Elite Recruitment and Political Stability:
The Impact of the Abolition of China's Civil Service Exam*

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Abstract

This paper studies how the abolition of an elite recruitment system – China's civil exam system that lasted over 1,300 years – affects political stability. Employing a panel dataset across 262 prefectures and exploring the variations in the quotas on the entry-level exam candidates, we find that higher quotas per capita were associated with a higher probability of revolution participation after the abolition and higher incidence of uprisings in 1911 that marked the end of the 2,000 years of imperial rule. This finding is robust to various checks including using the number of small rivers and short-run exam performance before the quota system as instruments. The patterns in the data appear most consistent with a model in which the abolition affected citizens' prospect of upward mobility (POUM) more in regions with higher quotas under the exam system. In addition, we document that modern human capital also contributed to the revolution and that social capital strengthened the effect of quotas on the participation in the revolution.

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1 Introduction

For over 1,300 years, China used a civil service exam to recruit elites, including high level state bureaucrats and a much larger non-official gentry.[1] The exam system was one of the most important institutions in Chinese history. It affected the competence of the bureaucracy, the circulation of elites, the allocation of talent and the perception of social mobility among average citizens (Weber 1951, Chang 1962, Qian 1982, Elman 2000). In September 1905, the exam system was abruptly abolished and the primary way of recruiting elites for the late imperial China was changed to a less transparent system. The existing literature has long argued that access to elite status plays a crucial role in determining social order (Pareto 1916, Mosca 1939, Acemoglu and Robinson 2008, North, Wallis and Weingast 2009). In this paper, we investigate one important political consequence of the change in elite recruitment: how the abolition of the exam contributed to revolution participation in the late 19th and early 20th century across China and thereby hastened the fall of the Qing dynasty in 1911. We also provide evidence to understand the mechanism behind the link between the abolition of the exam and political instability.

One feature that facilitates analysis of the exam system is that it was governed by long-standing quotas. For the entry-level of the exam, all 262 prefectures were assigned specific quotas that determined the number of candidates succeeding in the exam and entering the elite class.[2] The quota assignment did not change over time and hence did not respond to change in the population, development or conflict propensity in a prefecture.[3] The persistence of quotas is an example of "state simplifications" where the state lacked the capacity to implement a more complicated proportional system (Scott 1998). This simplification was also reflected in the stepwise feature of the quotas. The quota for each prefecture consisted of two parts: each county in the prefecture received a quota and the prefecture as a whole received an additional quota that could be shared among counties.[4] The values of the two parts followed a stepwise rule – 8, 12, 15 and 20 accounted for over 70% of the cases, roughly according to the administrative scale. The persistence and lumpiness of quota values provide significant regional variations. We use quotas per capita at the prefecture level to measure the influence of the exam system and examine their roles in citizens' participation in revolutionary organizations before and after the abolition in 1905.

[1] The gentry in China refers to those who passed the exams. A small share of the gentry became government officials while the remaining did not have official positions but still held privileged status. The gentry and their immediate family members accounted for around 2% of the population in the mid-19th century (Chang 1955).

[2] A prefecture is the administrative level below the province. In the Qing dynasty, 18 provinces were located in the traditional agricultural area. There were 10 to 20 prefectures under each province and 10 to 20 counties under each prefecture.

[3] The quota assignment only changed once in the Qing dynasty due to the fighting of the Taiping Rebellion. See Section 2.1 for more discussions on the quotas.

[4] Individuals in counties could compete for the additional quotas for the prefecture so that the quota was binding at the prefecture level. The mean and standard deviation of prefecture-level quotas are 114 and 76, respectively.

The abolition of the exam was driven by the combination of internal demand and external shocks. In the late Qing period, China was defeated in a series of wars against the West and was forced to open. The exam system, in contrast to the modern and Western education system, was considered by many intellectuals as one of the roots of the underdevelopment of China. For example, the exam sought out men who were obedient to their elders rather than candidates with technical knowledge or political ability. The exams focused on reciting the classics and did not include modern Western topics such as engineering and science (Castrillon 2012). The demand for the abolition of the exam became much stronger in 1905, when Japan won the Russo-Japanese War. Japan's success was attributed to the Meiji Restoration and Modernization, which set an example for the Qing dynasty and facilitated the the abolition of the exam (The Imperial Edict 1905, Franke 1960).

