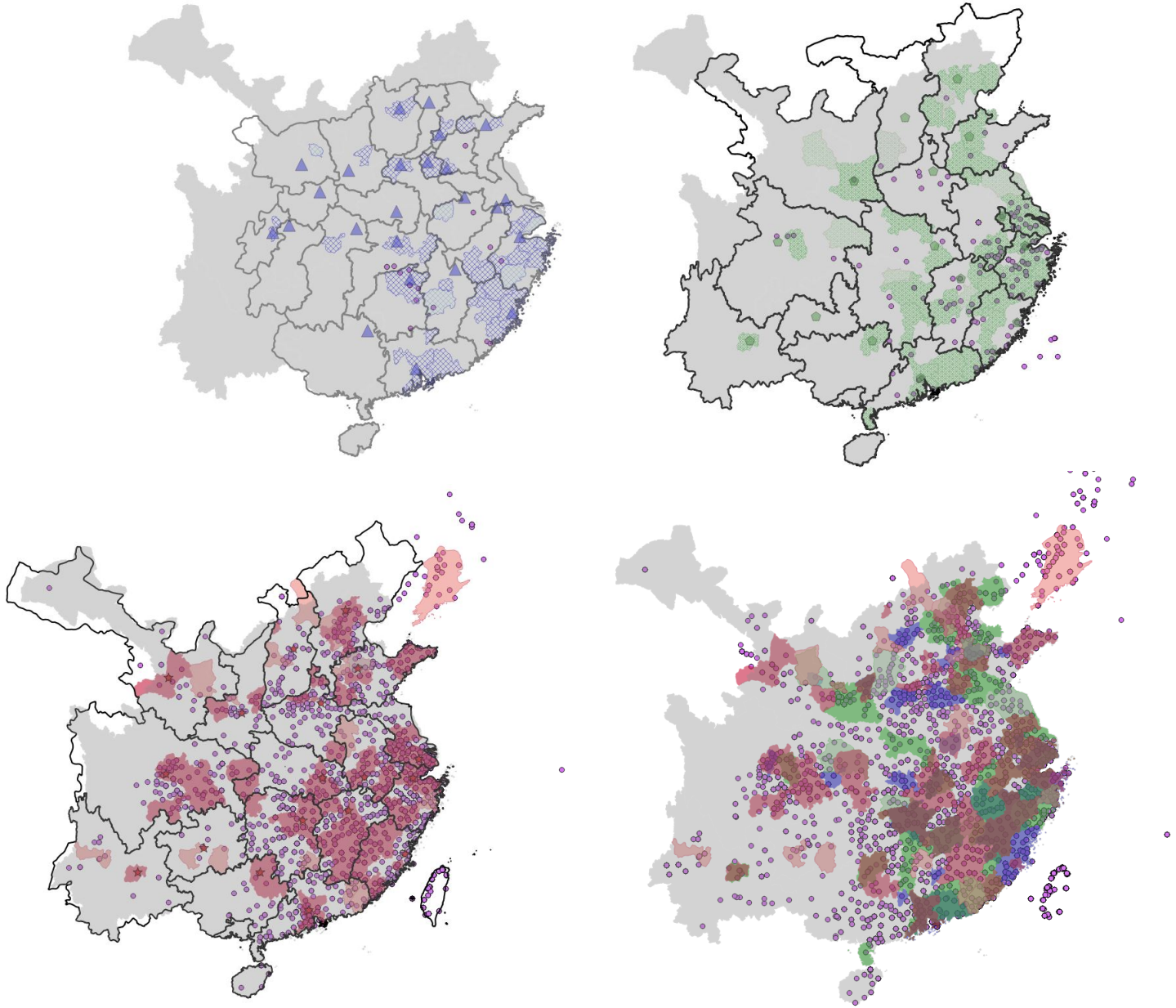


Table A1: Proximity and Clan Land Establishment (Grid-level Analysis)

Grid Size:	100 Km^2 Grid		1 Degree Grid		150 Km^2 Grid	
Dependent Variable:	Clan (Dummy)	Clan (Percentage)	Clan (Dummy)	Clan (Percentage)	Clan (Dummy)	Clan (Percentage)
	(1)	(2)	(3)	(4)	(5)	(6)
Proximity (-ln(dist))	0.229***	0.115***	0.146***	0.100***	0.178***	0.062**
	(0.045)	(0.030)	(0.042)	(0.025)	(0.059)	(0.030)
Observations	1,109	1,109	1,105	1,105	627	627
R-squared	0.334	0.355	0.339	0.378	0.402	0.424
Province by Dynasty FE	Y	Y	Y	Y	Y	Y
Cluster at Grid	Y	Y	Y	Y	Y	Y
Grid FE	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Dep. Var Mean	0.391	0.227	0.356	0.189	0.381	0.182
Number of Grids	441	441	444	444	253	253

