Mobility and Revolution: The Impact of the Abolition of China's Civil Service Exam System*

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April 15, 2014

Abstract

This paper studies a dramatic interruption in mobility: the abolition of China's civil exam system in 1905. This exam system lasted over 1,300 years and was the primary channel of upward mobility in the Ming and Qing dynasties. To examine how this abolition affects citizens' participation in revolution that was already ignited in the late 19th century (and replaced the Qing dynasty with a republican government in 1911), we collect a panel dataset across 262 prefectures and explore the variations in the quota on the first-level exam candidates. Differences-in-differences estimations show that one percent more in the quota increases the number of registered revolutionaries by about 0.2 percent after the abolition of the exam system, which implies 0.02 percentage points higher incidence of uprisings in 1911. This finding is robust to various checks including using confluences of rivers and short-run exam performance before the quota system as two instrumental variables.

*We are grateful to Davide Cantoni, Gordon Hanson, Torsten Persson, Gerard Roland, Noam Yuchtman and the participants in the seminars at UCSD, UC Berkeley and UC Merced for their helpful discussions.

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1 Introduction

A recent and growing literature has addressed the role of social mobility in determining the demand for redistribution. For instance, Banebou and Ok (2001) formalize the prospect of upward mobility (POUM) hypothesis and argue that many people with below average income do not support higher tax rates because of a belief in their prospect for upward mobility. The hypothesis is supported by empirical studies with data from different parts of the world (Ravallion and Lokshin 2000, Corneo and Gruner 2002, Alesina and La Ferrara 2005). However, in regimes without a functioning democratic system, it is unclear how desired redistribution can be achieved. In non-democratic regimes, revolution has often been the way to achieve redistribution. In fact, social mobility has also been considered an important element in determining revolution and the stability of political regimes. For instance, one explanation for the public education provision in the late 19th-century France is that political leaders hoped to promote social mobility and create a middle class with less inclination towards revolution (Bourguignon and Verdier 2000). In contrast, the discouragement of the prospect of upward mobility has been documented to contribute to the Tian'anmen movement in 1989 in China (Zhao 2004) and the Arab Spring (Malik and Awadallah 2013). Motivated by many other cases, Leventoglu (2013) provides a model formalizing the role of social mobility in revolution.

However, unlike the link between social mobility and the demand for redistribution, the link between social mobility (or the lack of it) and the demand for revolution has not been established empirically. The lack of evidence may be not surprising, as mobility often evolves together with other economic and political variables and it is difficult to find dramatic change in mobility. Moreover, it is also challenging to get information on participation in revolution. This paper addresses these challenges by studying a dramatic interruption in mobility, namely the abolition of China's civil exam system: the system was established in AD 605 and served as the primary channel of upward mobility in the Ming and Qing dynasties until its abolition in 1905 (upward mobility throughout this paper refers to the status change from the lowest class to the gentry class).[1] We collect a rich set of data from various sources. The varition in mobility comes from variations in the quotas across 262 prefectures under the exam system.[2] The outcomes include information on revolutionaries

[1] Similarly, downward mobility resulted from the failure of men to perpetuate the literary tradition of their family and inability to pass the examinations, summarized by a Chinese saying, "wealth does not pass three generations" (Wang 1960, Ho 1962). As discussed in Section 2.1, the status change is both political and economic change, as political status is highly correlated with income. We have some crude measures of political mobility but cannot have exam numbers on intergenerational income correlations for this historical period.

[2] A prefecture is the administrative level below the province. In Qing dynasty, there were 18 provinces

in major revolution groups established both before and after the abolition of the exam, the spatial distribution uprisings in 1911 that finally replaced the Qing dynasty with a republican government, and a few other political outcomes during republican era such as the origins and party identification of congress members. The baseline is to evaluate how the prospect of upward mobility affects citizens' participation in revolution before and after the abolition of the exam.

The civil service exam system, its abolition and the political transition of China from an imperial rule to a republican era are among the most important institutional changes in Chinese history. They provide a nice testing ground for the link between mobility and revolution. The importance of the exam system in mobility has been documented by historians. For example, studying the biographies of the exam candidates in Ming (1368-1644) and Qing (1644-1910) dynasties, Ho (1959, 1962) shows that over 40 percent of those succeeded in the highest level came from non-official backgrounds and the number should be even higher for lower-level candidates, concluding that "probably more careers ran 'from rags to riches' in Ming and Qing China than modern Western societies." (see Section 2.1 for more detailed descriptions of related facts). With the abolition of the exam system in 1905, this channel of mobility no longer existed.[3] Scholars have also conjectured the consequences of the demise of the exam system. As remarked by Gilbert Rozman, "the year 1905 marks the watershed between old China and new; it symbolizes the end of one era and the beginning of another. It must be counted a more important turning point than the Revolution of 1911, because it unlocked changes in what must be the main institutional base of any government: the means of awarding status to the society's elites and of staffing the administration." (Rozeman, 1982). Benjamin Elman also pointed out, "with the Republican Revolution of 1911, the imperial system ended abruptly, but its demise was already assured in 1904 when the Qing state lost control of the education system" (Elman, 2009). Anecdotally, the association between the abolition of the exam and the success of revolution was also recognized by the leaders of revolutionary groups. Hu Hanmin, one of the key leaders of the *Kuomintang*, made a well-known emotional remark after the success of the revolution, "if the exam were not abolished, who would have joined the revolution?"[4]

In our empirical analysis, to proxy for the prospect of upward mobility, we collect data on

located in the traditional agricultural area, and each province has 10 to 20 prefectures.

[3] A subsitute institution arose, namely the new educational system, with study abroad as its highest stage in fact if not in name. See more discussions of the subtitute in Section 2.1. The main message is consistant with that in Wang (1960): the link between political (and related economic) status and the investment in traditional education became much weaker for those without an elite background.

[4] The biography of Hu also provides a case for the influence of the exam system. He was born in 1879 to a poor family. In 1900, he passed the second-level exam. In 1905, he joined the largest revolutionary group (*Tongmenghui*) and later became of the leaders of the *Kuomintang*.

different levels of exam candidates across 262 prefectures. In particular, we focus on the first-level of candidates, which concerns the fundamental mobility of citizens and is controlled by a prefecture-level quota system. We explore variations in the quotas (controlling for population sizes) to measure opportunities of upward mobility. Two aspects of the quota assignment bear emphasis. First, the quota system was very stable in the Qing dynasty, except for an increase due to the need of repressing the Taiping Rebellion in 1850s. We collect data for both the early period (1724-1851) and the late period (1873-1904) and use the latter quota to proxy the mobility in our baseline estimations. Second, the quota for a prefecture was assigned to county schools and prefectural-capital schools and the number for a school follows a stepwise rule: the most common numbers for a school are 20, 15, 12 and 8. The reason for using such a stepwise assignment is that the government needs a simplified way of implementing the quota system.[5] These two features of the quota assignment imply great regional variations even if we control for population sizes. For instance, province fixed effects can only explain 30% of the variations in the quota across prefectures, leaving a large chunk of variations within provinces for us to explore. In addition, we also collect information on the highest-level candidates and key officials, where the highest-level candidates are controlled by a provincial-level quota system and we can identify their origins of prefectures. With these data, we can also document the "mobility pyramid" at different levels. We find that one percent more quota in a prefecture increases one percent more candidates succeeding at the highest level exam and 0.8 percent more high-level officials from the prefecture.

A second dataset we construct is the number of registered revolutionaries in each prefecture. Naturally, it is impossible to get the information of all the participants in the revolution. The revolutionaries we can get are members of major revolution groups at the national level, who could motivate more participants at different local levels.[6] We would like to know how representative these revolutionaries are. To this end, we collect the information on the spatial distribution of uprisings in 1911 (known as the *Xinhai* Revolution as it was also the year of *Xinhai* in the sexagenary cycle of the Chinese calendar) from a Japanese

[5] This logic is similar to "state simplifications" discussed in James Scott's "Seeing like a State" (Scott 1998). We would like to clarify two possible understandings of the quota system. First, it is sometimes thought that quotas are proportional to population sizes (Brandt et al., 2014). This is not true at the prefecture level due to the two features of the quota assignment emphasized here. Besides, the government did not really have the state capacity to implement a quota system proportional to the regional population, although the quota is naturally correlated with the population size. Second, because Zhengjiang and Jiangsu provinces were very successful in the national-level exam, people may think that the variations in the quota stem from province-level variations. This is not true for the prefecture-level exam either. In fact, we will explore within-province variations in our empirical analysis. These two thoughts may be more relevant for the national-level exam governed by a provincial-level quota system.

[6] For these early revolutionaries we are studying, their participation was voluntary. Therefore, the concern that the revolutionary groups tended to recruit more in certain regions is not very important.

newspaper so that we can link the number of revolutionaries to actual uprisings. As another check, we compare the distribution of their surnames to that of the population and find the distributions are very similar, which gives us confidence on the representativeness of the participants. Additionally, we construct a county-level dataset in Guangdong province where the earliest revolutionary group emerged. Since the majority of those revolutionaries in very early stage originated from Guangdong, this helps us trace the participants to even earlier periods. We complement the baseline prefecture-level analysis with the county-level information.

In addition, we collect a set of observable characteristics of prefectures. We also collect information on alternative mobility channels during this period such as doing business and studying overseas. Moreover, we gather information on the origin of congress members and their party identification after the abolition of the exam. This data helps us to check upward (political) mobility after the abolition as well as check for potential ideological differences.

Using differences-in-differences as our baseline estimation strategy and comparing the impact of the quotas before and after the abolition of the exam system, we obtain an estimate of the elasticity of the number of revolutionaries on the quota: one percent more in the first-level exam quota increases the number of registered participants in revolution by about 0.2 percent in the prefecture-level data between 1900 and 1906. Moreover, this impact only took place after the abolition of the exam in 1905 whereas the quota difference did not differ significantly before 1905. Linking this estimate to the incidence of uprisings in 1911, we find that 0.2 percent more revolutionaries imply 0.02 percentage points higher incidence of uprisings. The elasticity estimate is robust to various checks including controlling for mobility at higher levels and other mobility channels and using county-level data from Guangdong where the earliest revolution group started and the data can be traced back to 1894.

Our interpretation of the baseline finding is that people in prefectures with more upward mobility space got discouraged more by the abolition. Consequently, they were more likely to be mobilized. This is not to say that all revolutionaries belonged to this category. Indeed, some people became revolutionaries due to their ideology, their preference or their quest for modernization. The purpose of this study is not to document the background of each revolutionary but to investigate the impact of the interruption of the most important mobility channel and how the impact differs across regions. The role of mobility in this context renounces that in the literature on mobility and demand for redistribution mentioned above. The thin literature linking social mobility and revolution is only theoretical. Among such studies, we employ a similar framework in Acemoglu and Robinson (2001) and Leventoglu (2013) to highlight the role of mobility in our context as well as potential confounding factors we need to consider in our empirical analysis.

As an important historical event, the abolition of the exam might trigger many responses in the society besides the interruption of mobility. Similarly, the quota can be correlated with other dimensions besides mobility opportunities. However, for any alternative channel to explain our findings, it has to be systematically correlated with the quota and its effect has to be discontinuous before and after the abolition of the exam. We compare our interpretation with six types of alternative explanations including whether higher quotas mean more "modern" human capital for revolution (Huntington 1968), whether the abolition was an economic shock for the current period, whether regions with higher quotas are more important in other dimensions, whether the quota is correlated with ideological differences.

Despite that the quota system is relatively stable and has the stepwise feature, it is still conceivable that the quota may be correlated with omitted variables not captured by our robustness checks (e.g. political connectedness). If the impacts of the omitted variables differ before and after the abolition, our estimate from the differences-in-differences strategy is biased. In particular, the selection of bureaucrats after the abolition is likely to be related to the omitted variables that are positively correlated with the number of quota. For example, incumbent officials correlated with the quota system may influence the selection of bureaucrats after the abolition. This concern implies that our estimate from the differences-in-differences strategy is biased downward.

To deal with this concern of endogeneity that cannot be addressed by differences-in-differences, we further employ two instruments for the quotas based on geographical and historical features. Inspired by Scott (2009), we use the number of confluence of rivers given the length of rivers in a prefecture as our first instrument. This feature affects the formation of counties and is positively correlated with the number of counties given population size. Therefore, it increases quotas given population size because each county school was usually assigned some quotas. We conduct various placebo tests and show that this feature does not affect other dimensions such as transportation importance, agricultural suitability or climate shocks. The second instrument stems from historical roots of the quota assignment: namely the growth of successful candidates between 1368 and 1425 in the Ming dynasty. In 1425, the regional quota system was firstly adopted to balance the opportunity to pass the national exam and the assignment of quota took into consideration the exam performance, especially in the most recent years before the system. Therefore, we use the short-run difference in the number of successful candidates between 1399-1425 and that between 1368 and 1398. We show that this instrument is positively correlated with quotas but does not affect the growth of the number of successful candidates in the long run. The estimates using the two instrument variables are generally larger.

The rest of the paper is organized as follows. Section 2 discusses the historical background and lays out a simple model. The purpose of the model is to highlight the channel of social mobility in the association of the abolition of the exam and the participation in revolution. Sections 3 describes the data. Section 4 presents the baseline results, while Section 5 discusses robustness checks and alternative explanations. Section 6 presents the results using instrument variables. Section 7 concludes.

2 Historical Background and Conceptual Framework

In this section, we first describe the background of the exam system, its abolition and the revolution. We then lay out a simple model to link the abolition of the exam to the revolution participation, where social mobility is the main channel.

2.1 The Civil Service Exam System and Its Abolition

The Structure of the Exam The civil service examination system was established in AD 605 during the Sui Dynasty (581-618). It was designed to select the best potential candidates to serve as administrative officials, for the purpose of recruiting them for the state's bureaucracy. The system was used on a small scale during this and the subsequent Tang dynasty (618-907), it was expanded under the Song dynasty (960-1276). After being interrupted during the Mongol Yuan dynasty (1276-1368), the examination system became the primary channel for recruiting government officials during the Ming (1368-1644) and Qing (1644-1910) dynasties.

The structure and process of the civil examination system remained stable especially in the late imperial period (the Ming and Qing dynasties). The contents of all the examinations were dominated by the Confucian classics – the Four Books and the Five Classics (Elman, 2000). Figure 1 illustrates the basic structure of this system, consisting of three stages of exams. The first level is a prefecture-level licensing examination (*Yuankao* in Chinese) held in the prefecture capital after the annual primary testing in the county seat. This level of examination took place twice every three years. The candidates who passed the prefecture-level examination were termed *Xiucai* (literati). The second level is a triennial provincial-level qualifying examination (*Xiangshi* in Chinese) in the provincial capital. The successful candidates were termed *Juren* (recommended man, a provincial graduate). The third level is a national examination (*Huikao* in Chinese) taking place in the the capital, with re-examination to rank the candidates in the imperial palace (*Dianshi* in Chinese). These candidates are termed *Jinshi* (presented scholar, a graduate of the palace examination). These candidates and their family members constituted the gentry class, who played an important role in organizing the society (Chang 1955).

[Figure 1 about here]

The Exam System and Mobility Historians have made many influential contributions to understanding how the exam system works and its impacts. Here, we point out four facts closely related to social mobility based on our data and influential historical studies (Edmunds 1906, Krack 1947, Chang 1955, 1962, Ho 1959, 1962, Rawski 1979, Elman 2000).

F1: the degree or title of each level carried different political status and henceforce economic income. At the lowest level, the candidates who passed the prefecture-level examination became the lower gentry class, who were exempted from corporal punishment, and had the right to wear a scholar's robes. Although the title was primarily a political status, it also provided the opportunity to manage local affairs, become secretarial assistants to officials, and to teach – three important sources of income for Chinese gentry (Chang 1962). Those passed the provincial and national levels belonged to higher gentry class. The highest achievement was to become a government official, which brought great power and prestige. For instance, the district magistrate had great authority to carry out court orders, collect taxes, and implement the policies of the central government, all of which provided "the greatest opportunity for the rapid accumulation of wealth" (Chang 1962). According to the estimate in Chang (1962), the gentry class received about 24 percent of the national income, even though they constituted only about 2 percent of the population.

The change in political and economic status is what we mean by social mobility in this paper.

F2: the exam system matters for the social mobility of a large amount of population. Edmunds (1906) provides some estimates about the number of candidates: during the late Qing dynasty, some 760,000 candidates competed biennially for the first degree, while about 190,000 competed triennially for the second degree – a total of 950,000 for the whole empire. This number does not account for another 1,000,000 students preparing for the first exam. Chang (1955) estimated that the population of the gentry class accounts for about 1 to 2 percent in the total population. In our data, the number of those passed the prefecture-level exam (i.e., *Xiucai)* in the Qing dynasty is also around 0.4-0.5 percent of the population.[7] There is no exact data on the number of total exam takers. However, the share of the gentry

[7] The numbers are calculated as follows: suppose that the life expentancy is 60 years. There were 40 prefecture-level exam in these 60 years. The ratios calculated using (total quotas in the late Qing period for each prefecture-level exam * 40 prefecture-level exams)/(population sizes in 1880 or 1910) are 0.4 and 0.5.

(). Another way to think about the problem is to use the expected exam times for a man: he can take the exam around 30 times.

class suggests that exam takers should at least account for 5 percent of the total population (or 10 percent of the male population). This estimate is likely to be lower bound. For example, Rawski (1979) argues that the literacy rate for the male population is around 30 to 45 percent thanks to the civil exam system.

Of course, very few could make it to the very top: on average, 0.04% of the prefecture-level candidates succeeded in the national-level exam in our data. But the prefecture-level exam concerned a large share of the population and also provided the eligibility for the very top positions.