Historians and sociologists have conjectured that the abolition of the exam affected the collapse of the dynasty which soon followed (Franke 1970, Rozman 1982, Elman 2009).[5] We focus on revolution participation (defined by participating in revolutionary organizations) in the late 19th and early 20th century for two reasons. First, the revolution transformed China from an imperial system to a republic and was the most significant political change in China for over 2,000 years. Second, for average citizens in such a non-democratic society, few options existed to express discontent or demand redistribution. Rebellions and revolutions were the main means. Several revolutionary organizations emerged by the 1890s. We investigate how the abolition of the exam contributed to participation in these organizations. We construct a dataset of the prefectures of origin for the 1,277 registered revolutionaries between 1900 and 1906 from the major revolutionary organizations.[6] The revolutionaries for whom we can get information were members of major revolutionary groups at the national level, who could motivate more participants at different local levels. We are concerned about whether the missing of information on revolutionaries is random. This concern matters only if the missing is correlated with quotas and varies before and after the abolition, which is not very likely. Nevertheless, as a further check for this concern, we collect a second dataset to measure revolutionary activities. Based on reports from a major Japanese newspaper in 1911, we code the spatial distribution of the early uprisings in 1911 across China. The strong positive correlation between the cumulative number of revolutionaries and the incidence of uprisings in a prefecture suggests that it is reasonable to examine both measures as outcomes. We also collect a set of observable characteristics of prefectures to control for geographical characteristics, political and economic importance as well as urbanization.

Using difference-in-differences as our baseline estimation strategy and comparing the im-

[5] Section 2.5 discusses qualitative evidence based on historical studies and diaries of individuals living in this period.

[6] We start from 1900 because the majority of revolutionaries before 1900 came from one province (Guangdong). We also construct a county-level dataset in Guangdong province where we can trace the revolutionaries to 1894. We stop in 1906 because the largest revolution group was divided into many groups in 1907. As a result, systematic data on the lists of major revolutionary groups was only available until 1906. But we also examine the incidence of revolution in 1911.

pact of quotas on revolution participation before and after the abolition of the exam system, we find that a one standard deviation increase in the logged quotas per capita (0.7) implies about a 7.7 percentage point higher probability of revolution participation in the prefecture-level data between 1900 and 1906, i.e., about 48% of the mean probability in this period.[7] We find no pre-trends before September 1905. When examining the correlation with quotas and the 1911 Revolution, we find that a one standard deviation increase in the logged quotas per capita was associated with about a five percentage point higher probability of early uprisings in 1911, which is about one third of the mean probability of incidence.

Two main concerns about our baseline findings are whether the results reflect the role of quotas and whether they are specific to the abolition of the exam. For instance, prefectures with higher quotas might be more pro-conflict or different in political sentiment. Another possibility is that a general revolutionary upheaval occurred in 1905. Our findings might capture the impact of such an upheaval rather than abolition of the exam. To speak to the first concern, we employ the incidence of the Boxer Rebellion between 1899 and 1901 as a placebo. Since the Boxer Rebellion was motivated by proto-nationalist sentiments and opposition to foreign imperialism and Christianity, it was correlated with ideology and conflict propensity in a prefecture. However, it was uncorrelated with the exam system and we would not expect quotas to affect its incidence. We find no impact of quotas on the incidence of the Boxer Rebellion, showing that our finding is unlikely to be driven by pro-conflict sentiment correlated with quotas. To check the second concern, we examine the impact of other historical events in this period and show that they did not exhibit a similar effect on revolution participation.

Despite the fact that the prefecture-level quota was persistent, it is still conceivable that the quota might be correlated with omitted variables whose impact differed before and after the abolition of the exam. For example, political networks correlated with the quota system might influence the selection of bureaucrats more after the abolition. To deal with this concern, we further employ two instruments for quotas based on geographical and historical features. Exploring the stepwise feature, we use the number of small rivers (given the length of rivers) in a prefecture as an instrument.[8] Given the same population, the number of small rivers in a prefecture affected the number of counties under its administration.[9] Since each county was usually assigned a positive quota according to the stepwise rule, the number of counties was positively correlated with the quota. These two links are supported by the data. We also conduct various placebo tests to make sure that the instrument is not correlated with other dimensions such as transportation, agriculture or climate. The second instrument

[7] Per capita refers to per 1 million population throughout this paper.