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. Panel datasets are at grid-dynasty level. The dependent variable for odd-numbered columns use a dummy measure which takes value of 1 if more than 50% of the prefecture's territory is covered by historical strong clan prefectures; while even-numbered columns use a continuous measure which equals to the percentage of the prefecture's territory is covered by historical strong clan prefectures. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Columns (2) and (4) additionally controls for interaction terms of prefecture characteristics with dynasty fixed effects. Prefecture characteristics includes average slope, elevation, longitude, latitude, dummy variables indicating whether the prefecture contains a major river and a prefecture is a coastal city, as well as agriculture suitability indexes for wheat, rice, fox millet,maize and sweet potato.

Table A2: Proximity and Clan Land Establishment (Judicial Capitals)

Dependent Variable:	Clan Prefecture (Dummy)		Clan Coverage (Percentage)	
	(1)	(2)	(3)	(4)
Proximity (-ln(dist))	0.049*	0.050*	0.050**	0.048**
	(0.027)	(0.029)	(0.022)	(0.023)
Observations	776	776	776	776
R-squared	0.271	0.314	0.310	0.360
Number of Prefectures	267	267	267	267
Province by Dynasty FE	Y	Y	Y	Y
Cluster at Prefecture	Y	Y	Y	Y
Prefecture FE	Y	Y	Y	Y
Controls	N	Y	N	Y
Dep. Var Mean	0.311	0.311	0.315	0.315

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. The dependent variable for columns (1) and (2) use a dummy measure which takes value of 1 if more than 50% of the prefecture's territory is covered by historical strong clan prefectures; while columns (3) and (4) use a continuous measure which equals to the percentage of the prefecture's territory is covered by historical strong clan prefectures. Proximity to judicial capitals for the Song dynasty is used as the explanatory variable. All columns include prefecture fixed effects and province-by-dynasty fixed effects. Columns (2) and (4) additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.

Table A3: Economic Development (Song, Ming Dynasties only)

Dependent Variable:	Dynasty Earliest Pop. Density	
	(1)	(2)
Proximity (-ln(dist))	-0.001	-0.033
	(0.014)	(0.024)
Observations	509	509
R-squared	0.667	0.770
Number of Prefectures	267	267
Controls	N	Y
Dep. Var Mean	0.208	0.208

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. The sample uses Song and Ming dynasties only. Dynasty earliest population density refers to the earliest population density data available for each dynasty. Both columns include prefecture fixed effects and province-by-dynasty fixed effects. Column (2) additionally controls for interaction terms of prefecture characteristics with dynasty fixed effects.

Table A4: Clan Genealogy Data and Clan Land Data

Dependent Variable:	Clan Prefecture (Dummy)			Clan Coverage (Percentage)		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(# Clans Compiled Genealogy +1)	0.091***	0.079***	0.064**	0.087***	0.058***	0.044*
	(0.011)	(0.026)	(0.028)	(0.009)	(0.021)	(0.023)
Observations	776	776	776	776	776	776
R-squared	0.086	0.283	0.320	0.107	0.317	0.362
Number of Prefectures	267	267	267	267	267	267
Cluster at Prefecture	Y	Y	Y	Y	Y	Y
Province by Dynasty FE	N	Y	Y	N	Y	Y
Prefecture FE	N	Y	Y	N	Y	Y
Controls	N	N	Y	N	N	Y

Notes: Robust standard errors, clustered at the district level, are shown in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. The dependent variable for columns (1) and (2) use a dummy measure which takes value of 1 if more than 50% of the prefecture's territory is covered by historical strong clan prefectures; while columns (3) and (4) use a continuous measure which equals to the percentage of the prefecture's territory is covered by historical strong clan prefectures. Number of clans compiled genealogy (in natural logarithm) is used as the explanatory variable. Considering some prefectures might have zero clan compiled genealogies in a dynasty, I add 1 to the number of clans before taking the natural logarithm. Columns (2) and (5) include prefecture fixed effects and province-by-dynasty fixed effects. Columns (3) and (6) additionally control for interaction terms of prefecture characteristics with dynasty fixed effects.