F3: under this exam system, there were no effective legal and social barriers which prevented the movement of individuals and families from one status to another. In theory, one did not need to be of certain status to take the exam. In practice, the exam takers needed to invest in preparing for the exam and forgo the opportunities to work, which might hinder people from very poor families to take the exam. On balance, the exam was a fairly efficient mobility channel. For example, Kracke (1947) examines the candidate lists in the Song dynasty and demonstrates that approximately 60 percent of all successful candidates came from non-official backgrounds (that is to say that neither their fathers nor grandfathers had earned a degree). Chang (1955) indicates that at least of 35 percent of the gentry class in the 19th century were "newcomers", that is neither their fathers nor grandfathers had held gentry status. Studying the biographies of the candidate in Ming and Qing dynasties, Ho (1962) finds that over 40 percent of those succeeded in the highest level (namely *Jinshi*) came from non-official backgrounds. Using a different method, Hsu (1949) studied the background of prominant individuals mentioned in the gazetteers of four widely separated regions in China and found that roughly 50 percent of the local prominants came from unknown origins and roughly 80 percent of the descendants beyond the grandson generation of the local prominants became unknown. He also pointed that the fairly high degree of mobility was driven by the civil service exam system.

F4: the numbers of successful candidates in each level are controlled by a quota system at different administrative levels. The quota for the prefecture-level examination was assigned at the prefectural-capital school and county schools whereas the quota for the exams at higher level was assigned at the province level. The quota system worked as an institutional means to confine and regulate the power of elites (Elman 2000). It also allowed to recruit officials from different parts of the country.

There was no standard formula for the regional quota, but two features of the assignment deserve emphasis. First, the quota system is relatively stable during the Qing dynasty with increases due to the need of repressing the Taiping Rebellion (as a way of encouraging contribution to the fight). We collect the quota data for both the early period (1724-1851) and the late period (1873-1904). Second, within a prefecture, different number of quotas were assigned to county schools and the prefecture-capital school. The number for a school is step-wise: the most common numbers for a school are 20, 15, 12 and 8. Given this feature, there are a lot of variations across regions for us to explore, even though a higher quota is naturally correlated with the size of importance of the administrative units (Chang 1955). In our empirical analysis below, we also explore instrumental variables to deal with omitted variables correlated with the quota.

To help further illustrate the link between the quota system and mobility opportunities, we present the correlations among the quota, the number of *Jinshi* (candidates passing the national-level exam) and the number of high-level officials across 262 prefectures in the Qing dynasty in Panel A of Table 1. We will introduce the data sources and summary statistics later in data section. Two findings emerge from from Panel A. First, as shown in columns (1) and (4), even without considering for any other factors, the quota explains a large part of the variations in the numbers of *Jinshi* and high-level officials (the R-squared values are 0.67 and 0.52). Columns (2) and (3) (or columns (5) and (6) for high-level officials) show the results after controlling for the log of population as well as province fixed effects. Second, the elasticities with respect to the quota are also very high: 1 percent increase in the quota for a prefecture implies 1.1 percent increase in the number of Jinshi and 0.8 percent increase in the number of high-level officials.

[Table 1 about here]

As acknowledged before, the results in Table 1 are only about political status, which was highly correlated with economic status in historical China.

Its Abolition and the Impact on Mobility After more than 1200 years of use, the introduction of Western knowledge systems led to a series of reforms after the First and Second Opium Wars and the decline of the imperial examination system. Wolfgang (1960) provides a detailed description of the process. At the time of its abolition, the examination system exhibited several characteristics that many intellectuals saw as reasons of the underdevelopment of China compared with the West (Castrillon 2012). For example, the exam sought out men who are "obedient to their elders and incorrupt" rather than candidates with technical knowledge or political ability. Besides, the exams focused on reciting the classics and did not include modern Western topics such as engineering and science. In 1901, the format of the exam essay (known as the eight-legged essay because the essay had to be divided into eight sections) was relaxed and the three-level exam structure was retained. In late 1903 and early 1904, the Committee on Education submitted a memorandum urging the abolition of the examination system. The memorandum received imperial approval on 13 January 1904, indicating that the exam would be abolished within the next five to ten years. On 2 September 1905, The Empress Dowager Cixi endorsed a memorandum ordering the discontinuance of the old examination system at all levels.

Along with the abolition, the dynasty hoped to switch to a modern Western-style education system. However, the modern school system favored the elite by making study abroad the decisive stage of Chinese education and by affording privileges only to those who had studied abroad (Castrillon 2012). In his study on social mobility in this transition, Wang (1960) points out "whereas under the old scheme a scholar with limited financial resources had a good chance to succeed, under the new one the opportunity to receive higher education was virtually limited to a small group of men from official, professional, and mercantile families". He finds that foreign-trained Chinese received almost four times the salary of holders of the first degree. These facts effectively discouraged the large group of individuals who had invested in the traditional system. Even if some of them switched to the new system and got a higher salary than the case with a traditional education background, the link between their education and their political status got interrupted without an elite background.[8]

One might wonder how bureaucrats got selected after the abolition of the exam system and whether the new selection system is also related to the quota system. After the abolition of the exam, the Qing government adopted the congress system in 1908. As pointed out by historians, the new system in the end of the Qing was mainly controlled by the incumbents (Spence 1990). When the Qing was replaced by the Republic, the congress was also replaced.

To compare with the upward mobility under the exam system, we also collect data on the origins of congress members in 1908 (in the Qing dynasty) and in 1912 (in Republic of China) and use the same specification as in Panel A of Table 1 (except that we control for the population in 1910, which is closer the timing of the outcomes).

The results are presented in Panel B of Table 1. Columns (1)-(3) present the results for congress members in 1908. Compared with those in Panel A, the R-squared value is only around 0.2, which suggests that the explanation power of the quotas on the number of high-level officials became much lower. Besides, the elasticity is reduced to only one tenth that before the abolition. These suggest that the link between the quota and upward mobility became much weaker in 1908.

Columns (4)-(6) present the results for congress members in 1912, after the Qing dynasty was replaced by the Republic of China. The link between the quota and the number of congress members became stronger than that in 1908 (in the Qing dynasty).

[8]For example, Yuchtman (2010) finds that high-paying jobs at the Tianjin-Pukou railroad were practically reserved for individuals with a modern education.

With no detailed intergenerational information, these measures together ith the evidence from existing research still clearly suggest that the civil service exam was an important mobility channel and the loss of the channel was not fully compensated after its abolition. Therefore, the abolition may have ominous social implications, including on the revolution activities that were already ignited.

2.2 The Revolutionaries

In the 1890s, a few underground anti-Qing groups, with the support of Chinese revolutionaries in exile, tried to overthrow the Qing dynasty. These groups arose mainly in response to the decline of the Qing state, which had proven ineffective in its efforts to modernize China and confront foreign aggression, and was exacerbated by ethnic resentment against the ruling Manchu minority. The earliest revolutionary organizations were founded outside of China. For example, Sun Yat-sen's *Xingzhonghui* (Revive China Society) was established in Honolulu in 1894 and spread to Hong Kong and Guangzhou in Guangdong province.

Chang Yu-fa at the Academia Sinica is an influential historian studying revolutionary groups during this era. Chang (1982) describes the background of six major groups during 1900-06 and provides the lists of registered revolutionaries. The six groups are as follows:

(i) *Xingzhonghui* (the Revive China Society), which was established in Honolulu in 1894;

(ii) *Junguomin Jiaoyuhui* (the Society of National Military Education), which was established in Japan in 1903;

(iii) *Huaxinghui* (the China Arise Society), which was established in Changsha in 1903 and spread to Wuchang, Shanghai and other regions;

(iv) *Guangfuhui* (the Revive the Light Society), which was established in Shanghai in 1904 and spread to Zhangjiang and Anhui provinces;

(v) *Tongmenghui* (the Chinese Revolutionary Alliance), which united Xingzhonghui (Revive China Society) and Huaxinghui (China Arise Society) in 1905, attracting participants across China and later formed the nucleus of the Kuomintang (the governing political party of the republic);[9]

(vi) *Rizhihui* (the Society for Daily Improvement), which was established in 1905-6 in Wuhan and was influential in Hubei and Hunan.

In 1907, *Tongmenghui* was divided into many groups. As a result, a systematic data on the lists of major revolutionary groups were only available until 1906. The revolution consisted of many revolts and uprisings. The turning point was the Wuchang Uprising in Hubei Province on October 10, 1911. The revolution ended with the abdication of the

[9] As the data on the members in *Tongmenghui* was already collected in Luo (1958), Chang (1982) only provides the information on the founders. We also add the information on members in Luo (1958).

"Last Emperor" Puyi on February 12, 1912, which marked the end of over 2,000 years of imperial rule and the beginning of China's republican era. We will also link the number of revolutionaries to the uprisings in 1911.

The new republic is by no means a well-functioning democracy. The central authority waxed and waned in response to warlordism (1915–28), Japanese invasion (1937–45), and the Chinese Civil War (1927–49), with central authority strongest during the Nanjing Decade (1927–37), when most of China came under the control of the Kuomintang. Figure A1 in the appendix shows the polity scores of China between 1890 and 2000. As it shows, although the republican period had better scores than the previous dynasty (before 1911) and the following People's Republic of China (after 1949), China struke a positive score only in the year of 1912.

2.3 Conceptual Framework

Basic Setup To understand the role of the civil exam system in revolution, we construct a simple model following Acemoglu and Robinson (2001) and Leventoglu (2013). Our analysis is much simpler as we focus on the revolution condition only. The purpose of the model is to link the abolition of the exam to the participation in revolution where social mobility plays a key role while highlighting potential confounding factors.

There are two type of agents in economy: the poor citizen (p) and the rich elite (r). Note that rich and poor refer to both political status and economic status, which are simplified and measured by a single dimension (their income). The share of the rich is $\lambda < \frac{1}{2}$. The income of the country is drawn from a distribution: with probability π, the economy is bad and $w = w^L$; with probability $1-\pi$, the economy is good and $w = w^H$. Let θ be the income share of the rich and $\theta > \frac{1}{2}$. Then the income of a poor is $x_p = \frac{(1-\theta)w^e}{1-\lambda}$ and the income of a rich is $x_r = \frac{\theta w^e}{\lambda}$, where $\frac{1-\theta}{1-\lambda} < 1 < \frac{\theta}{\lambda}$.

For simplicity, we focus on a two-period setup. Each agent's utility is determined by his income in the current period and the expected income in the next period. A poor agent becomes rich in the next period with probability η_p and stay as poor with probability $1-\eta_p$. Similarly, a rich agent becomes poor in the next period with probability η_r and stay as rich with probability $1-\eta_r$. The civil exam system is an important opportunity for the status switches. Another way to think about why social mobility matters is to assume that agents care about his current income and the mobility of the children as in Leventoglu (2013).

Taxation is the instrument of the government and redistribution occurs through taxation with a tax rate τ. $c(\tau)$ is the deadweight loss due to taxation, where $c(0) = 0$, $c'(0) = 0$, $c'(\tau) > 0$ for $\tau > 0$, $c'' > 0$ and $c'(1) = \infty$. In the status quo (S), the rich sets the tax rate.

The poor decides whether to start a revolution (R) or keep the status quo (S). Revolution is costly: $(1-\delta)$ of the income realized in that period is destroyed. After a revolution, the poor agents share the wealth equally and the rich lose everything.

Analysis Since the rich cannot commit to future redistribution, it can only set the tax rate in the current period to maximize $(1-\tau)x_r^e + (\tau - C(\tau))w^e$. Since $\frac{\theta}{\lambda} > 1$, the rich sets $\widehat{\tau}_r = 0$. Following Acemoglu and Robinson (2001) and Leventoglu (2013), we assume that revolution is sufficiently costly in economically good times. Hence there is no revolution either when $w = w^H$, and the rich also sets $\widehat{\tau}_r = 0$.

If $w = w^L$, there is a possibility of revolution. After a revolution, the poor agents share the wealth equally and the rich lose everything. This yields a utility for the poor:

$$x_p(R) = \frac{1}{1-\lambda}(\delta w^L + \beta \overline{w}). \tag{1}$$

where β is the discounting rate.

If $w = w^L$, then the rich would like set a tax rate of τ_r to avoid a revolution. The expected income of an agent i under this regime before the state of the economy is realized is given by:

$$\overline{x}_i(S) = (1-\pi)x_i^H + \pi[(1-\tau_r)x_i^L + (\tau_r - C(\tau_r))w^L].$$

When the state of the economy is realized as $w = w^L$, the utility of a poor agent under this status quo is given by:

$$x_p(S) = (1-\tau_r)x_p^L + (\tau_r - C(\tau_r))w^L + \beta[\eta_p \overline{x}_r(S) + (1-\eta_p)\overline{x}_p(S)]. \tag{2}$$

The best for the poor to get at the status quo is when $\tau_r = \widehat{\tau}_p$ such that $C'(\widehat{\tau}_p) = 1 - \frac{1-\theta}{1-\lambda}$. Thus, the poor would like to have revolution: $x_p(R) \geq x_p(S)$ where $x_p(S)$ is evaluated at $\tau_r = \widehat{\tau}_p$, i.e.,

$$\frac{1}{1-\lambda}(\delta_R w^L + \beta \overline{w}) \geq (1-\tau_r)x_p^L + (\tau_r - C(\tau_r))w^L + \beta[\eta_p \overline{x}_r(S) + (1-\eta_p)\overline{x}_p(S)] \tag{3}$$

Condition (3) gives the threshold of revolution δ^*. Besides,

$$\frac{\partial \delta^*}{\partial \eta_p} = \overline{x}_r(S) - \overline{x}_p(S) > 0. \tag{4}$$

This gives our main empirical hypothesis:

H. *A decrease of social mobility (η_p) decreases the threshold of revolution and hence makes revolution more likely.*

It also predicts that the effect of η_p should be more important in more unequal regions. In other words, the effect is larger in regions where it is more profitable to become the elite.

Consistency with the Historical Background This simple model is consistent with the historical background. The late Qing period was indeed economically bad times ($w = w^L$). Besides the incompetence and corruption of the government, the Western powers had launched in succession the Opium War, the Second Opium War, the Sino-French War, the Sino-Japanese War and the Eight-Power Allied Forces invasion, forcing China to sign a series of unequal treaties. These treaties are associated with large indemnities. For instance, the Treaty of 1901 required the government to pay eleven countries an indemnity of 450 million taels of silver, which was close the annual GDP during that period.

We interpret the abolition of the civil exam system as a decrease of η_p. This is reasonable giving the facts on social mobility shown in Panels A and B in Tables 1. Another interpretation of the abolition is that it decreases the current income x_p^L. This channel is relatively less impact as we examine a very short period and the income is unlikely to change dramatically. Empirically, we also examine the impact of income shocks proxied by weather shocks.

3 Data

3.1 Proxies for Mobility

Prefecture-level and County-level Quota We collect three sets of data to proxy social mobility:

(i) the quota for the first-level candidates (i.e., *Xiucai*) for 262 prefectures (controlling for the population size). This is our main measure of upward mobility opportunities for a large group of citizens across prefectures (after considering population size and other factors). The data comes from the Imperially Established Institutes and Laws of the Great Qing Dynasty (Qinding da Qing huidian shili, edited by Kun, Gang et al.). The quota for a prefecture is the sum of the numbers for the county schools and the prefectural-capital school (Figure A1 in the web appendix gives an example of how the quotas were recorded). As mentioned above, the numbers follow a stepwise rule. Figure 2 plots the frequency of numbers for the county schools and the prefectural-capital schools. As it shows, the most frequent numbers are 20, 15, 12 and 8, which account for over 70% of all the cases. This feature implies that the quotas can vary significantly across regions given the same population size. For example, other things being equal, a prefecture with more counties tend to have a higher quota. Later, we will explore such variations as an instrument.

[Figure 2 about here]

According to Chang (1955), the prefecture-level examination quotas were assigned during 1644-1724, and remained stable after 1724. The only change happened due to the Taiping Rebellion, when the quota was used to reward contribution to the repressing of the rebellion. The quota system was stable again between 1873 and 1904. Our main analysis focuses on the quota at the latter period as it is closer to the revolution. During this period, the average prefectural quota was 113.8 with a standard deviation of 75.7 (Table 2). The quota in the first-level exam in the whole Qing period accounts for about 2.3% of the population size in 1880.

Our empirical analysis focuses on the variations in the quota at the prefecture level while controlling for province fixed effects. This helps us take into consideration potential confounding factors at the province level. In fact, the province fixed effects only explain 30% of the variations in the quota, leaving a large chunk for our exploration within provinces.

[Table 2 about here]

(ii) candidates succeeded in the highest level exams (i.e., *Jinshi*) as well as key officials coming from different prefectures. The number of *Jinshi* was controlled by a provincial-level quota. The data comes from Zhu and Xie (1980) and Qian (2005), which list the name, and county of origins of all the *Jinshi* (candidates who passed the national-level exam) and key officials (higher than or equal to vice-provincial level). We count the number of *Jinshi* and key officials in each prefecture to measure the possibility of becoming the very elites. In our data, on average, 0.4% of Xiucai became *Jinshi* and about 15% of the *Jinshi* became key officials.

(iii) county-level quota for Guandong, where the revolution started. The data comes from the same source as in (i). The limitation of this data is that it misses the quota at the prefecture capital. However, as mentioned in the background, the data on revolutionaries in Guangdong can be traced to earlier years.

Figure 3 maps the spatial distribution of quotas as well as quotas per million of individuals. Among the 262 prefectures, the quota ranges from 2 (Maogong Ting in Sichuan) to 423 (Shuntian Fu where the capital was located). The quota per capita in 1880 varies from 8.6 per million (Haimen Ting in Jiangsu in the East) to 1704 per million (Anxi Zhou in Gansu in the west) with a mean of 135. Table 2 provides the data sources and summary statistics for these variables.

[**Figure 3 about here**]

3.2 Origins of the Revolutionaries and the Uprisings in 1911

Origins of the Revolutionaries We code the origins of revolutionaries in six major groups, based on the lists in Chang (1982) and Luo (1958). The lists provide a revolutionary's name, county of origin and the year of joining the organization.[10] Based on these information, we construct a dataset of prefecture-level participants across China between 1900 and 1906. This is the period when the revolution was spreading across the whole country. During this period, the origins of participants were widely distributed. The 1,277 recorded participants with identifiable origins came from 151 prefectures (across 17 out of the 18 provinces). The lowest share was 1.4% (from Shaanxi in the west) and the highest share is 11.93% (from Hubei). Related summary statistics are presented in Table 2. In our empirical analysis, we look at both the number of participants in a region as well as whether there were any participants.