[8] See Section 3.4 for different measures of small rivers.

[9] The logic that the number of small rivers affected the number of counties looks similar to that in Hoxby (2000). However, the channel is different. Rivers did usually not serve as county boundaries in China and other Asian countries where agriculture was the dominant sector. Instead, every county would like to include rivers within its administrative boundaries but the number of rivers would also increase the administrative costs. In equilibrium, each county usually included one or two small rivers within its boundary.

explores the short-run change in exam performance before the quota system. Compared with the level of performance, short-run change was more likely to driven by some random factors such as the supply of talents. It affected the assignment of quotas but did not affect human capital in the long run. The main finding using the differences-in-differences method still holds using the two instruments.

Why would the abolition of the exam contribute to revolution participation? We lay out four hypotheses around the major players in society. First, the "*state capacity*" hypothesis concerns the role of the state. The abolition of the exam might signal or be driven by the deterioration in state capacity. Second, the "*elite resistance*" hypothesis refers to the role of the existing elites who had succeeded in the exam system and might be negatively affected by the abolition of the exam. Third, the "*elite eligibility*" hypothesis is about the role of the commoners who hoped to become elites through the exam and whose prospects were negatively affected by the abolition. Finally, the "*modern human capital*" hypothesis refers to the role of those who switched to the modern and Western education system and might be exposed to revolutionary and modernization ideology.

For each hypothesis, we provide direct and indirect evidence for or against it. The empirical patterns appear to be most consistent with the "*elite eligibility*" hypothesis. The other hypotheses differ from the data in important ways.[10] The tests of these hypothesis also deliver some new findings. For example, we find that modern human capital (those studying abroad) contributed to the revolution, which is consistent with the modernization hypothesis in Huntington (1968). But the impact of modern human capital did not differ before and after the abolition and hence cannot explain our main findings.

The "*elite eligibility*" hypothesis is closely related to the prospect of upward mobility (POUM) hypothesis formalized in Benabou and Ok (2001) where the poor do not support high levels of redistribution because of the hope that they or their offspring may make it up the income ladder. Little evidence on this hypothesis comes from authoritarian regimes, as it is unclear how redistribution can be realized without a democracy.[11] In this perspective, revolution can be thought of as a way of achieving redistribution. Recently, Acemoglu, Egorov and Sonin (2015) provide a dynamic model on the relationship between social mobility and political stability and demonstrate that there can be multiple equilibria. Our study provides new empirical evidence for this literature.

To formalize our interpretation, we construct a simple model to highlight the role of elite eligibility on revolution participation.[12] The model provides a reduced-form way of capturing the change in prospect. It can also be interpreted as change in the expected returns on the

[10] Our approach is not to cherry-pick evidence but to present as much evidence as possible.

[11] Existing empirical evidence for the hypothesis includes the results from the US (Alesina and La Ferrara 2005), Russia (Ravallion and Lokshin 2000) and a set of OECD countries (Corneo and Gruner 2001).

[12] We borrow several elements of the model on riots in Passarelli and Tabellini (2013). Clearly this is not the only model to formalize our interpretation. For instance, Leventoglu (2005) introduces mobility to the political transition framework in Acemoglu and Robinson (2001b), which can also be interpreted as the role of elite eligibility.

investment in the exam.[13] Moreover, the change in prospect was very likely to be correlated with frustrations. We do not intend to disentangle these factors. This simple model also predicts that the role of prospect is strengthened by social capital that helps overcome the collective action problem. We also provide further evidence for this additional prediction.[14]

Besides the POUM literature, our study also adds to the growing literature on the importance of political institutions for development and stability (Acemoglu and Robinson 2001a, 2001b, Besley and Persson 2011). In particular, our study provides empirical evidence on the role of elite recruitment, which has been argued to affect political development (Seligman 1964, Acemoglu and Robinson 2008, North, Wallis and Weingast 2009). But we are not aware of existing empirical evidence.[15] Finally, we are the first to systematically study the long-lived exam system and the republic revolution, adding quantitative findings to the existing historical studies such as Franke (1970) and Rozman (1982).

The rest of the paper is organized as follows. Section 2 discusses the historical background, the data and some qualitative historical evidence. Section 3 presents the empirical results. Section 4 presents further evidence to understand the mechanism. Section 5 concludes the paper.

2 Historical Background and Data

We first describe the exam system, present the data on quotas and explain how it came to be abolished. Then, we describe the revolutionary participation and the uprising in the critical year of 1911 as well as related data. We also provide qualitative historical evidence on the link between the abolition of the exam and revolution participation.

2.1 The Civil Service Exam and the Assignment of Quotas

The Structure of the Exam The civil service examination system was established in AD 605 during the Sui Dynasty (581-618). The system was used on a small scale during Sui and the subsequent Tang dynasty (618-907) and 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 elites during the Ming (1368-1644) and Qing (1644-1911) dynasties. The structure and process of the civil examination system

[13] In a different context, Campante and Chor (2012) argue that the lack of adequate economic opportunities for an increasingly educated populace was an important factor in the Arab Spring.

[14] This finding contributes to a large literature on the economic and political impacts of social capital. We will not give an overview of the vast literature here but would like to point out that this role of social capital in revolution can be related to Satyanath, Voigtlander and Voth (2013) who show that social capital facilitated the rise of the Nazi Party. Naturally, the impact of the republic revolution was very different from that of the Nazi Party.

[15] The lack of evidence may be due to the fact that elite recruitment usually evolves gradually. For instance, in traditional European societies, elite status was mainly hereditary and was gradually changed to be based on meritocratic exams in the 19th century. But many changes took place underlying this switch: the Industrial and the French Revolutions, economic development as well as political democratization.

remained stable in the late imperial period (the Ming and Qing dynasties). The contents of the examinations were dominated by the Confucian texts – the Four Books and the Five Classics (Elman, 2000).[16]

Given the importance of the exam in political selection, systemic institutions were set up to keep the system as fair as possible. For instance, all essays were transcribed before marking so examiners could not identify a student by their calligraphy, and the Emperor personally supervised the final stage of the examination. The children of officials working in the central government were required to take the exam in the home prefectures of the officials. Despite these institutions, corruption still happened. In 1781, the Emperor executed 56 officials in Gansu province for selling examination degrees. All these evidence shows that the exam was perceived by commoners to be a relatively fair system in allocating the elite status ex ante, despite the fact that the offspring of existing elites were more likely to succeed in the exam ex post. (Elman 2000).[17]

Figure 1 illustrates the basic structure of this system. It consists of three stages of exams. The entry level is a prefecture-level licensing examination[18] held in the capitcal of the prefecture after the annual primary testing in the county seat. This level of examination took place twice every three years. The candidates who passed this exam were termed "the Literati"[19] They became the lower gentry class and were exempt from taxes and corporal punishment. The political status also provided an opportunity to manage local affairs, become secretarial assistants to officials, and to teach – three important sources of income for Chinese gentry (Chang 1962). Since this level determines the entry to the gentry class, it constitutes our focus in the analysis.

The second level is a triennial provincial-level qualifying examination in the provincial capital. The successful candidates were termed "the Recommended Man" and were eligible to become lower-level officials. The third level is a national examination taking place in the capital, with re-examination to rank the candidates in the imperial palace. These candidates were termed "the Presented Scholar"[20], many of whom were selected for high-level government positions.

[16] The Four Books and Five Classics collectively constituted the foundation of Confucianism and were the basis of the exam. The Five Classics consist of the Book of Odes, the Book of Documents, the Book of Changes, the Book of Rites, and the Spring and Autumn Annals. The Four Books are comprised of the Doctrine of the Mean, the Great Learning, Mencius, and the Analects.

[17] Selling lower-level exam degrees to raise money for the government became a more important issue in the last decades of the dynasty. However, this issue did not stop commoners from investing in the exam system (Chang 1955). In fact, the abolition was to stop the investment in the exam system. As stated in the Imperial Edict on the abolition in 1905, "as long as the system of examinations is not abolished, students will trust their good fortune for obtaining the highest degrees, and their desire for the difficult work of real betterment will be diverted. The people will follow their example, and the hope for the establishment of private schools will be small."

[18] *Yuankao* in Chinese.

[19] *Xiucai* in Chinese.

[20] *Jinshi* in Chinese.