A main concern is whether the participants recorded are representative of all the revolutionaries. To examine this concern, we compare the distribution of surnames of the revolutionaries to that of the whole population. Our testing bases on an assumption that the surname is not correlated with the likelihood of revolution participation. This assumption is supported by the studies on genetic structure, in which geneticists and physicists propose that surnames are passed down paternally (as is typical of patrilineal societies), and the underlying transmission rules are essentially the same as those of the Y chromosome (Kimura, 1983; Rossi, 2013; Zei et al., 1983). In China, surnames can be regarded as "selectively neutral" since the Song dynasty (960-1279), namely that it provides no selective advantage to the individual who possesses it (Du et al., 1992). As a result, the surname distribution of all the revolutionaries would have no systematical difference with that of the population. We can thus hypothesize that if our data missing is random, the distribution of surnames of the recorded revolutionaries should have no systematic difference from that of the population. When we compare the surname distribution of the recorded revolutionaries with that of the population, our null hypothesis (the data missing is random) can not be rejected if there is no systematic difference between them.

Because Chinese surnames are "selectively neutral" since the Song dynasty, the distribution of them has also been relatively stable. Yuan and Zhang (2002) provide the information of the top 100 surnames in the Ming dynasty and in the census of 1982 (there are only around 4,000 Chinese surnames and the top 100 surnames account for around 80% of the

[10] Chang's data is based on histories of *Kuomintang*, which were organized after *Kuomintang* retreated to Taiwan (in 1949).

population).[11] We compare the distribution of surnames of the revolutionaries to that of the population in Figure 4. The left figure in Panel A uses the population in 1982 and the right figure uses that in the Ming dynasty. As they show, the distribution of the surnames of revolution is very similar to that of the population.

A related concern is that the origins for some of the participants were not available and hence were dropped in our analysis (187 out of 1,464 are dropped). For this concern, we compare the distributions of family names of those used in our analysis and that of the population. These comparisons are presented in panel B of Figure 4. As they show, the distributions are once again similar. These comparisons give us confidence about the representativeness of our data on revolutionaries.

[**Figure 4 about here**]

We are also concerned about whether the early records are less precise than late records. We construct a county-level dataset for in the province where the revolutionary groups started, namely Gongdong between 1894 and 1906. Naturally, the majority of participants came from Guangdong in the beginning: 85% of the 244 recorded participants came from Guangdong before 1903. We complement the prefecture-level analysis with the county-level analysis within Guangdong.

The Uprisings in 1911 The *Xinhai* Revolution in 1911 consisted of many revolts and uprisings. The information on them was followed by Japanese newspapers. On November 3, 1911, the Tokyo Nichi Nichi Shimbun (the Tokyo Daily News) mapped the incidence of uprisings across China. We code the information on the short episode to be a dummy variable indicating whether there was an uprising in a prefecture in 1911. The mean and standard deviations of the variable are 0.16 and 0.37.

This data helps us further check the reliability of the revolutionary data we collect. We find that the incidence of uprising is highly correlated with the number of revolutionaries. Specifically, the correlation between the cumulative number of revolutionaries during 1900-06 and the incidence of uprising is 0.33 and significant at one percent level. Meanwhile, using this information, we can also link the number of revolutionaries to the incidence of uprisings.

3.3 Other Variables

Prefecture-level characteristics Since we employ the logged quota as our main explanatory variable, to control for the size effect, we include the logged population size in 1880.

[11] Figure A3 in the appendix illustrates the persistence of distribution of the top 100 surnames. Interestingly, as mentioned in Scott (1998), common citizens are called *LaoBaiXing* (the old 100 surnames) in Chinese.

Moreover, we also control for the logged area of the prefectures. As a robustness check, we also use the quota per million individuals as an alternative explanatory variable.

Due to potential importance of geography, we include two dummy variables: coast – whether a prefecture is situated on the seaboard (coast); and Yangtze river – whether a prefecture is located along the Yangtze River. Approximately 13.4 percent of the sampled prefectures are located on the coast and 6.1 percent are along the Yangtze River. Furthermore, provincial dummies are also included. These information is based on CHGIS.

After the first opium war (1839-42), China was forced to open, and new knowledge and economic forces began to penetrate China's economy. These penetrations might be correlated with the diffusion of revolutionary thought, so that it is necessary to control for its possible effects—measured by treaty ports. We assign a value of zero to prefectures with no treaty ports, and 1 to those with treaty ports based on Yan (1955). Table 2 shows that 11.45 percent of prefectures had treaty ports in 1904. The participation of revolution might also relate with economic conditions. To control for it, we include three levels of urbanization generated by Rozman (1974) in the form of dummy variables. According to Rozman's classification, big cities were those with a population of 300,000 and up, the ones in the middle between 70,000 and 300,000, and small cities between 30,000 and 70,000. According to these criteria, 19.84 percent or 52 prefectures are classified as small cities, 12.21 percent or 32 prefectures as mid-sized cities and 3.82 percent or 10 prefectures as big cities.

Besides these baseline controls, we also construct a dataset to measure the importance of a prefecture. These measures include (i) whether a prefecture is a provincial capital, (ii) the land tax per capita in 1820 (Liang 1981) and (iii) the designations by the government indicating whether a region belongs to four groups: *chong* (important in transportation/communication), *fan* (import in business), *pi* (difficult to gather taxes) and *nan* (high in crimes). The designation information is available for both counties and prefectures and is coded in Liu (1993).

As explained more in the instrumental variable section, we explore the number of confluences given the length of rivers in a prefecture as an instrument for the prefecture-level quota. The data on rivers in 1820 comes from CHGIS.

Other social mobility channels There are two main alternative channels of social mobility in late Qing: doing business and studying overseas. First, we employ the number of mechanized industrial firms that are above a designated size in each year as the proxy for measuring the first channel. Chang (1989) compiled ten series of extant materials on Chinese private enterprises and listed all modern firms with their locations and establishment dates. All firms in this study meet the following five criteria: (i) the firm is organized as a company;

(ii) the capital is over 10 thousand dollars; (iii) mechanization is used; (iv) there are over 30 employees; and (v) the value of the output is over 50 thousand dollars.

Second, in the late Qing period, to learn new knowledge and to be recruited by Qing Government, more and more educated Chinese left home to study overseas. In the main countries of the World (USA, England, German, France, and Japan), Japan was regarded as the most suitable country for Chinese to study in due to geo-graphical proximity and cultural similarity in Late Qing period. For instance, during 1900-1911, the total size of Chinese overseas students was estimated about 20 thousands, among which 90% studied in Japan (Yao, 2004). We construct a dataset which includes all Chinese students in technological academy, higher education institutions and universities. These data was edited by Shen (1978) based on the rosters of various Japanese schools. We employ the new students which arrived Japan of each prefecture in each year to be the proxy of this alternative channel.

If these measures only capture alternative mobility channels, we expect that they mitigate the impact of the abolition. However, these measures are also correlated with economic development and openness to new ideas, which may strengthen the impact of the abolition. Therefore, the direction of the overall effect is an empirical question.

Congress members in the Republican era We collect data on party identification of 863 congress members in the republican era and can identify the origins of prefectures for 703 of them. We are interested in whether our proxy for social mobility may be related to ideology. The data come from Chang (1985).

4 Baseline Results from Differences-in-Differences

4.1 Estimating the Elasticity

Before and After the Abolition Our baseline estimations are based on data across 262 prefectures between 1900 and 1906. To examine the impact of quotas on the participation of revolutionary groups before and after the abolition of the exam system in 1905, we use a difference-in-difference strategy. The specification is as follows:

$$\ln\left(1+\text{Member}\right)_{p,t} = \beta \ln \text{Quota}_p \times \text{Post}_t + \theta \text{X}_p \times \text{Post}_t + \lambda_p + \gamma_t + \delta_{prov} \times \gamma_t + \varepsilon_{p,t}, \tag{5}$$

where $\ln\left(1+\text{Member}\right)_{p,t}$ is the log of (1+ the number of members in revolutionary groups) in prefecture p and year t. $\ln \text{Quota}_p$ is the logged quota for the first-level candidates at the prefecture level. Post_t is a dummy equal to 1 for the years of 1905 and 1906.

λ_p and γ_t indicate prefecture and year fixed effects. In addition, to control for potential confounding factors at the province level such as the quotas at the province level for the candidates in higher-level exams, we also include a very flexible provincial-specific trends: $\delta_{prov} \times \gamma_t$.

X_p is a vector of prefecture-level characteristics. Naturally, we control for the logs of population size and area size. Additionally, we include a set of dummy variables indicating whether the prefecture located on the coast or Yangtze River, whether the prefecture is a treaty port and dummies for city ranks.

With the double-log specification, the coefficient β is the elasticity of the number of revolutionaries on the quota. The estimates of the elasticity are presented in Table 3. Column (1) only controls for prefecture and year fixed effects and column (2) also controls for provincial specific year dummies. Columns (3)-(6) further include the interactions of the post dummy and different sets of controls. Column (7) reports the results weighted by the population size. The results are consistent across these specifications: on average, 1 percent more in the quota increases the number of revolutionaries by about 0.2 percent (the estimates range from 0.16 to 0.34).

[Table 3 about here]

An alternative measure of the dependent variable is using a dummy to indicate whether there are participants. These results are presented in Table A1 in the web appendix. They deliver a similar message as in Table 3.

We also use an alternative way to measure social mobility: the ratio of the quota to population. The results are also consistent with our baseline results and are presented in the robustness checks in Section 5 when including mobilities at higher levels.

Dynamic Impacts A more flexible way to examine the link between the quota and the revolution is to look at the impacts of quotas year by year using the following specification:

$$\ln\left(1+\text{Member}\right)_{p,t} = \sum_{\tau=1901}^{1906} \beta_\tau \ln \text{Quota}_p \times \text{Year}_\tau + \theta_\tau \sum_{\tau=1901}^{1906} \text{X}_p \times \text{Year}_\tau + \lambda_p + \gamma_t + \delta_{prov} \times \gamma_t + \varepsilon_{p,t}, \tag{6}$$

where the year of 1900 is left as a comparison.

The results are presented in Table 4. Column (1) only includes the fixed effects and column (2) also controls for the interactions of logged population and year dummies as well as the interactions of logged area size and year dummies. Column (3) further controls for the interactions of other prefecture characteristics and year dummies. Column (4) reports the results after weighting by the population size.

The results in column (3) are visualized by the red lines in Figure 5, where the dashed red lines indicate the 95 percent confidence intervals. As shown in Table 4 and Figure 5, the positive impact of quotas took place in 1905, when the exam system was abolished. Moreover, the impact of the quota was close to 0 before the abolition of the exam.

[Table 4 about here]
[Figure 5 about here]

4.2 Linking the Elasticity to the Uprisings in 1911

The differences-in-differences give us an elasticity of the number of revolutionaries on the quota. What did an elasticity of 0.2 imply for the *Xinhai* Revolution that replaced the dynasty? To answer this question, we link the number of revolutionaries to the incidence of uprisings in 1911 by the following specification:

$$\text{Incidence}_{p,1911} = \alpha_1 \overline{\ln(1+\text{Member})}_{p,pre} + \alpha_2 \overline{\ln(1+\text{Member})}_{p,post} + \theta \text{X}_p + \delta_{prov} + \varepsilon_p,$$

where $\text{Incidence}_{p,1911}$ takes the value of 1 if there is at least one uprising in the prefecture in 1911.

Note that $\ln(1+\text{Member})_{p,t}$ studied in the main specification in a flow variable: the new members. Here, we are interested in a stock variable: the sum or the mean of members. We can assume no attrition of members or try different attrition rates of members. The results are similar. To save space, we report the results assuming no attrition in Table 5.

Columns (1)-(2) separate the results for the mean numbers of revolutionaries before and after the abolition. Columns (3)-(4) report results using the change of revolutionaries after the abolition. The previous finding says that one percent more in the quota increases the number of registered revolutionaries by about 0.2 percent after the abolition of the exam system. Here, we find that one percent more of revolutionaries due to the abolition increase the incidence of uprisings in 1911 by about 0.1 percentage points. Therefore, one percent more quota implies an 0.02 percentage points higher incidence of uprisings. Note that the variation in quotas is large (the standard deviation of $\ln \text{Quota}_p$ is 0.88). A standard deviation increase in $\ln \text{Quota}_p$ implies about 1.8 percentage points higher incidence of uprisings.

[Table 5 about here]

5 Robustness Checks and Alternative Explanations

We first present robustness checks for the baseline results. These checks show that our baseline estimates are robust and are consistent with our interpretation that the abolition discourages mobility more in regions with more mobility space. Then we compare this interpretation with six types of alternative explanations.

5.1 Robustness Checks

Using Alternative Dependent Variable In addition to using $\ln\left(1+\text{Member}\right)_{p,t}$ as our dependent variable, we also use a dummy indicating whether there are revolutionaries in a prefecture. The specification is very similar to the baseline and the result can be interpreted as the impact on probability of becoming revolutionaries. The results are very similar to the baseline ones except that the magnitudes are smaller. To save space, we present the results in the web appendix. Table A1 presents the main results and Figure A4 shows the dynamic effects.

Other Mobility Channels The civil exam system was the primary mobility channel in historical China. In the early 1900s, western influence brought two limited social mobility channels: doing business and studying overseas (particularly to Japan). One might wonder whether these channels could substitute for the civil service exam system. Note that these channels were only available to a tiny share of people. Moreover, these channels mattered in more developed regions where the impact of quotas could be larger. Hence, whether the impact of quota is mitigated or strengthened is an empirical question. To check this empirically, we collect data on the firms and the number of students studying in Japan across prefectures and examine their impact on the number of revolutionaries.

The specifications are similar to the baseline estimations, except that we are interested in the impacts of two triple interactions: $\ln \text{Quota}_p \times \text{Post}_t \times \ln(1+\#\text{Japan.Students})$ and $\ln \text{Quota}_p \times \text{Post}_t \times \ln(1+\#\text{Firms})$. The results are presented in Table 6. Column (1) shows that the number of firms has no impact on the number revolution participants. Instead of mitigating the impact of quotas on revolution, the impact of quotas is stronger in regions with more firms, as shown in column (2). This is likely due to the fact that the impact of quotas is stronger in more developed regions. As shown in columns (3) and (4), the results on studying in Japan delivers a similar message. Column (5) and (6) show all the channels together. Column (7) reports the results after weighting by the population size.

These results show that our baselind estimate varies little even after including these potential channels. In Figure 6 below, we will also show that the impacts of the number of students studying in Japan did not differ systematically before and after the abolition.

[Table 6 about here]

Using County-level Data in Guangdong (1894-1906) A second set of data we use the county-level information for 92 counties in Guangdong, where the revolutionary groups started. The advantage of this set of data is that we can trace back to even earlier years, namely since 1894. The disadvantage is that these results are limited to a certain province. Moreover, considering that counties could still compete for some quotas at the prefecture capital, we also control for prefecture-specific trends ($\delta_{pref} \times \gamma_t$).

The specifications are very similar to the prefecture-level analysis, except that the variables are replaced by county-level information:

$$\ln\left(1+\text{Member}\right)_{c,t} = \lambda_c + \gamma_t + \delta_{pref} \times \gamma_t + \beta \ln \text{Quota}_c \times \text{Post}_t + \theta \text{X}_c \times \text{Post}_t + \varepsilon_{c,t},$$

where c refers to a county.

The estimates of β are presented in Table 7. The results are consistent with the baseline estimations. The magnitudes are generally larger than the baseline results.

[Table 7 about here]

We also estimate the impacts year by year. To save space, these results are presented in Table A2 in the web appendix. The main finding (column (4) in Table A2) is also visualized by the black lines in Figure 4, where the dashed ones indicate the 95 percent confidence intervals.

5.2 Interpretation and Alternative Explanations

Our Interpretation Our interpretation of the baseline finding is that people in prefectures with more upward mobility space got discouraged more by the abolition. Consequently, they were more likely to be mobilized. This is not to say that all revolutionaries belong to this category. Indeed, some people became revolutionaries due to their ideology, their preference or their quest for modernization. However, those affected by traditional exam system were the majority. Even if some of them could switch to limited modern education, the link between their education and the political status under the exam system was interrupted. The purpose of this study is to investigate the impact of the interruption of this primary political and economic mobility channel and how the impact differs across regions contingent on mobility opportunities under the exam system.

Alternative I: "Modern" Human Capital for Revolution One alternative interpretation of our finding is that regions with higher quotas were also rich of "modern" human capital and human minds that demanded modernization through revolution. This interpretation follows the logic in Huntington (1968), where modernization causes instability due to modern education.

We do not deny that some people became revolutionaries due to their ideology, their preference or their quest for modernization. Our interpretation of the main finding is that those whose future got discouraged were more likely to be mobilized. In fact, our interpretation is also closely related to the returns of human capital: the political and economic returns to human capital under the exam became much lower after the abolition. Moreover, the dynamic results in Figure 5 show that the effect of quotas on the number of revolutionaries only took place after the abolition of the exam. If modernization is the main story, it is unclear that we should expect such a discontinuity.

Moreover, when we study the impact of the number of students studying in Japan, we found that it had a postive effect on the number of re (as shown in Table 7). Since this number varies year by year, we can check whether its impact differed before and after the abolition by evaluating its impacts year by year.

The results are visualized in Figure 6, where the dashed red lines indicate the 95 percent confidence intervals. As it shows, there is no systematic discountinuity before and after 1905. As already shown in Table 7, our baseline estimate varies little after including its impact.

[Figure 6 about here]

Alternative II: Political Connectedness One alternative explanation is that higher quotas imply political connectedness. To check whether this is the case, we also collect data on candidates at higher levels, which allows us to examine the importance of political connectedness.

$$\begin{aligned}\ln(1+\text{Member})_{p,t} &= \beta_1\left(\frac{\text{Quota}}{\text{Population}}\right)_p\times\text{Post}_t+\beta_2\left(\frac{\text{Jinshi}}{\text{Quota}}\right)_p\times\text{Post}_t+\beta_3\left(\frac{\text{Officials}}{\text{Jinshi}}\right)_p\times\text{Post}_t\\ &\quad+\theta\text{X}_p\times\text{Post}_t+\lambda_p+\gamma_t+\delta_{prov}\times\gamma_t+\varepsilon_{p,t}.\end{aligned}$$

As mentioned above, the averages of $\frac{\text{Quota}}{\text{Population}}$, $\frac{\text{Jinshi}}{\text{Quota}}$ and $\frac{\text{Officials}}{\text{Jinshi}}$ are around 2%, 0.04% and 15% for the whole Qing period. This robustness check serves two purposes. The first is to check that the baseline results are robust to an alternative measure of mobility: here we use $\frac{\text{Quota}}{\text{Population}}$ instead of the logged quota (while controlling for the log of population). The second is to check which level of mobility matters for revolution. The results are presented in Table 8.