Eligibility and Entry Costs The exam was, in principle, open to men from all socio-economic backgrounds and hence every male could in theory take the exam regardless of his background. The degree could not be inherited so that children of the existing elites still needed to compete with the commoners in the exam. There was no limit on age or the number of attempts to pass the exam. In practice, exam takers needed to invest time and money in preparing for the exam and forgo the opportunities to work, which hindered men from poor families to take the exam. Wang (1989) estimates that an average family (of five individuals) needed land holdings of around 1.5 acre to afford the entry-level exam for one individual, while 30-40% households in the late Qing period owned land above this threshold.[21] In addition, clans often pooled resources to support promising individuals from poor families. The population influenced by the exam system was further amplified by the fact that family members of the exam-takers also became involved in the investment (Wang 2013).

As a result of the open nature, at least two million men – about 2.5% of the male population aged between 15 and 49 in the mid-Qing era – registered for each prefecture-level exam, while the total quota for each exam was around 30,000 (Elman 2000).[22] Because of a large amount of repeated exam takers, we do not have regional information on exam-takers. Conceptually, exploring the number of exam takers is not helpful as it is endogenous to the probability of success governed by quotas per capita.

The Assignment of Quotas and the Related Data The numbers of successful candidates in each exam level were controlled by a quota system. The quota for the prefecture-level examination was at the prefecture level 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 central authorities to recruit officials from different parts of the country.

The quota for a prefecture consisted of two parts: each county in the prefecture received a quota and the prefecture as a whole received an additional quota that could be shared among counties. The quota was therefore binding at the prefecture level. The data on quotas comes from the Imperially Established Institutes and Laws of the Great Qing Dynasty (Kun, Gang et al. 1899). Figure A.1 in the appendix gives an example of how the quotas were recorded.

There was no standard formula for the regional quota, but two features of the assignment deserve emphasis. First, the quota assignment was very stable during the Qing dynasty. The quota assigned in 1724 persisted until 1851, when the civil war (the Taiping Rebellion) started and the government increased quotas to encourage contribution to the fight. After the war, the revised quota assigned in 1873 persisted until the abolition of the exam. We collect the quota data for both the early Qing dynasty (1724-1851) and the late Qing dynasty

[21] He only had information from one region in China. Naturally, the land concentration varied significantly across regions.

[22] The total population size in the mid-Qing dynasty was around 300 million and the population of the male aged between 15 and 50 was around 80 million.

(1873-1904). Our main analysis focuses on quotas in the latter period, and the results are robust to using quotas in the early period.

Second, quotas assigned to each county and the additional quota for each prefecture followed a stepwise rule: the most common quota values are 8, 12, 15 and 20, roughly based on the administrative scale. As shown in Figure A.2, these four values account for over 70% of the observations.

Both features are examples of "state simplifications" where the state lacked the capacity to implement a more complicated proportional system (Scott 1998).[23] Our empirical analysis focuses on the variations in quotas per capita at the prefecture level, while controlling for province fixed effects. Variations come from the lumpiness of quota values, the persistence over time and variation in prefecture population. Province fixed effects only explain 30% of the variations in the quotas, leaving a large chunk for our exploration within provinces. Figure 2 maps the spatial distribution of quotas as well as quotas per million individuals (based on the population in 1880). Table 1 provides the data sources and summary statistics for these variables. For *each* prefecture-level exam, the mean and standard deviation of quotas are 114 and 76, whereas the mean and standard deviation of quotas per million individuals are 136 and 141.[24]

In addition, to measure the prospect for the lower-level elites, we collect information on the origin of candidates who succeeded in the highest-level exams (i.e., the presented scholars) and the prefecture origin of all the key officials. The number of presented scholars was controlled by a province-level quota. The data comes from Zhu and Xie (1980) and Qian (2005) who list the name, and county of origins of all presented scholars and all key officials (higher than or equal to the level of vice-provincial governors). Around 27,000 presented scholars came out of all the 112 national exams in the Qing dynasty. Over 90 percent of the 4,200 key officials held a presented scholar degree. We employ the number of presented scholars and key officials in each prefecture to measure the probability of moving up to the top of the social ladder.

2.2 The Abolition of the Exam

In the late Qing period, China was defeated in a series of wars against the West: the First Opium War (1839-42), the Second Opium War (1856-60), the Sino-French War (1883-85), and the Sino-Japanese War (1894-95). The exam system was seen by many intellectuals as one of the roots of the underdevelopment of China. For example, the exam sought out men who are "obedient to their elders" rather than candidates with technical knowledge or political ability. Further, the exams focused on reciting the classics and did not include modern topics

[23] Scott argues that for a state to exercise its power across a large population, it often has to simplify, codify, and and regularize local practices, at the cost of ignoring local variation and local knowledge.