To facilitate the reading of coefficients, $\frac{\text{Quota}}{\text{Population}}$ and $\frac{\text{Jinshi}}{\text{Quota}}$ are multiplied by one hundred in the estimations. Columns (1)-(3) present the results for $\frac{\text{Quota}}{\text{Population}}$, $\frac{\text{Jinshi}}{\text{Quota}}$ and $\frac{\text{Officials}}{\text{Jinshi}}$ respectively. Column (4) presents the horse-race results with all three levels and column (5) presents the results weighted by population size. As they show, what matters is the lowest level of mobility. This is reasonable given that this level concerns a large share of population and matters most for the entry of the gentry class.

[Table 8 about here]

Alternative III: Economic Shocks As discussed in the conceptual framework, we interpret the impact of the abolition as discouragement of social mobility (a decrease of η_p). Another interpretation is that the abolition decreases the current income (x_p^L) and this effect is larger in regions with higher quotas. We think that the latter is of less importance given that the abolition of the exam did not suddenly push people under subsistence level. One way to test whether the decrease of current income matters in this context is to employ weather shocks that have been documented to matter in conflict such as sino-normadic conflict and peasant rebellions (see Hsiang et al. (2013) for a recent survey of related studies).

The results are presented in Table 9. In Column (1) and (2), we employ a dummy variable indicating whether the rainfall is extremely low or high to measure the weather shock.[12] The results show that the weather shock (in the year) has no significant effect on the participation of revolution. Moreover, the effects of the abolition of civil examination in the region with more rainfall do not differ with that in the region with less rainfall, when we employ the average rainfall index during 1800-99 to proxy the average weather of a prefecture (Column (3) and (4)). But, we do find that the effect of quota is much stronger in the region with more volatile yearly rainfall. Specifically, we employ the standard deviation of rainfall index during 1800-99 to proxy the volatility of rainfall in a prefecture, and find the effect of the quota is larger in the prefecture with larger variations (Column (6)).

[Table 9 about here]

Alternative IV: Prefectural Importance Another interpretation is that the regions with more mobility space were also regions of more importance, where more people joined the revolutionary groups.

We measure the importance in various ways: (i) whether a prefecture is a provincial capital, (ii) the land tax per capita in 1820 and (iii) the designations by the government indicating whether a region belongs to four groups: *chong* (important in transporta-

[12] The data comes from the State Meteorological Society (1981).

tion/communication), *fan* (import in business), *pi* (difficult to gather taxes) and *nan* (high in crimes).

The results are presented in Table 10. As they show, these characteristics do not affect the number of revolutionaries after the abolition and the impact of quotas holds after controlling for these factors and their interactions with the post dummy.

[**Table 10 about here**]

Alternative V: Ideology One may wonder whether the quota also captures certain political preference we cannot measure. For example, citizens in regions with higher quotas might be more radical politically. To check whether this is the case, we link the quota system to individual's party identification among the congress members in 1912, using the following cross-sectional specification:

$$KMT_{i,p} = \varphi \ln \text{Quota}_p + \delta_{prov} + \varepsilon_{i,p},$$

where $KMT_{i,p}$ is a dummy indicating whether a party member i belongs to the *Kuomintang* or not. Compared with the other parties (the *Kunghotang* and the *Minzhutang*), *Kuomintang* (which literally means "Chinese Nationalist Party") was known to be more radical. In contrast, the party ideology of the *Kunghotang* was based on Jean-Jacques Rousseau's The Social Contract whereas the *Minzhutang* emphasizes that stability was of their primary goal.

The results are presented in columns (1)-(3) in Table 11. Among the 703 party members we can identify the origins and ages, 434 are identified with Kuomintang. Based on the individual-level information, we do not find any significant impact of the quota on party identification. However, consistent with the hypothesis that the *Kuomintang* was more radical, we find that younger people are more likely to identify themselves as the *Kuomintang* members.

Columns (4)-(7) report the results using prefecture-level information to examine the link between quotas and the number of party members. As they show, quotas increase the number of party members in both the *Kungmintang* and the other parties. This finding is expected because more revolutionaries naturally lead to more party members after the success of revolution. However, the magnitudes of the impacts on the *Kungmintang* vs. the other parties are are similar (0.158 vs. 0.178).

These findings suggest that ideological difference is unlikely to explain our finding.

[**Table 11 about here**]

Alternative VI: Other Omitted Variables Besides what we have considered, one may imagine other omitted variables correlated with the quota. Even the impacts of these variables do not differ before and after the abolition, our baseline estimates are valid. We are concerned whether this assumption is true given that the selection criteria of officials after the abolition may be correlated with the quota. To deal with this concern, we employ two instrumental variables in section 6.

Alternative VII: Behavioral Explanations One can also imagine alternative explanations where people felt betrayed by the traditional system and their decision of becoming a revolutionary is not really rational. We take a rational choice approach to understand the participation in revolution, because the participation in revolution was a risky choice in this period. For example, even close to the success of the revolution, the Second Guangzhou Uprising in April 1911 led to the death of at least 86 revolutionaries.

6 Results from Instrumental Variables

We have shown that the results from differences-in-differences are robust to various checks. However, using DID strategy, we can rule out the effects of omitted variables only when their effects do not change before and after the abolition of civil examinations. But, this may not be the case, given that the government still selects bureaucrats after the abolition of the exam, which is affected by incumbents correlated with the quota system. Although the quota had no direct effect on the selection of civil servants after the abolition, the effect of the omitted variables is likely to increase. In other words, these omitted variables provide more negative incentives on the participation of revolution. As a result, the DID methods are likely to bias our estimate downward. To correct the potential bias, we employ explore two instruments for the quota.

Instrument I: Confluence of rivers (given river lengths) Our first instrument stems from geographical characteristics. Conceptually, for two prefectures with the same population size, the prefecture with more counties enjoy more quotas, because there were usually one or more schools for each county and the quota is assigned based on schools. Therefore, we would like to find an instrument that affects the formation of counties in a prefecture but does not affect revolution through other channels such as economic development. Inspired by Scott (2009), geography suitability for forming an alluvial plain is a reasonable candidate, because an alluvial plain provides natural focal point for the population. Figure 7 maps the spatial distribution of rivers and counties and gives an example after zooming in part of the map.[13] It suggests that the it is reasonable to link the location of counties with confluences of rivers.[14]

[Figure 7 about here]

However, there are two concerns of using confluence of rivers as an instrument. The first is that it might also affect economic development. Therefore, we use the number of confluences given the length of rivers. Additionally, we also control for whether the river is a main river (ranked 1 and 2 in the river ranks). We conduct a set of placebo tests to show that the shape of rivers conditional on the length and the rank does not affect other dimensions like transportation, agricultural suitability and climate shocks.

A second concern is that the number of confluences might be endogenous if there are no stable river courses. The well-known case is the middle and low reaches of Yellow River that changed periodically. Figure A6 in the web appendix compares the main rivers in 1820 and those in 2000, which shows that the middle and low reaches of Yellow River is the only region with big changes in river courses. Therefore, we drop the 19 prefectures located in this region (the shaded area in Figure A6).

In sum, the channel that the ratio of river junctures to river length affects the prefecture-level is as follows:

$$\# \textit{ of confluences/river length in a prefecture} \rightarrow \textit{the number of counties} \rightarrow \textit{quota}$$

We show this channel in Figure 8. The Panel A of Figure 8 shows that there exists a positive relationship between the ratio of confluences to the river length and the number of counties. One increase in the number of confluences (per 100 kilometers river) will lead to 5.36 increase in the number of counties. Moreover, the Panel B of Figure 8 shows that the number of counties is highly related with quota. In terms of magnitude, with one more county in a prefecture, the quota will increase about 6.42.

[Figure 8 about here]

[13] Different from the case in the United States where river branches often work as county boundaries (Hoxby, 2000), counties in China tend to include rivers inside their boundaries, due to the important of agriculture. The case of counties in China may also apply to other parts of Asia where agriculture was of primary importance in the historical periods.

[14] Figure A5 in the web appendix gives the distribution of confluences calculated from the information on rivers.

Validity tests of instrument I To check whether the ratio of confluences to the river length is a valid instrument, we first show it is indeed positively correlated with prefecture-level quota, and second do a sets of placebo tests to check whether our instrument satisfies the exclusion restriction. We begin with regressing the quota (in log-term) on the instrument using the following specification:

$$\ln \text{Quota}_p = \rho(\frac{Confluence}{RiverLength})_p + \theta \text{X}_p + \delta_1 \ln \text{Riverlength}_p + \delta_2 \text{MainRiver}_p + \delta_{prov} + \varepsilon_p,$$

where $(\frac{Confluence}{RiverLength})_p$ measures the number of confluences relative to total river lengths in prefecture p.

We control for the same variables as in the baseline estimations. In addition, to take into account possible effects of rivers, we also include the log of river lengths and a dummy indicator on the main rivers. Columns (1) in Table 12 reports the impacts of $(\frac{Confluence}{RiverLength})_p$ on the log of quotas and show that $(\frac{Confluence}{RiverLength})_p$ is strongly positively correlated with the log of quotas. In term of magnitude, one-standard deviation increase in the ratio to the river length (0.401) will lead to 13.0 percent increase in quota. During the whole Qing dynasty, the quotas were relatively stable after 1724, with the only biggest change happening during the Taiping Rebellion.[15] According to the logic of our instrument, the ratio of confluence to river length should positively affect the quota in the quota before the Taiping rebellion with similar magnitude. We report the effect of our instrument on the quota before Taiping Rebellion in Column (2) of Table 12, which shows that one-standard deviation increase in the ratio to the river length (0.401) will lead to 12.7 percent increase in quota. This effect trivially differs from that on the quota after the Taiping Rebellion. Using the change in quota as our dependent variable, we repeat the regression in Column (3), and find that there is no significant effect on quota's growth.

[Table 12 about here]

Our instrument is valid only when it affects the participation of revolution only via quotas. To check whether this is a concern, we conduct three sets of placebo tests. First, the region with more river confluences might be more likely to be a communication/transportation center and we need to examine the relationship between our instrument and transportation conditions. In Qing dynasty, every administrative unit was characterized by a dummy variable indicating whether it is a communication center or not (*Chong* in Chinese). With this information, we regress the prefecture-level transportation indicator on our instrument

[15] In Chang (1955), the sum of the quotas before the Taiping Rebellion was 25,089 and increased to 30,113 after the rebellion. The increase is around 20 percent.

with controlling for the same control variables, which shows that there is no significant relationship. Based on the county-level binary indicator on transportation, we take the average of all counties to generate a prefecture level measurement as an alternative proxy of transportation. As expected, being located on a major river is correlated with transportation importance but the number of confluences relative to total river lengths is not. Column (4) shows that our instrument has no significant effect on it.

Second, it is possible that more confluences might imply good irrigation conditions. To rule out such possibility, we examine whether the instrument is correlated with suitability of different crops premised on the notion that good irrigation might lead to higher crop suitability. We employ the suitability for three crops: rice - a crop highly dependent on water; foxmillet - a traditional Chinese drought-resistant crop; and sweet potato - the main New World crop in China. Columns (6)-(8) show that there is no significant relationship.

Third, we also wonder whether the incidence of climate disasters might systematically differ between the two prefectures with different density of confluences. We construct a measure on the drought/flood index from -2 to 2 during 1800-99, and find that our instrument is not significantly correlated with it (Columns (9)).

Estimation results from instrument I Given the validity tests, we perform the instrument variable estimations. The first stage and second stage estimations are as follows:

$$\begin{aligned} \ln \mathrm{Quota}_p \times \mathrm{Post}_t &= \rho\left(\frac{Confluence}{RiverLength}\right)_p \times \mathrm{Post04}_t + \theta \mathrm{X}_p \times \mathrm{Post}_t + \psi \mathrm{Mainriver} \times \mathrm{Post}_t \\ &\quad + \delta \ln \mathrm{RiverLength_p} \times \mathrm{Post_t} + \lambda_p + \gamma_t + \delta_{prov} \times \gamma_t + \varepsilon_{p,t}, \end{aligned}$$

and

$$\begin{aligned} \ln{(1+\mathrm{Member})}_{p,t} &= \beta \widehat{\ln \mathrm{Quota}_p \times \mathrm{P}}\mathrm{ost04}_t + \Pi_p \times \mathrm{Post}_t + \theta \mathrm{X}_p \times \mathrm{Post}_t + \psi \mathrm{Mainriver} \times \mathrm{Post}_t \\ &\quad + \delta \ln \mathrm{RiverLength_p} \times \mathrm{Post_t} + \lambda_p + \gamma_t + \delta_{prov} \times \gamma_t + \varepsilon_{p,t}. \end{aligned}$$

Since we drop the prefectures located in the middle-low reaches of Yellow river, we first report the baseline result using this subsample in Column (1) of Table 13. We find that quota's effect increase about 0.177 with the abolition of civil examination, which is very similar with the baseline results using the whole sample. Column (2) presents the results for the reduced-form The instrumental evidence are presented in Column (3)-(7) of Table 13. In Column (2), we include the river length, the indicator of main river, and all control variables of baseline estimation, and find that the quota's effect significantly increase with the abolition of civil examination. Moreover, the magnitude is much larger than our baseline results.

Though we have shown that our instrument is not related with transportation and agricultural production conditions, perhaps a more intuitive check of robustness of our estimations is to include these variables to see if they may change the effect of instrumented quota. In Column (4), we first include the prefecture level indicator of communication center, and the crop suitabilities for three crops, and find that the coefficient of $\ln \text{Quota}_p \times \text{Post}_t$ only trivially changes. When we replace the prefecture level indicator with the county's average, the coefficient remain similar. In Column (6) and (7), we further include the drought/flood index during 1800-99, and the results remain stable.

[Table 13 about here]

Instrument II: Exam performance before the adoption of quota system Our alternative instrument stems from historical roots of the quota system. As we introduced above, the quota was assigned to schools. The school system was initially employed during Ming dynasty (AD 1368-1644) in 1425. Before 1425, there was no school system, and no regular quota of successful candidates for a specific region. In 1425, the regional quota system was firstly adopted to balance the opportunity to pass the national exam. Thereafter, the central government began to appoint government officials to each prefecture and county in 1436 (School Supervisor, "*Tidu Xuexiao Guan*" in Chinese), who supervised regional schools and selected certain number of candidates to join the higher level exam (Wang 2005). In short, there was no formal regulation on the regional quota before 1425 and the regulation and institution were initially adopted during 1425-36.

We hypothesize that the performance in civil exam before 1425, measured by the number of *Jinshi* (those succeeding in the national-level exam), could affect the subsequent quota assignment. The region with better performance is likely to be assigned more quota. However, we also need to make sure that the performance measure did not have long-run impact on candidates. Therefore, we would like to employ changes of the number of *Jinshi* in a very short run. The idea is that the short-run change in performance may be driven by random factors that did not have long-run impacts. Following this thought experientment, we divide the pre-1425 period into two sub-periods (1368-1398 and 1399-1425). Denote the number of *Jinshi* in log-term during Period 0 as $(\ln[1+Jinshi_0])_p$ and that during Period 1 as $(\ln[1+Jinshi_1])_p$, we employ $(\Delta \ln Jinshi)_p$, namely the first difference of exam performance, as our alternative instrument. Another advantage to employ the first-difference is to rule out the time-invariant prefecture-specific factors.

We first examine its effect on the quota using the specification as follows:

$$\ln \text{Quota}_p = \rho\Delta \ln Jinshi_p + \theta \text{X}_p + \delta(\ln[1+\text{Jinshi}_0])_{\text{p}} + \delta_{prov} + \varepsilon_p,$$

where we control for the same variables as in the baseline estimations and the performance of civil exam during 1368-1398. Columns (1) of Table 14 reports the effects of $(\Delta \ln Jinshi)_p$ on the log of quotas and show that they are significantly positively correlated. Moreover, we examine the effect of $\Delta \ln Jinshi_p$ on the quota in the quota before the Taiping rebellion (column (2)) and the change during Taiping Rebellion (column (3)). We find that it significantly correlates with the quota before Taiping Rebellion but has no impact on the growth of the quota.

As placebo tests, we examine whether this instrument affect changes in the number of *Jinshi* in longer periods. We looked at seven periods (defined by the tenures of emperors), and take first difference in the number of *Jinshi* (in log-term). By regressing these differences on our instrument, we do not find any significant correlations, as shown in columns (4)-(9)

[Table 14 about here]

The first stage and second stage estimations are similar to that for the first instrument:

$$\begin{aligned}
\ln \text{Quota}_p \times \text{Post}_t &= \rho\Delta \ln Jinshi_p \times \text{Post04}_t + \theta \text{X}_p \times \text{Post}_t \\
&\quad + \delta \ln[1 + Jinshi_0]_p \times \text{Post}_{\text{t}} + \lambda_p + \gamma_t + \delta_{prov} \times \gamma_t + \varepsilon_{p,t},
\end{aligned}$$

and

$$\begin{aligned}
\ln(1 + \text{Member})_{p,t} &= \beta \widehat{\ln \text{Quota}_p \times \text{Post04}_t} + \Pi_p \times \text{Post}_t + \theta \text{X}_p \times \text{Post}_t \\
&\quad + \delta \ln[1 + Jinshi_0]_p \times \text{Post}_{\text{t}} + \lambda_p + \gamma_t + \delta_{prov} \times \gamma_t + \varepsilon_{p,t}.
\end{aligned}$$

The results are presented in Table 15. Column (1) reports the result with only including the control variables of baseline estimation and $(\ln[1+Jinshi_0])_{\text{p}}$, which shows that the quota's effect significantly increase with the abolition of civil examination. The magnitude is alse larger than our baseline results. The coefficient trivially changes when we include the additional controls, such as the length of rivers, indicators for main rivers and transportation centers and crop suitability, as shown in columns (2)-(4).