[24] Since there was no limit on the number of attempts, one way to understand the probability of success is to calculate $1-(1-2q)^n$, where q indicates quotas per capita and n indicates the times a man could attempt to take the exam in his life. If $n = 10$, the probability is 0.27% for a man in the prefecture with the mean quotas per capita. At the household level, the probability of success depends on the number of male members.

such as engineering or science.

Motivated by the criticisms leveled against the exam system, the government tried to reform the exam system. Franke (1960) provides a detailed description of the process. 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 gradually be abolished within the next decade.

However, on 2 September 1905, The Empress Dowager Cixi abruptly endorsed a memorandum ordering the abolition of the examination system at all levels. One important external factor behind the abolition is the success of Japan in the Russo-Japanese War of 1904-05, which was the first major military victory in the modern era of an Asian power over a European nation. Japan's success was attributed to the Meiji Restoration and Modernization, which set an example for the Qing dynasty and facilitated the abolition of the exam (Franke 1960). As stated in the memorandum of the abolition, "those who have carefully studied the situation know that the secret of Prussia's victory over France and of Japan's over Russia lay in their primary schools; in fact, the root of prosperity and strength is in the establishment of schools, and in this respect it is now only China that lags in the rear" (The Imperial Edict 1905).[25]

As also pointed out in the memorandum of the abolition, the resources of the government was not adequate for the opening of enough modern schools and there were no teachers that could teach modern subjects. Even with universal modern schools, it required more than 10 years before men of talents "of the modern sort" could be produced. However, any postponement in the abolition would just delay the availability of talents even more. The pressing of strong neighbors made any delay even more costly (The Imperial Edict 1905).

Along with the abolition, the dynasty attempted to switch to a Western-style education system.[26] The intention of the reform was to modernize China. However, the modern system favored the existing elite more than the previous exam system. First, without an open exam to compete for the elite status, the incumbents could have more influence on elite recruitment (Spence 1990). Second, it was also easier for existing elites to adapt to the new system. The new system valued foreign educational background in elite recruitment and gave similar titles (such as quasi-presented scholars) to those with a foreign educational background. Many of the gentry sent their children to study abroad so that they could obtain elite status after returning home (Wang 1960, Castrillon 2012). It became much more difficult for commoners to afford to study abroad and the link between their exam performance and their political

[25]See Ferguson (1906) for the English translation of the memorandum.

[26]The government also tried to provide alternative channels for the existing elites. These options were very limited and restricted to those who got degrees at the provincial level and national level. The related government document on these options,"Regulations on the Options for the Degree-Holders", was issued in 1906. Tsing (2007) provides more discussions on why these regulations did not mitigate the shock of the abolition.

status was interrupted. Wang (1960) studies the mobility changes during this tradition, and points out that the new system limited the higher education opportunity to a small group of men from official and professional families while under the old scheme, a scholar with limited financial resources had a good chance of succeeding.

A main challenge for our study is whether the abolition of the exam reflected some revolutionary upheaval in China. For example, the Russo-Japanese War might affect regions with higher quotas more. In Section 3.3, we conduct several placebo tests to show that our findings are driven by the abolition of the exams rather than other events in this period.

2.3 The Revolutionaries and the Early Uprisings in 1911

In the 1890s, 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. The opposition 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 (1982) describes the background of six major groups during 1900-06 and provides the lists of registered revolutionaries. His primary source is the member rosters of revolutionary organizations that were disclosed after the success of the revolution. In addition, he also added members based on biographies and memoirs. Table A.1 in the appendix describes the six groups in detail. In 1907, the largest group (the Chinese Revolutionary Alliance) was divided into many groups. As a result, systematic data on the lists of major revolutionary groups was only available until 1906.

The revolutionaries launched many small-scale uprisings. Most were repressed by the government. The turning point was the success of the Wuchang Uprising in Hubei Province on October 10, 1911, following which uprisings spread across China. The revolution ended with the abdication of the "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.[27] We will also examine the link of quotas and the uprisings in 1911.