To compare with the results using the density of confluences as instrument, we run the IV-regression based on the subsample (dropping the Middle and Low reaches of Yellow River), and find that the effects are stable, as shown in columns (5)-(6). Compared with Table 12, we find the effect of Quota instrumented by historical exam performance is slightly larger than that instrumented by the density of confluences.

To check if our instruments of "historical exam performance" and "the density of confluences" are valid, it is necessary to ensure that they do not have any direct effects on the participation of revolution. To ensure that "the density of confluences" does not have any direct effect, we use "historical exam performance" to instrument for quotas, followed by adding "the density of confluences" to the model as the exogenous regressor. Our instrument of "the density of confluences" would be rendered invalid if it has a significant effect on the dependent variable. This method can be regarded as an easy-to-interpret version of the over-identification test. The results are reported in column (7), which shows that the effect of "the density of confluences" is insignificant. Similarly, we employ "the density of confluences" as instrument and include "historical exam performance" as the exogenous regressor. The results reported in column (8) also show that it has no direct effect on the revolution participation. These tests imply that the validity of the two instrument cannot be rejected.

[**Table 15 about here**]

7 Conclusion

Exploring the unique historical event of the abolition of the civil exam system in historical China, this paper documents that more people became revolutionaries in regions with more quotas (after controlling for population sizes) after the abolition. The finding is consistent with the interpretations that it is easier to mobilize revolutionaries in regions with more upward mobility space before the abolition. It contributes to the literature on social mobility on political stability, where there has been very little empirical evidence.

We realize that this important historical event might trigger many responses in the society and that the quota of a prefecture might be correlated with other prefecture characteristics. However, for other alternative channels to explain our finding, they have to be systematically correlated the quota and their impacts have to be discontinuous before and after the abolition. After comparing with various types of alternative explanations, the mobility channel governed by the quota system appears to be the most likely one.

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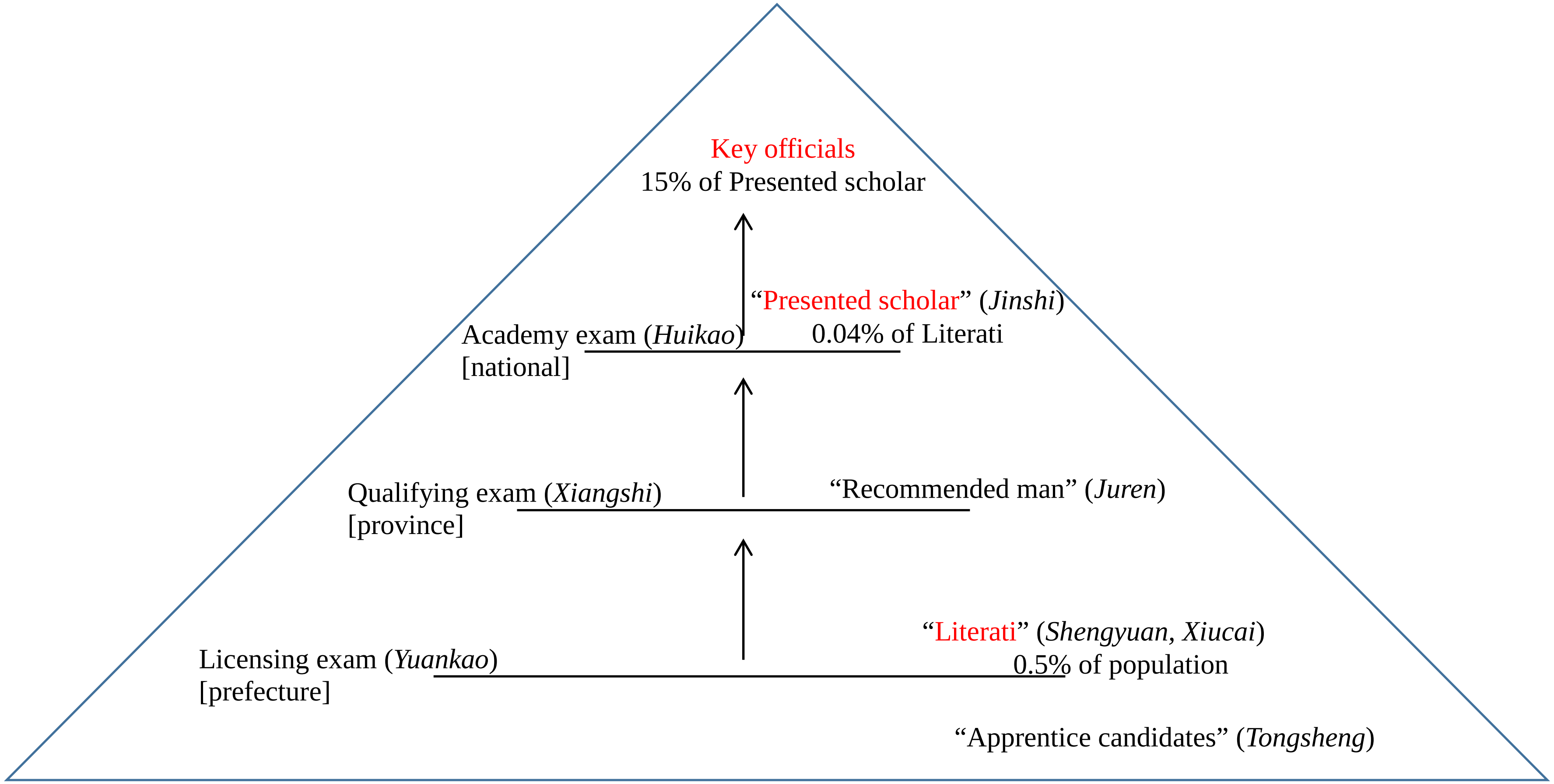
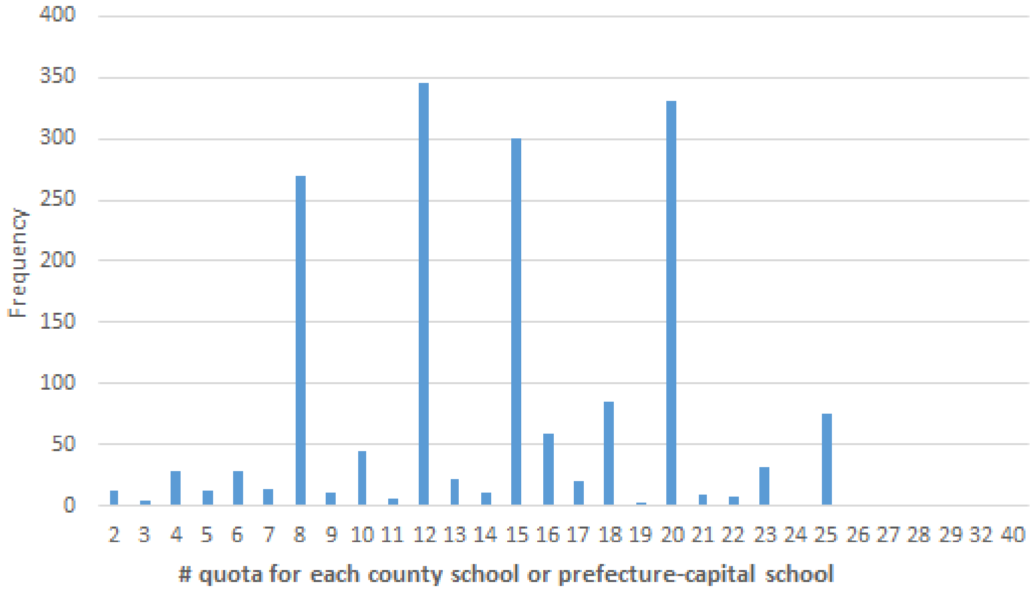
Figure 1: The Structure of Civil Examination System



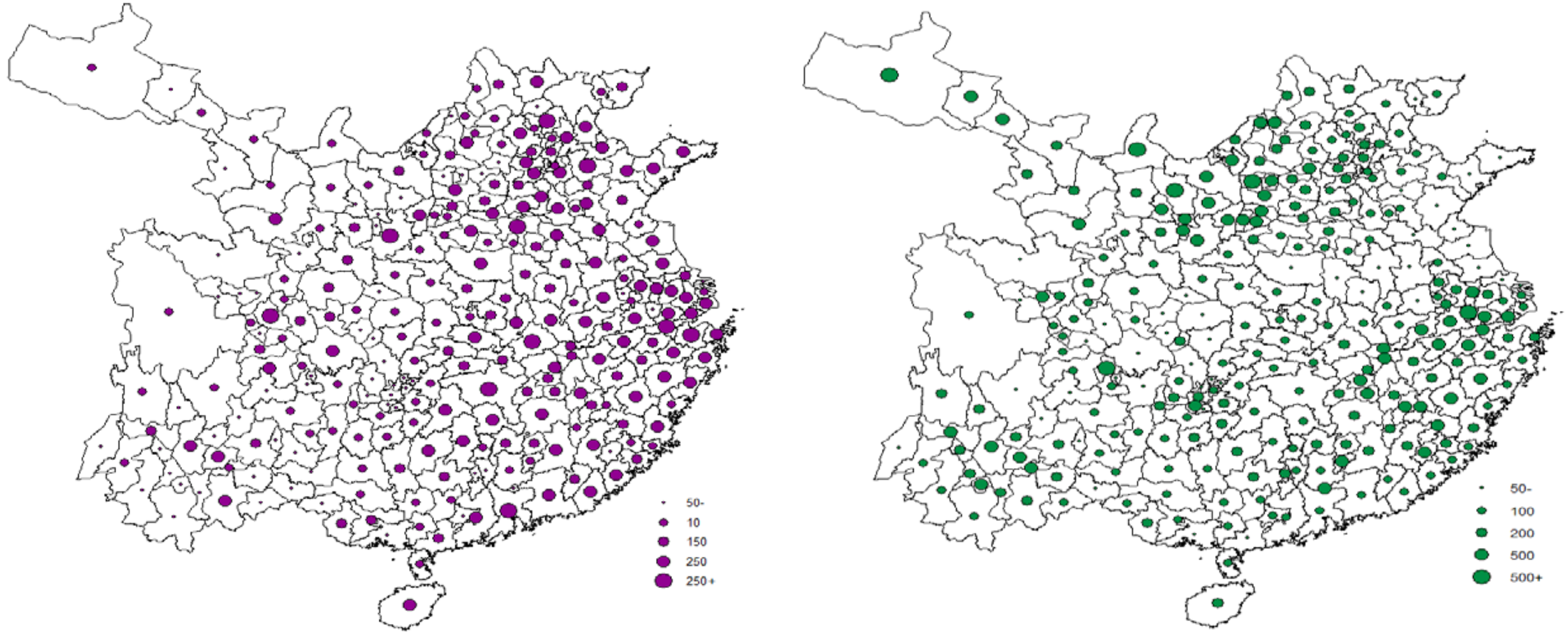
Notes: the data on the prefecture-level exam graduates comes from (Kun, Gang et al. 1899). The data on the national-level exam graduates comes from Zhu and Xie (1980). The data on officials is from Qian (2005) and the population data is from Ge (2000). We do not have information on the number of province-level exam candidates. The ratios are calculated based on these data.

Figure 2: Distribution of Quotas for County Schools and Prefecture-Capital Schools



Notes: This figure shows that the number of quota assigned to schools within prefectures is stepwise: the most frequent numbers are 20, 15, 12 and 8. This is because the government needs a simplified way of implementing the quota system, which is similar to the "state simplifications" logic in Scott (1998).

Figure 3: The Spatial Distribution of Quota



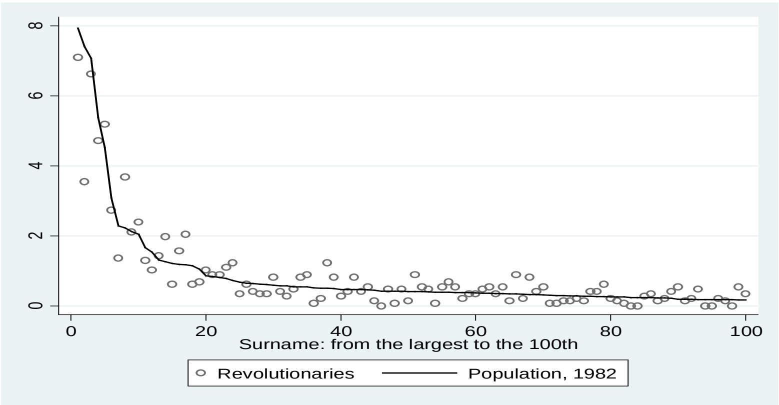
Panel A: the Number of Quota

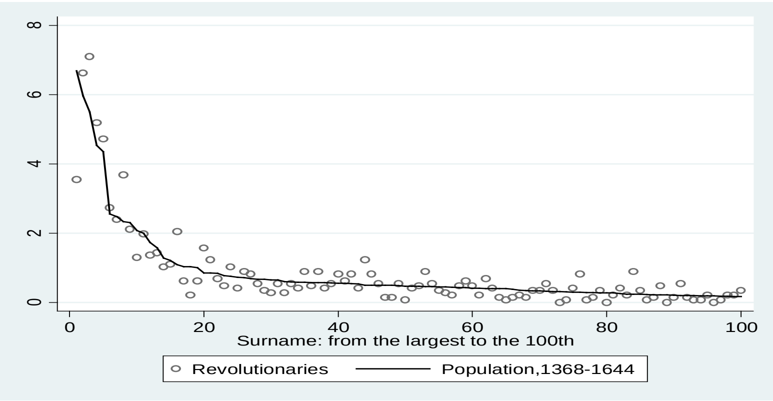
Panel B: the Number of Quota per 1 Million Populations in 1880

Notes: This figure shows that there are great regional variations in terms of quota and quota per capita. For example, province fixed effects only explain 30% of the variations across prefectures.

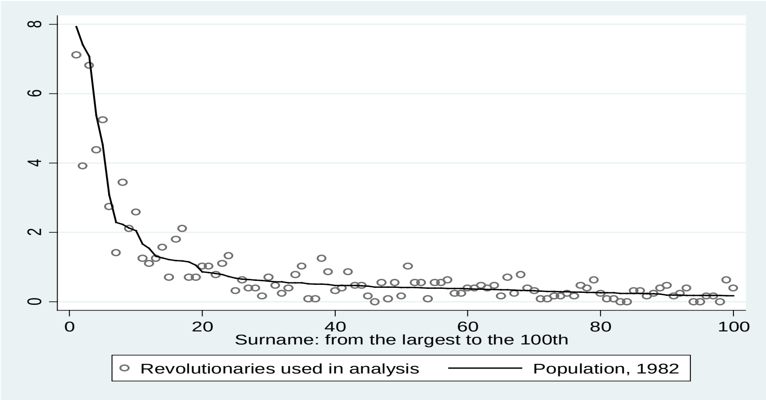
Figure 4: Representativeness of the Recorded Participants: Distribution of Family Names

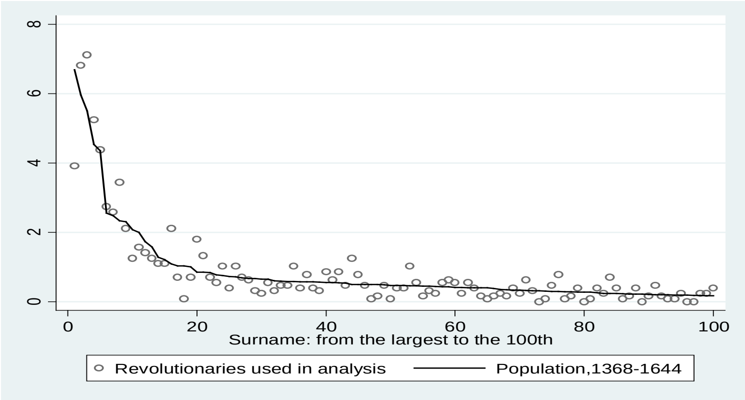
Panel A: All the Recorded Revolutionaries vs. the Population





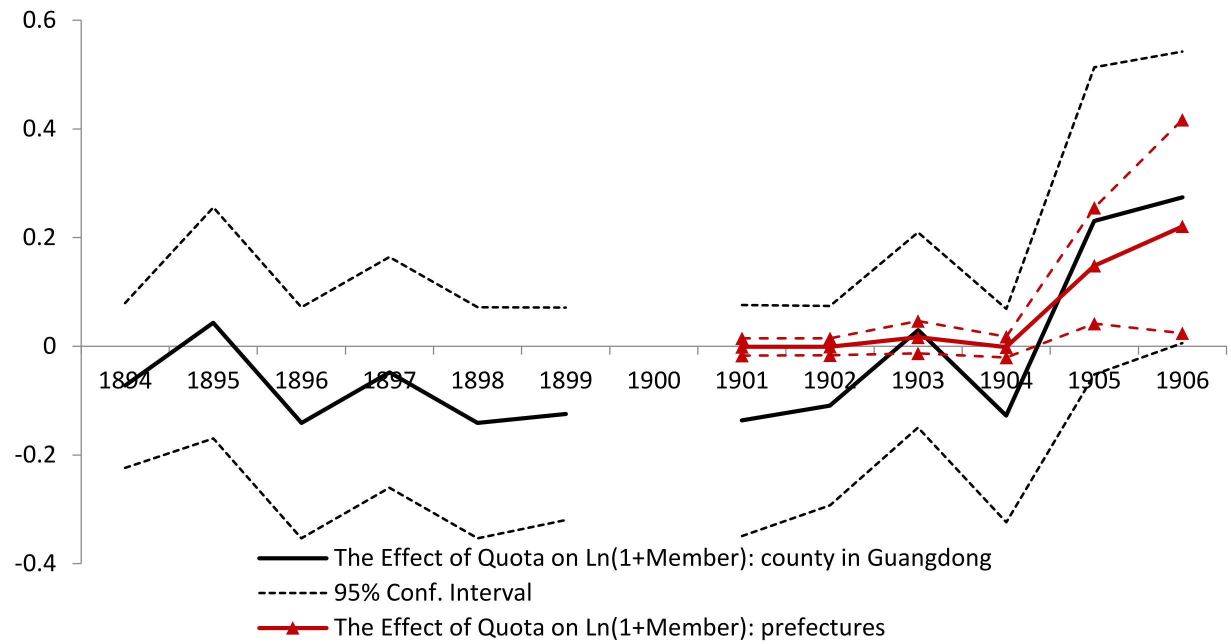
Panel B: Revolutionaries with Origins vs. the Population





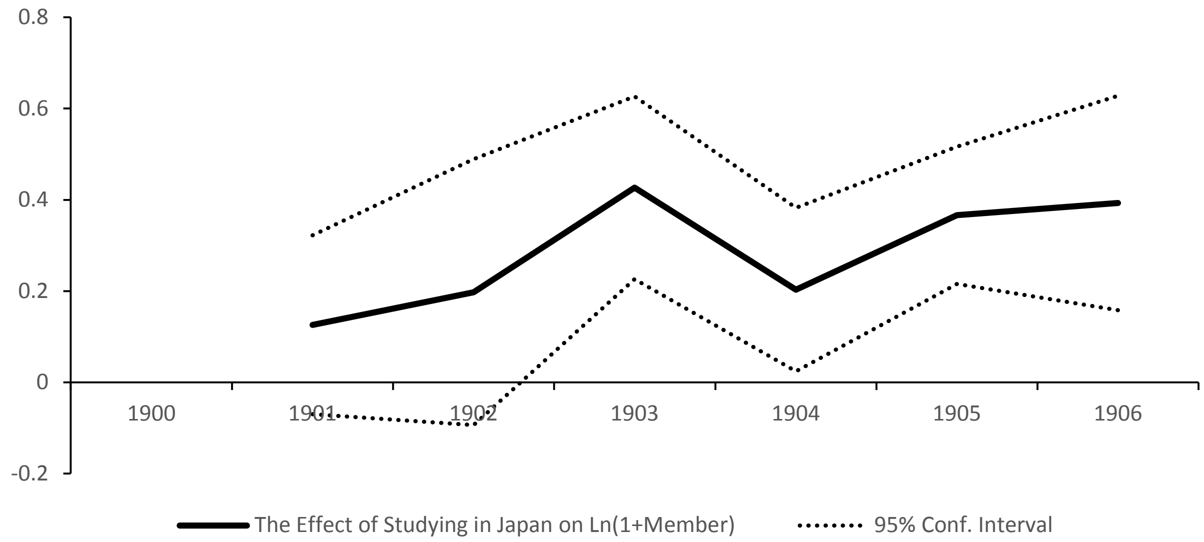
Notes: The figure shows that the surname distribution of revolutionaries are consistent with that of the population. This suggests that the registered revolutionaries are representative.