Data on the Origins of the Revolutionaries Based on information about the six major groups that provides a revolutionary's name, county of origin and the year of joining the organization in Chang (1982), we construct a dataset of prefecture-level revolutionaries across China between 1900 and 1906.[28] This is the period when the revolution was spreading

[27] The new republic was by no means a well-functioning democracy. Figure A.3 in the appendix shows the polity scores of China between 1890 and 2000. As is shown, although the republican period had better scores than the previous dynasty (before 1911) and the following People's Republic of China (after 1949), China only obtained a positive score once in the year of 1912.

[28] As the data on the members in the Chinese Revolutionary Alliance was already compiled in Luo (1958), Chang (1982) only provides information on the founders. We add the information on members in Luo (1958).

across the country and hence, the origins of participants were widely distributed. The 1,277 recorded participants with identifiable origins came from 151 prefectures (from 17 out of the 18 provinces). The lowest share was 1.4% (from Shaanxi in the west) and the highest share was 11.93% (from Hubei in the south). Related summary statistics are presented in Table 1. In our empirical analysis, we examine both whether there were any participants and the number of participants.

One concern about the data quality is whether the early records were less precise than the late ones. To deal with this concern, we construct a county-level dataset for the province where the revolutionary groups started, namely Guangdong between 1894 and 1906. We complement the prefecture-level analysis with the county-level analysis within Guangdong. Figure A.5 plots the probability of revolution participation over time. The trend of the county-level data is very similar to that in the prefecture-level data between 1900 and 1906.[29]

Another important concern is the selection of registered revolutionaries. For this concern to matter for our analysis, the selection of registered revolutionaries needs to be systematically correlated with the quota and differs before and after the abolition of the exam, which seems to be a strong assumption. Nevertheless, as a validity check of the data, we collect a second dataset on the uprisings in 1911 from a Japanese source.

Data on the Early Uprisings in 1911 After the success of the Wuchang Uprising, many other uprisings occurred throughout the country over a compressed time period. The uprisings was closely followed by Japanese newspapers. On 3 November 1911, the Tokyo Nichi Nichi Shimbun (the Tokyo Daily News) provided a detailed map on the incidence of uprisings across China. We code the information to be a dummy variable indicating whether there was any uprising in a prefecture in 1911. Note that this information only included the early uprisings, while there were still uprisings in December 1911. Therefore, it is reasonable to think of them as the immediate echo to the success of the Wuchang Uprising by existing revolutionaries in a short episode rather than a slow diffusion of the uprisings. If there were more revolutionaries in a prefecture, the probability of echoing was likely to be higher.

This data helps us further check the reliability of the revolutionary data we collect. Figure A.6 in the appendix maps the spatial distribution of the uprisings and that of origin of revolutionaries. As is shown, the incidence of uprising is highly correlated with the number of revolutionaries originating from the prefecture. The correlation between the cumulative number of revolutionaries during 1900-06 and the incidence of uprisings is 0.33 (significant at the one percent level). With this information, we can also link quotas to the incidence of uprisings.

One concern is that the Japanese newspaper might consult news reports in China and the reporting might reflect the number of newspapers across regions. We collect the number of newspapers for each prefecture in 1911 and find that the correlation between the incidence of

[29]This analysis is only feasible for Guangdong as the majority of revolutionaries before 1900 originated from Guangdong.

early uprisings and the number of newspapers is very weak (with a p-value of 0.325).[30] We also include the number of newspapers per capita when we analyze the impact of quotas on the incidence of earlier uprisings.

Other Information on the Revolutionaries Ideally, one would also like to know the family and educational background of the revolutionaries. Unfortunately, there is no systematic information on the revolutionaries besides their origins. For the largest group (the Chinese Revolutionary Alliance), we also know the age of the revolutionaries. Figure A.7 plots their age distribution. The median age is 24, thus suggesting that the majority of the revolutionaries were young.[31]

We have also gathered biographical information for 63 out of the 106 cadres of the Chinese Revolutionary Alliance. 32 of them received traditional education only whereas 31 received some modern or western education besides traditional education. Among those receiving traditional education only, 12 joined the revolutionary group before 1905 and 20 joined after 1905. In contrast, among those receiving some modern education, 17 joined the revolutionary group before 1905 and 14 joined after 1905. These numbers suggest that more people educated under the exam system became revolutionaries after the abolition of the exam. But this finding has to be taken with a grain of salt because those with biographies available are the very top leaders and those with modern educational background were more likely to become cadres and have biographies.