Figure 5: The Dynamic Impacts of ln Quota on ln (1+Member)



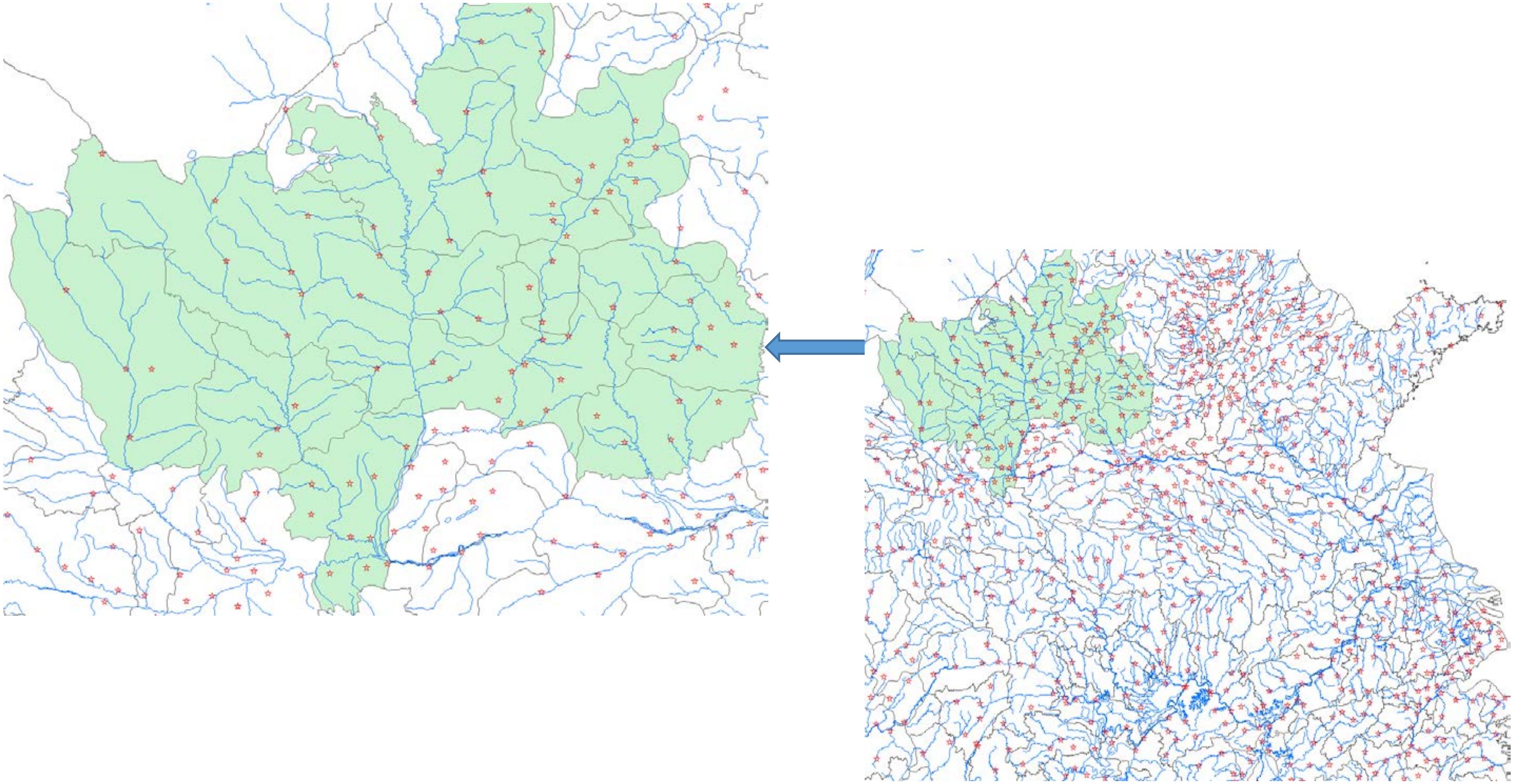
Notes: This figure presents the dynamic effects of the quota on the number of revolutionaries, using the year 1900 as reference group. The red lines are the results using the prefecture-level data between 1900 and 1906. The black lines are those using county-level data in Guangdong between 1894 and 1906. The dashed lines indicate the 95% confidence intervals. These results show that the impact of the quota only took place after the abolition of the exam.

Figure 6: The Dynamic Impacts of Studying in Japan on on ln (1+Member)



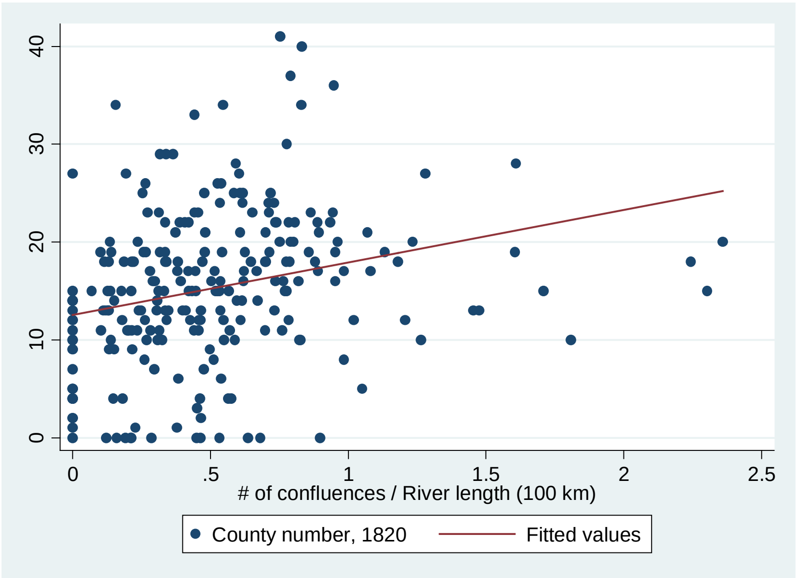
Notes: This figure shows that the impacts of the number of students studying in Japan did not systematically before and after the abolition in 1905. These estimates are obtained by examining the impact of the number of students studying in Japan year by year.

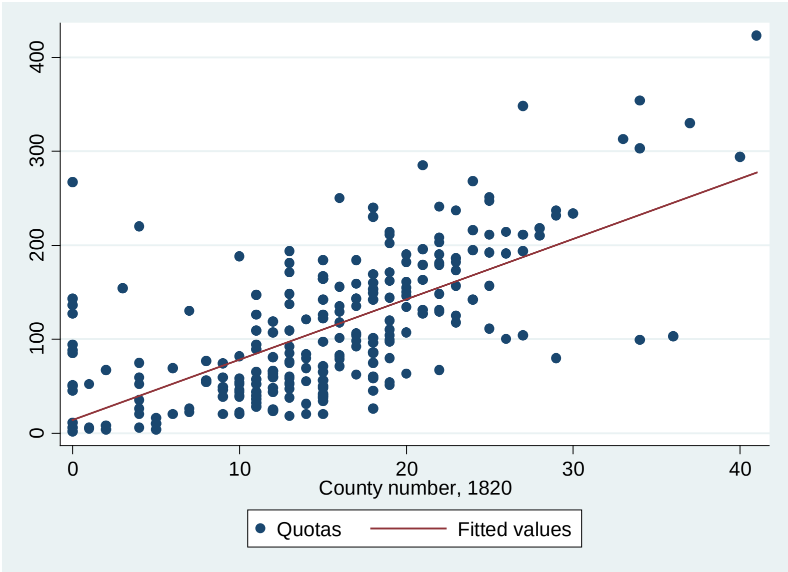
Figure 7: Rivers, Confluences and Counties



Notes: These two maps show that it is reasonable to assume that confluences of rivers matter for the formation of counties. The left panel zooms in part of the map on the right.

Figure 8: River Confluences, County Number, and Quotas





Panel A: River Confluences and County Numbers
#county=12.57+5.36(***) #confluences/river length

Panel B: County Numbers and Quotas
#quotas=14.00+6.42 (***) #counties

Notes: This figure shows that the number of confluences (given the length of river) in a prefecture increases the number of counties and the number of counties increases the quotas.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 1: The Exam Quota System and Upward Mobility: Before and After the Abolition

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: With the exam system					
Dependent Var.	ln (1+ # Jinshi)			ln (1+ # Officials)		
ln Quota	1.429***	1.283***	1.140***	1.073***	0.867***	0.785***
	(0.062)	(0.095)	(0.107)	(0.064)	(0.098)	(0.112)
ln Population 1880		0.160**	0.238***		0.224***	0.201**
		(0.079)	(0.091)		(0.081)	(0.096)
Province FE			Y			Y
Observations	262	262	262	262	262	262
R-squared	0.669	0.674	0.752	0.518	0.532	0.626
	Panel B: Without the exam system					
	ln (1+ # Congress mem. in 1908) *Before the Republic*			ln (1+ # Congress mem. in 1912) *The Republic*		
ln Quota	0.232***	0.131***	0.112**	0.590***	0.400***	0.364***
	(0.028)	(0.044)	(0.056)	(0.033)	(0.050)	(0.063)
ln Population 1910		0.111***	0.121**		0.209***	0.264***
ln Quota		(0.037)	(0.048)		(0.042)	(0.054)
Province FE			Y			Y
Observations	262	262	262	262	262	262
R-squared	0.203	0.229	0.254	0.551	0.590	0.608

Notes: Under the exam system, the number of quota explains a large part of variations in the number of *Jinshi* (candidates passing the national-level exam) and the number of key officials and that the elasticity is also very high (1.14 and 0.78 respectively).
After the abolition, the link between the quota and high-level officials were weakened after the abolition of the exam (in 1908). In addition, the link got stronger after the revolution (in 1912).
Standard error in parenthesis; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2: Definition of Variables, Data Sources and Summary Statistics

Variables	Variables Definition	Data Sources	Observation	Mean	S.D.
Revolutionaries	The number of members who join revolutionary organizations	A, B	262*6	0.696	3.231
Uprisings in 1911	Whether there was an uprising in 1911	C	262	0.160	0.367
Quota of imperial examination	Quota of imperial civil examination	D	262	113.8	75.7
	The number of *Jinshi*	E	262	95.977	146.596
	The number of key officials	F	262	15.580	30.440
Baseline Control variables	Population in 1880 (log-term)	G	262	13.620	1.075
	Size (log-term)	H	262	9.336	0.770
	Treaty port	I	262	0.115	0.319
	Small city	J	262	0.198	0.400
	Middle city	J	262	0.122	0.328
	Large city	J	262	0.038	0.192
	Yangtze River (=1, if riverside)	H	262	0.061	0.239
	Coast (=1, if coastal)	H	262	0.134	0.341
Instrumental variables	The number of junctions to the length of rivers	H	262	0.513	0.407
	The length of rivers	H	262	6.847	0.713
	Changes in Jinshi before 1425	E	262	0.377	0.727
Placebo test	Transportation(pref)	K	262	0.615	0.488
	Transportation(cnty)	K	262	0.380	0.300
	Fox millet	L	262	2.877	1.334
	Rice suitability	L	262	1.991	1.075
	Sweet Potato suitability	L	262	2.622	0.992
Other social mobility channels	The number of domestic private firms	M	262*6	0.097	0.573
	The number of oversea students	N	262*6	0.793	2.725

A: Chang, Yu-fa (1982), *Revolutionary Organizations of the Qing Period.*
B: Luo, Jialun (1958), *Documents on the Revolutionary*, vol. 2.
C: The Tokyo Nichi Nichi Shimbun, November 3, 1911,
D: Kun, Gang et al. (Ed.) (1899), *Imperially Established Institutes and Laws of the Great Qing Dynasty*.
E: Zhu, Baojiong, and Peilin Xie (Ed.) (1980), *Index of Names of Jinshi Graduates in the Ming and Qing Periods.*
F: Qian, Shifu (2005), *A Chronological Table of Qing Officials.*
G: Ge, Jianxiong (2000) *China Population History*
H: Harvard Yenching Insitution (2007), CHGIS, Version 4.
I: Yan, Zhongping (1955), *Selected Statistical Materials on Modern Chinese Economic History*
J: Rozman, Gilbert (1973), *Urban Networks in Ch'ing China and Tokugawa Japan*
K: Liu, Cheng-yun (1993), "Chong, Fan, Pi, and Nan: An Exploration of the ranking of Qing Administrative Units"
L: FAO (2012), GAEZ: http://fao.org/Ag/AGL/agll/gaez/ index.htm.
M: Chang, Yufa (1989), "Private Industries in the Late Ch'ing and the Early Republic of China, 1860-1916".
N: Shen, Yunlong (Ed.) (1978), *The Lists of Oversea Students in Japan in the Late Qing Period.*

Table 3: Baseline Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7) Weighted
Ln(Quota) * Post	0.245***	0.343***	0.184***	0.202***	0.183***	0.156**	0.182**
	(0.037)	(0.045)	(0.064)	(0.066)	(0.069)	(0.070)	(0.074)
Ln(Population) * Post			0.173***	0.209***	0.222***	0.211***	0.072
			(0.058)	(0.062)	(0.069)	(0.069)	(0.050)
Ln (Area) * Post				-0.104*	-0.100*	-0.101*	-0.027
				(0.056)	(0.056)	(0.056)	(0.036)
Coastal * Post					-0.041	-0.128	-0.095
					(0.136)	(0.138)	(0.117)
Yangtze River * Post					0.199	0.020	-0.008
					(0.191)	(0.240)	(0.166)
Treaty Port * Post						0.203	0.173
						(0.151)	(0.116)
Small City * Post						0.035	0.083
						(0.101)	(0.139)
Middle City * Post						0.112	0.085
						(0.142)	(0.126)
Large City * Post						0.329*	0.225
						(0.193)	(0.200)
Prefecture FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Province FE*Year FE		Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834	1,834
R-squared	0.252	0.456	0.465	0.468	0.469	0.477	0.402

Notes: This table reports the impact of quota on the number of revolutionaries after the abolition of the exam, compared with that before the abolition.
Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.
The results in column (7) are weighted by population size.

Table 4: Year-by-Year Effects

	(1)	(2)	(3)	(4) Weighted
Ln(Quota) * 1901	-0.047	-0.024	-0.027	-0.001
	(0.029)	(0.021)	(0.030)	(0.008)
Ln(Quota) * 1902	-0.032	-0.019	-0.029	-0.001
	(0.022)	(0.019)	(0.030)	(0.008)
Ln(Quota) * 1903	0.080**	0.084	0.043	0.017
	(0.039)	(0.053)	(0.056)	(0.015)
Ln(Quota) * 1904	0.028	-0.002	-0.035	-0.002
	(0.041)	(0.033)	(0.039)	(0.010)
Ln(Quota) * 1905	0.329***	0.191***	0.141**	0.148***
	(0.049)	(0.066)	(0.071)	(0.054)
Ln(Quota) * 1906	0.369***	0.227**	0.151	0.221**
	(0.062)	(0.088)	(0.097)	(0.100)
Prefecture FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y
ln Popu* Year FE, ln Size *Year FE		Y	Y	Y
Other Pref. Dummies * Year FE			Y	Y
Observations	1,834	1,834	1,834	1,834
R-squared	0.460	0.475	0.507	0.428

Note: This table reports the dynamic effects, using the year of 1900 as the reference group. It shows that the effect of quotas only took place after the abolition.
Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Revolutionaries and the Incidence of Uprising

	(1)	(2)	(3)	(4)
Dependent Var.	Uprising = 0/1			
$\overline{\ln(Member_{it}+1)}$: Pre-abolition	0.086	0.121		
	(0.139)	(0.152)		
$\overline{\ln(Member_{it}+1)}$: Post-abolition	0.133***	0.100**		
	(0.044)	(0.050)		
$\overline{\ln(Member_{it}+1)}$: Change			0.149***	0.107**
			(0.043)	(0.050)
Baseline Controls		Y		Y
Provincial FE	Y	Y	Y	Y
Observations	262	262	262	262
R-squared	0.248	0.274	0.238	0.266

Notes: This table links the number of revolutionaries to the incidence of uprising across prefectures in 1911 reported by a Japanese newspaper (November 3, the Tokyo Nichi Nichi Shimbun). The dependent variable is 1 if there was a rising in a prefecture. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%. Basic controls include all the control variables in column (7) of Table 3.

Table 6: The Impacts of Other Possible Mobility Channels

	(1)	(2)	(3)	(4)	(5)	(6)	(7) weighted
Ln(Quota) * Post	0.152**	0.140**	0.135**	0.117*	0.133**	0.105*	0.134**
	(0.070)	(0.067)	(0.067)	(0.065)	(0.067)	(0.063)	(0.056)
Ln(Firm+1)	0.112	-0.132			0.089	-0.149	-0.105
	(0.098)	(0.113)			(0.098)	(0.120)	(0.118)
Ln(Firm+1)* Ln(Quota) * Post		0.083**				0.082**	0.060
		(0.038)				(0.040)	(0.042)
Ln(Japan stu.+1)			0.182***	0.115**	0.179***	0.131**	0.070*
			(0.050)	(0.048)	(0.048)	(0.051)	(0.042)
Ln(Japan stu. +1)* Ln(Quota) * Post				0.028**		0.022	0.048***
				(0.014)		(0.014)	(0.015)
Prefecture FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y	Y	Y	Y
Baseline Controls * Post	Y	Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834	1,834
R-squared	0.478	0.485	0.492	0.495	0.492	0.502	0.433

Notes: This table shows that the baseline results hold after controlling for the number of firms and the number of students studying in Japan. Note that these variables capture various dimensions such as alternative mobility channels and development stages. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%. Baseline controls include all the control variables in column (7) of Table 3.

Table 7: County Level Results from Guangdong

	(1)	(2)	(3)	(4)	(5)	(6)	(7) Weighted
ln Quota * Post	0.587***	0.539***	0.567***	0.567***	0.571***	0.571***	0.444***
	(0.163)	(0.141)	(0.139)	(0.139)	(0.141)	(0.141)	(0.126)
ln Popu * Post			-0.120	-0.180	-0.184	-0.222	-0.119
			(0.094)	(0.155)	(0.156)	(0.179)	(0.143)
ln Area * Post				0.060	0.067	0.106	0.056
				(0.239)	(0.240)	(0.262)	(0.214)
Coastal * Post					-0.044	-0.044	0.027
					(0.117)	(0.117)	(0.112)
Treaty Port * Post						0.212	-0.137
						(0.346)	(0.282)
County FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Prefecture FE*Year FE		Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834	1,834
R-squared	0.252	0.456	0.465	0.468	0.469	0.477	0.402

Notes: The table presents the results using county-level data in Guangdong between 1894 and 1906.
Standard errors in parenthesis are clustered at the county level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: The Importance of Political Connectedness

	(1)	(2)	(3)	(4)	(5) Weighted
(100*Quota/Popu) * Post	0.059***			0.070***	0.049***
	(0.015)			(0.017)	(0.015)
(100*Jinshi/Quota) * Post		0.126		0.087	0.075
		(0.124)		(0.120)	(0.128)
(Official/Jinshi) * Post			-0.139	-0.057	0.008
			(0.148)	(0.146)	(0.099)
Prefecture FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y	Y
All Controls * Post	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,778	1,778	1,778
R-squared	0.482	0.474	0.476	0.488	0.428

Notes: This table shows that what matters for the number of revolutionaries is the mobility at the lowest level (Quota/Popu). Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%. Basic controls include all the control variables in column (7) of Table 3.

Table 9: The Impacts of Weather Shock

	(1)	(2)	(3)	(4)	(5)	(6)
Ln(Quota) * Post	0.156**	0.154**	0.159**	0.161**	0.156**	0.211***
	(0.070)	(0.071)	(0.070)	(0.071)	(0.070)	(0.081)
Weather shocks	0.000	-0.005				
	(0.034)	(0.039)				
Weather shocks * Ln(Quota) * Post		0.006				
		(0.029)				
Average weather * Post			0.207	0.142		
			(0.384)	(0.362)		
Average weather * Ln(Quota) * Post				0.192		
				(0.402)		
Weather S.D. * Post					0.004	-0.121
					(0.141)	(0.139)
Weather S.D. * Ln(Quota) * Post						0.324*
						(0.185)
Prefecture FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y	Y	Y
Baseline Controls * Post	Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834
R-squared	0.477	0.477	0.477	0.477	0.477	0.480

Notes: The table shows the current economic shocks (proxied by weather shocks) do not explain the baseline finding. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%. Baseline controls include all the control variables in column (7) of Table 3.

‘

Table 10: The Role of Regional Importance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln(Quota) * Post	0.153**	0.175**	0.140*	0.158**	0.152**	0.154**	0.156*
	(0.070)	(0.078)	(0.073)	(0.073)	(0.072)	(0.071)	(0.081)
Province Capital * Post	0.100						0.108
	(0.231)						(0.232)
Tax per capita in 1820 * Post		0.122					0.165
		(0.345)					(0.337)
Communication (Chong) * Post			0.081				0.095
			(0.077)				(0.078)
Business (Fan) * Post				-0.015			-0.047
				(0.078)			(0.096)
Difficulty of taxing (Pi) * Post					0.038		0.059
					(0.077)		(0.082)
Crime (Nan) * Post						0.014	0.025
						(0.072)	(0.090)
Prefecture FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y	Y	Y	Y
Baseline Controls * Post	Y	Y	Y	Y	Y	Y	Y
Observations	1,834	1,799	1,834	1,834	1,834	1,834	1,799
R-squared	0.477	0.479	0.478	0.477	0.477	0.477	0.481

Notes: The table shows that baseline results hold after controlling for various measures of importance of a prefecture.
Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.
Baseline controls include all the control variables in column (7) of Table 3.

Table 11: The Quota and Party Identification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Individual-Level			Prefecture-Level		
		Kungmintang=0/1		Ln (1+#*Kungmintang* Mem.)		Ln (1+#Other Party Mem.)	
ln Quota	0.070	-0.035	-0.039	0.226***	0.158**	0.250***	0.178***
	(0.045)	(0.048)	(0.048)	(0.066)	(0.068)	(0.055)	(0.058)
ln Population	-0.049	0.009	0.012	0.232***	0.198***	0.100**	0.088
	(0.031)	(0.037)	(0.037)	(0.053)	(0.055)	(0.050)	(0.054)
Age in 1912			-0.005*				
			(0.003)				
Baseline Controls					Y		Y
Province FE		Y	Y	Y	Y	Y	Y
Observations	703	703	701	262	262	262	262
R-squared	0.004	0.181	0.185	0.494	0.518	0.472	0.504

Notes: This table shows that the number of quotas did not affect party identification, although younger people tend to join the more radical party (the *Kuomintang*), as shown in the individual-level analysis in columns (1)-(3). Columns (4)-(7) reports results using prefecture-level data: quotas increase the number of party members in both the *Kungmintang* and the other parties and the magnitudes of the impacts are similar (0.158 vs. 0.178).
Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.
Baseline controls include all the control variables in column (7) of Table 3.

Table 12: Testing the Validity of Instrument (the ratio of the number of confluences to the river total length)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Var.				Placebo I			II		III
	Ln Quota			Transportation Center		Suitability			Climate
	Late Qing	Early Qing	Change	Prefecture	County Average	Rice	Foxmillet	Sweet Potato	Drought /Flood
Confluence/RiverLeng.	0.329**	0.321**	0.008	0.052	0.037	0.159	-0.167	-0.061	0.019
	(0.128)	(0.140)	(0.027)	(0.109)	(0.070)	(0.142)	(0.191)	(0.157)	(0.016)
Ln (River Length)	0.135	0.139	-0.003	0.031	0.032	-0.008	-0.037	-0.215	0.017
	(0.117)	(0.123)	(0.027)	(0.098)	(0.070)	(0.149)	(0.181)	(0.133)	(0.012)
Main River	0.044	0.022	0.022	0.160**	0.129**	-0.031	-0.017	0.083	0.003
	(0.079)	(0.083)	(0.018)	(0.072)	(0.052)	(0.101)	(0.129)	(0.115)	(0.010)
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	243	243	243	243	243	243	243	243	243
R-squared	0.773	0.746	0.713	0.293	0.248	0.699	0.707	0.527	0.409

Notes: Columns (1)-(3) show that the instrument is correlated with the level of quotas. Columns (4)-(9) present three different sets of placebo tests. The prefectures located at the low and middle reaches of the Yellow River are excluded.
Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.
Baseline controls include all the control variables in column (7) of Table 3.

Table 13: Instrumental Evidence (the ratio of the number of confluences to the river total length)

	Baseline	Reduced Form	IV-Fixed Effect Model				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
					IV Results		
Ln(Quota)* Post	0.177***		0.449**	0.438**	0.431**	0.439**	0.432**
	(0.024)		(0.226)	(0.224)	(0.219)	(0.214)	(0.210)
					The First Stage		
Confluences/River L * Post		0.148**	0.329***	0.335***	0.340***	0.351***	0.356***
		(0.073)	(0.042)	(0.041)	(0.042)	(0.041)	(0.042)
Basic controls * Post	Y	Y	Y	Y	Y	Y	Y
Ln(River Length) * Post		Y	Y	Y	Y	Y	Y
MainRiver * Post		Y	Y	Y	Y	Y	Y
Transportation(pref)*Post				Y		Y	
Transportation(cnty)*Post					Y		Y
Fox millet * Post				Y	Y	Y	Y
Rice* Post				Y	Y	Y	Y
Sweet Potato* Post				Y	Y	Y	Y
Weather * Post						Y	Y
Prefecture FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y	Y	Y	Y
Observations	1,701	1,701	1,701	1,701	1,701	1,701	1,701
R-squared	0.426	0.505	0.489	0.491	0.492	0.491	0.492

Notes: The table presents the results using the ratio of the number of confluences to the river total length as an instrument. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%. Baseline controls include all the control variables in column (7) of Table 3.

Table 14: The Validity of Instrument $(\Delta \ln \mathit{Jinshi})_P$

	Ln Quota			Placebos: The Change in the Number of *Jinshi* (log-term)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Late Qing	Early Qing	Change	1436-1505 Vs. 1368-1435	1506-1572 Vs. 1436-1505	1573-1643 Vs. 1506-1572	1644-1722 Vs. 1573-1643	1723-1795 Vs. 1644-1722	1796-1861 Vs. 1723-1795
$(\Delta \ln \mathit{Jinshi})_P$	0.219***	0.208***	0.010	-0.019	-0.107	-0.096	-0.119	0.023	-0.060
	(0.046)	(0.045)	(0.012)	(0.089)	(0.079)	(0.067)	(0.082)	(0.096)	(0.073)
$(\ln \mathit{Jinshi}_0)_P$	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	262	262	262	262	262	262	262	262	262
R-squared	0.786	0.761	0.705	0.424	0.138	0.160	0.278	0.471	0.188

Note: Columns (1)-(3) show that the instrument is correlated with the level of quotas. Columns (4)-(9) present different sets of placebo test.

Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Baseline controls include all the control variables in column (7) of Table 3.

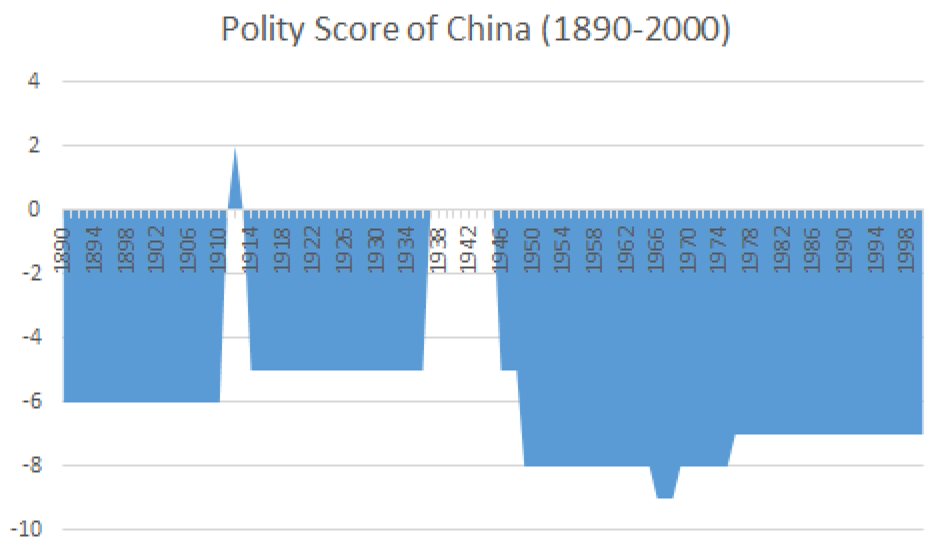
Table 15: Instrumental Evidence

	Reduced Form	IV-Fixed Effect			Sub-sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					IV Results			
Ln(Quota)* Post		0.525***	0.510***	0.495***	0.505***	0.496***	0.505***	0.444*
		(0.176)	(0.175)	(0.166)	(0.170)	(0.168)	(0.171)	(0.229)
# of confluences / River L							-0.015	
							(0.091)	
$(\Delta \ln \mathit{Jinshi})_P$	0.115***							0.013
	(0.038)							(0.070)
					The First Stage			
# of confluences / River L							0.295***	0.330***
							(0.041)	(0.039)
$(\Delta \ln \mathit{Jinshi})_P$		0.219***	0.217***	0.234***	0.240***	0.246***	0.238***	0.246***
		(0.021)	(0.020)	(0.020)	(0.022)	(0.022)	(0.022)	(0.021)
Baseline Controls * Post	Y	Y	Y	Y	Y	Y	Y	Y
Ln(River Length) * Post			Y	Y	Y	Y	Y	Y
Main River * Post			Y	Y	Y	Y	Y	Y
Transportation(pref)*Post				Y		Y	Y	Y
Fox millet * Post				Y		Y	Y	Y
Rice* Post				Y		Y	Y	Y
Sweet Potato* Post				Y		Y	Y	Y
Weather * Post				Y		Y	Y	Y
Prefecture FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,701	1,701	1,701	1,701
R-squared	0.477	0.428	0.454	0.458	0.482	0.484	0.483	0.491

Note: Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%. Baseline controls include all the control variables in column (7) of Table 3.

Appendix

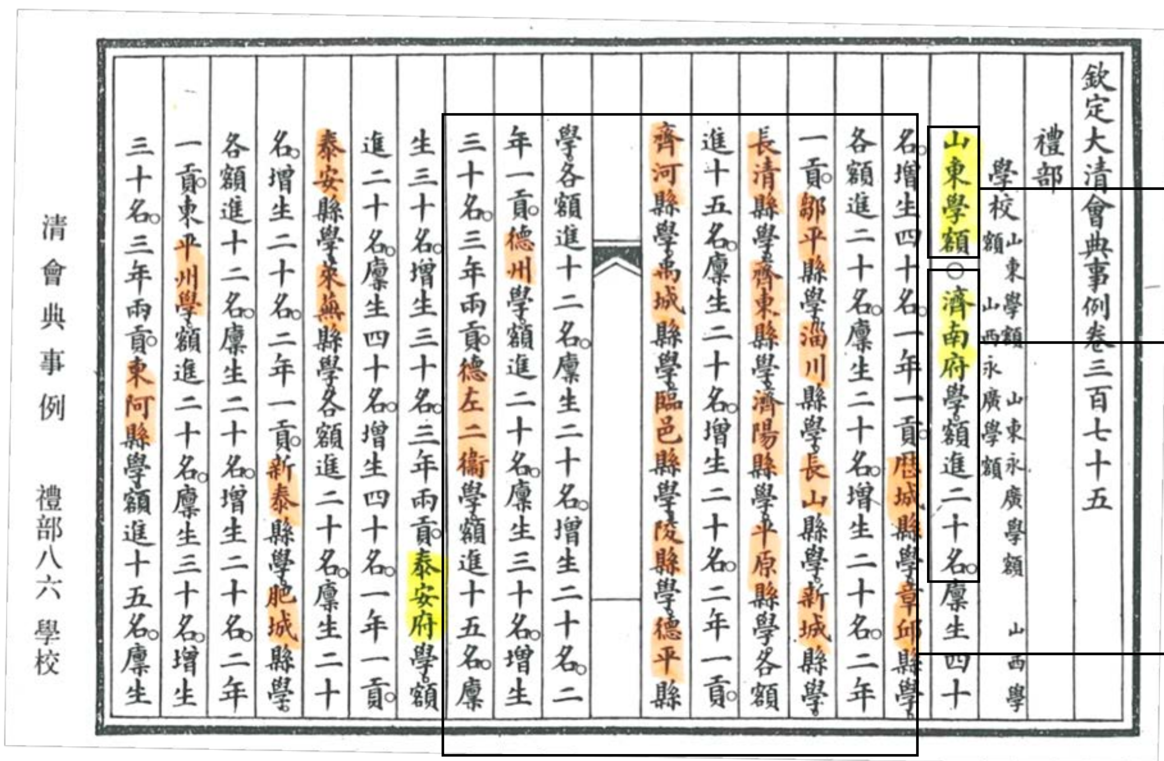
Figure A1: Polity Scores for China between 1890 and 2000



Notes: This figure reports the polity scores of China between 1890 and 2000, based on the information from Polity IV.

Figure A2: Data on Quota

The data come from the *Qing Hui Dian Shi Li* (edited by Kun, Gang), in which all schools and their quotas are listed. In each prefecture, there is one prefecture-level school and various county-level schools. We sum all quotas of all schools to obtain the total quota of each prefecture, as the following example shows. In Jinan, one prefecture in Shandong Province, the quota of prefecture school is 20 and the total quota of all county level school is 255. Then, the total quota of Jinan is 275.


欽定大清會典事例卷三百七十五
禮部
學校山東學額山西學額山東永廣學額山西學
山東學額○濟南府學額進二十名。廩生四十
名。增生四十名。一年一貢。歷城縣學章邱縣學
各額進二十名。廩生二十名。增生二十名。二年
一貢。鄒平縣學淄川縣學長山縣學新城縣學
長清縣學齊東縣學濟陽縣學平原縣學各額
進十五名。廩生二十名。增生二十名。二年一貢。
齊河縣學禹城縣學臨邑縣學陵縣學德平縣
學各額進十二名。廩生二十名。增生二十名。二
年一貢。德州學額進二十名。廩生三十名。增生
三十名。三年兩貢。德左二衛學額進十五名。廩
生三十名。增生三十名。三年兩貢。泰安府學額
進二十名。廩生四十名。增生四十名。一年一貢。
泰安縣學萊蕪縣學各額進二十名。廩生二十
名。增生二十名。二年一貢。新泰縣學肥城縣學
各額進十二名。廩生二十名。增生二十名。二年
一貢。東平州學額進二十名。廩生三十名。增生
三十名。三年兩貢。東阿縣學額進十五名。廩生

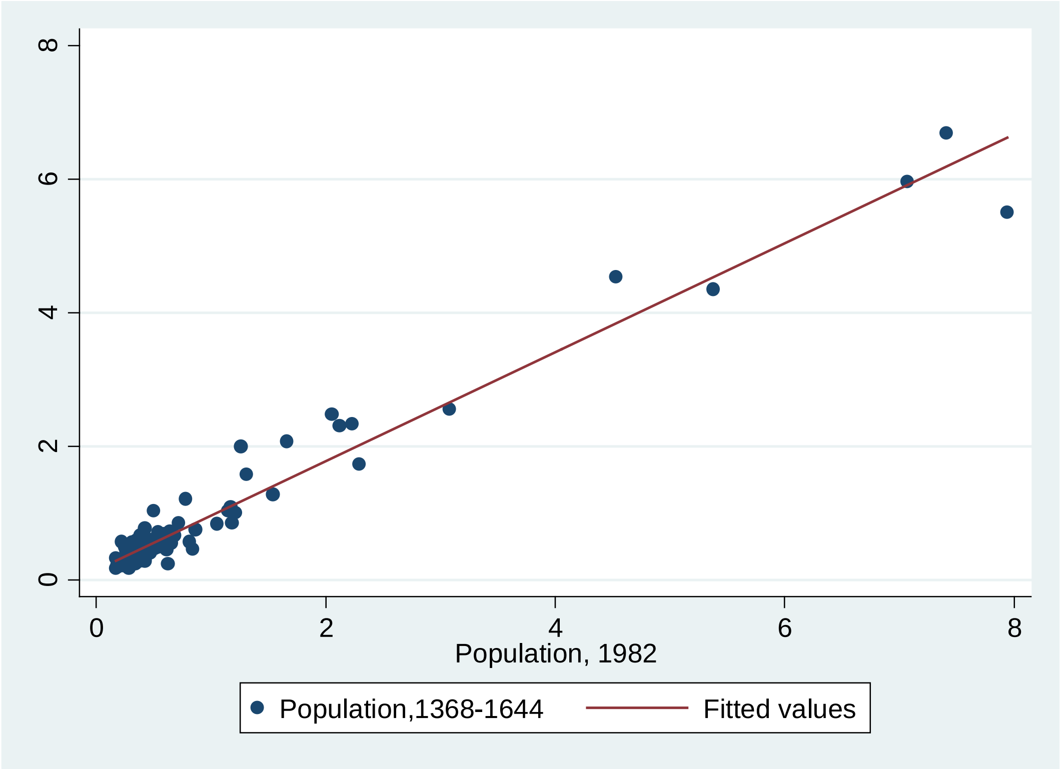
清會典事例　禮部八六　學校

Shandong Province

Prefecture: Jinan
The quota of Jinan (Prefecture) school is 20

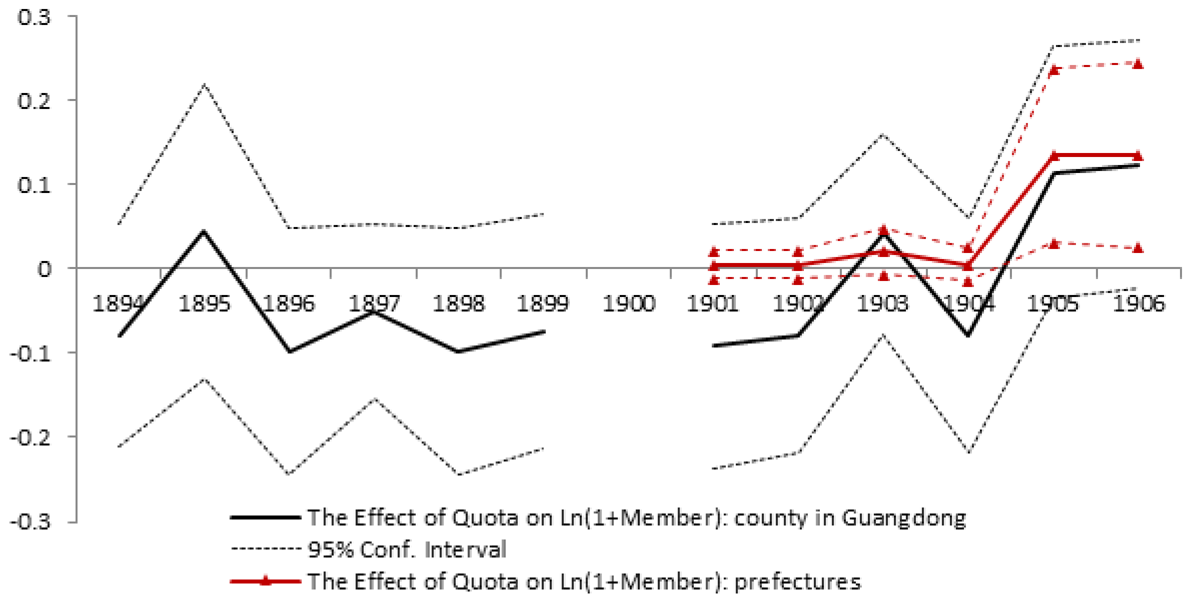
Licheng County: 20
Zhangqiu County: 20
Zouping County: 15
Zichuan County: 15
Changshan County: 15
Xincheng County: 15
Changqing County: 15
Qidong County: 15
Jiyang County: 15
Pingyuan County: 15
Qihe County: 12
Yucheng County: 12
Linyi County: 12
Ling County: 12
Deping County: 12
Dezhou: 20
DeZuo Garrison School 1: 7.5
DeZuo Garrison School 2: 7.5

Figure A3: The Persistence of Surname Distribution



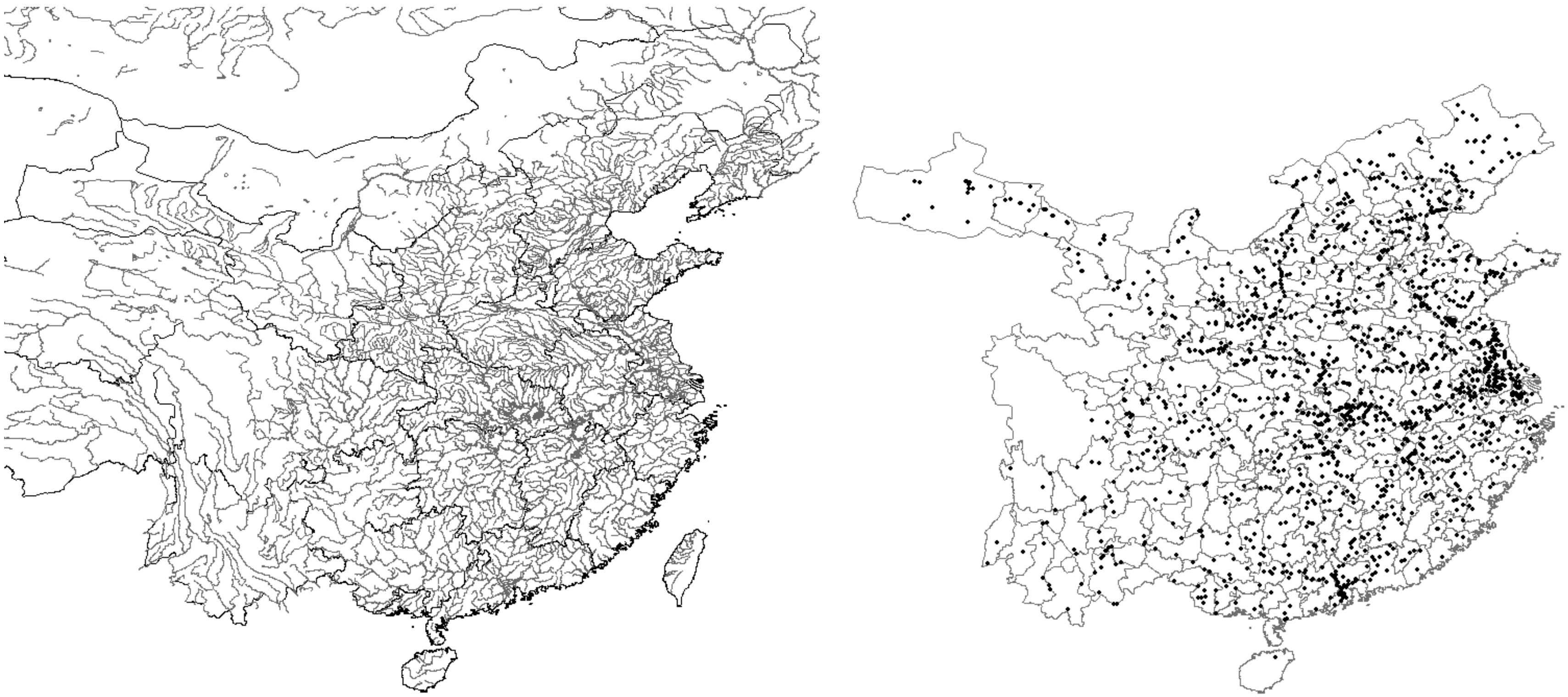
Notes: This figure shows that the surname distribution in the Ming dynasty is close to that in the year of 1982.

Figure A4: Dynamic Results for Revolutionaries=0/1



Notes: This figure presents the dynamic effects of the quota on the probability of having a revolutionary, using the year 1900 as reference group. The red lines are the results using the prefecture-level data between 1900 and 1906. The black lines are those using county-level data in Guangdong between 1894 and 1906. The dashed lines indicate the 95% confidence intervals. These results show that the impact of the quota only took place after the abolition of the exam.

Figure A5: Rivers and Confluences

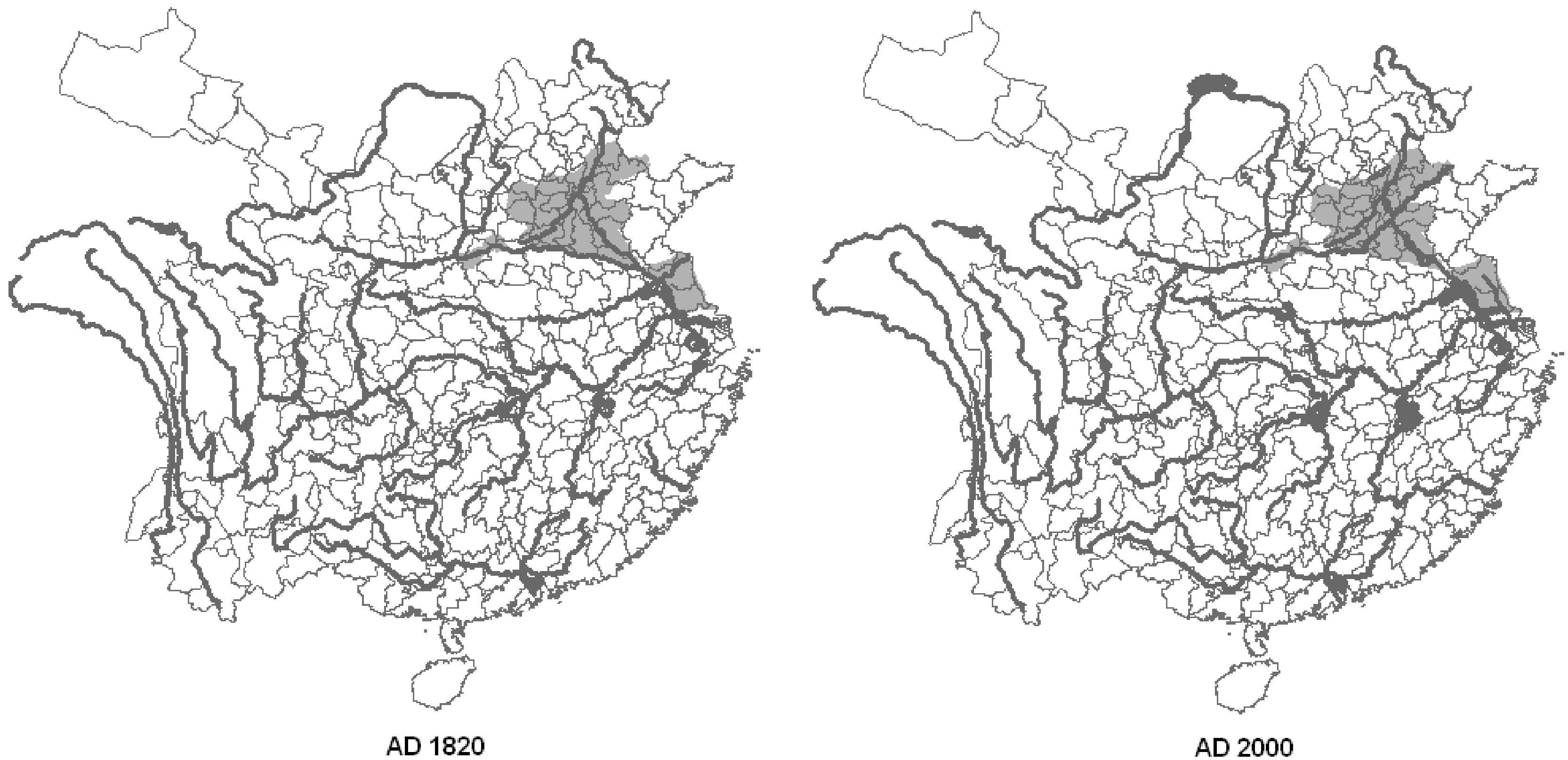


Panel A: Rivers

Panel B: Confluences

Notes: The map on the right is calculated from the map on the left.

Figure A6: Main Rivers Over Time



Notes: The two maps show that part of the courses of Yellow river changed over time. Therefore, we exclude those prefectures close to these courses when we use the shape of rivers as an instrument of the number of counties.

Table A1: Results on Whether Having a Revolutionary

	(1)	(2)	(3)	(4)	(5)	(6)	(7) Weighted
ln Quota * Post	0.138***	0.206***	0.139***	0.147***	0.126***	0.114**	0.129***
	(0.020)	(0.025)	(0.044)	(0.044)	(0.047)	(0.047)	(0.049)
ln Popu * Post			0.073*	0.090**	0.105**	0.102**	0.059*
			(0.037)	(0.039)	(0.043)	(0.044)	(0.034)
Ln Size * Post				-0.048	-0.044	-0.043	-0.013
				(0.034)	(0.033)	(0.034)	(0.025)
Coastal * Post					-0.047	-0.071	-0.055
					(0.090)	(0.093)	(0.097)
Yangtze River * Post					0.219**	0.161	0.068
					(0.098)	(0.109)	(0.119)
Treaty Port * Post						0.054	0.098
						(0.083)	(0.087)
Small City * Post						-0.006	0.042
						(0.060)	(0.090)
Middle City * Post						0.024	0.012
						(0.079)	(0.083)
Large City * Post						0.172	0.306**
						(0.137)	(0.129)
Prefecture FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Province FE*Year FE		Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834	1,834
R-squared	0.279	0.449	0.452	0.454	0.458	0.461	0.398

Note: This table reports the impact of quota on the probability of having a revolutionary after the abolition of the exam, compared with that before the abolition.
Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A2: Year-by-Year Impacts in Guangdong

	(1)	(2)	(3)	(4) Weighted
Ln(Quota) * 1894	0.003	-0.033	-0.009	-0.072
	(0.149)	(0.145)	(0.156)	(0.076)
Ln(Quota) * 1895	0.127	0.067	0.110	0.043
	(0.168)	(0.176)	(0.172)	(0.107)
Ln(Quota) * 1896	-0.217	-0.212	-0.219	-0.141
	(0.166)	(0.176)	(0.176)	(0.107)
Ln(Quota) * 1897	-0.049	-0.070	-0.067	-0.048
	(0.164)	(0.175)	(0.173)	(0.107)
Ln(Quota) * 1898	-0.217	-0.212	-0.219	-0.141
	(0.166)	(0.176)	(0.176)	(0.107)
Ln(Quota) * 1899	-0.185	-0.184	-0.188	-0.124
	(0.149)	(0.164)	(0.161)	(0.098)
Ln(Quota) * 1901	-0.199	-0.196	-0.199	-0.137
	(0.168)	(0.178)	(0.179)	(0.107)
Ln(Quota) * 1902	-0.157	-0.166	-0.162	-0.109
	(0.137)	(0.158)	(0.153)	(0.092)
Ln(Quota) * 1903	0.165	0.136	0.151	0.030
	(0.165)	(0.181)	(0.181)	(0.090)
Ln(Quota) * 1904	-0.191	-0.192	-0.194	-0.127
	(0.149)	(0.165)	(0.162)	(0.099)
Ln(Quota) * 1905	0.471**	0.427*	0.433*	0.231
	(0.225)	(0.234)	(0.229)	(0.142)
Ln(Quota) * 1906	0.500**	0.436**	0.454**	0.274**
	(0.213)	(0.217)	(0.211)	(0.135)
County FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Prefecture FE*Year FE	Y	Y	Y	Y
ln Popu* Year FE, ln Size *Year FE		Y	Y	Y
Other County Dummies * Year FE			Y	Y
Observations	1,196	1,196	1,196	1,196
R-squared	0.438	0.461	0.478	0.449

Note: This table reports the dynamic effects, using the year of 1900 as the reference group. It shows that the effect of quotas only took place after the abolition.
Standard errors in parenthesis are clustered at the county level: * significant at 10%; ** significant at 5%; *** significant at 1%.