2.4 Other Prefecture Characteristics

We include four sets of prefecture characteristics as our baseline controls. See Table 1 for more information on the data sources and summary statistics.

First, besides logged population size in 1880, we also control for the logged area of the prefectures.

Second, due to the potential importance of geography, we include two dummy variables: coast – whether a prefecture is situated on the coast and major rivers (those ranked as the first and second order streams in the Chinese river hierarchy) – whether a prefecture is located along major rivers.

Third, part of China was forced to open to trade after the first opium war (1839-42). The regions that were forced to open were known as treaty ports. Following the openness, new knowledge and economic forces began to penetrate China's economy, which might be correlated with the diffusion of revolutionary thought. Therefore, we use treaty port indicators to control for the possible effect of foreign influence.

Fourth, the participation in revolution might also be correlated with economic conditions. We control for urbanization measures from Rozman (1974), where Chinese cities were

[30] The data on the number of newspapers comes from Shi, Yao and Ye (1991).

[31] In the Qing dynasty, the average age of the literati, recommended men and presented scholars were around 24, 30 and 35, respectively (Chang 1955).

classified into three groups: large cities were those with a population of 300,000 and above, middle-level cities those with a population between 70,000 and 300,000, and small cities those with a population between 30,000 and 70,000.

Additionally, besides these first four baseline controls, we construct another 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 belonged to any of the 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 based on Liu (1993).

Table A.2 in the appendix presents the correlations between these prefecture characteristics and quotas per capita. As expected, quotas per capita is positively correlated with the prosperity and importance of a prefecture. We will control for the effect of prosperity and importance before and after the abolition of the exam in our analysis.

2.5 Qualitative Evidence

Before presenting the quantitative results, we discuss some historical records to show that our hypothesis was also borne out by qualitative evidence.

The dramatic change in the elite recruitment system due to the abolition of the exam and the possible consequences were clearly realized an average citizen who lived through this period. Liu Dapeng, a village gentry in Shanxi province (in northwestern China) kept diaries between 1891 and 1942. He learned about the abolition around September 10, 1905. He and other villagers realized that the ending of the exam system would transform channels for social mobility and that many other changes would inevitably follow. In an entry in December, 1905, he learned from his friend in the provincial capital that many students joined recently established organizations and was worried that "disasters and calamities will arise from them" (see Harrison (2005) for a systematic analysis of the diaries).

The importance of the abolition of the exam in revolution was also recognized by revolutionary leaders. Hu Hanmin, who became a key leader of the Kuomintang party after the success of revolution, once remarked, "who would have followed the revolution if the exam were not abolished?".[32]

Given these qualitative evidence, it is not surprising that scholars in the China field have conjectured that the abolition of the exam had important consequences on the collapse of the last dynasty. Franke (1970) states that the abolition of the examination system resulted in "the dissolution of existing political and social order", and hence the importance of this measure for the final collapse of the traditional system which soon followed cannot be overestimated. Rozman (1982) emphasizes that the abolition unlocked changes in what must be

[32]The website in memory of the 100th anniversary of the 1911 Revolution provides more anecdotal evidence on the importance of the abolition of the exam: http://news.ifeng.com/mainland/special/xinhaigeming100/.

the main institutional base of any government: "the means of awarding status to society's elites and staffing the administration." Elman (2009) remarks that the demise of the Qing was already assured when the Qing state "lost control of the education system".

Our main contribution is to construct systematic datasets to examine the link between the abolition of the exam and revolution participation. Moreover, we provide evidence to shed light on the mechanism behind the impact.

3 Empirical Results

In Section 3.1, we estimate the impact of quotas per capita on revolution participation before and after the abolition of the exam. We also present the link between quotas and the incidence of early uprisings in the 1911 Revolution. In Section 3.2 and Section 3.3, we present two sets of placebo tests to ensure that the baseline estimates are specific to the role of quotas and the abolition of the exam. Finally, to deal with omitted variables, we present results using two instrumental variables in Section 3.4.

3.1 Linking Quotas to Revolution Participation

The Impacts of Quotas before and after the Abolition Our baseline estimations are based on data across 262 prefectures between 1900 and 1906. We examine the link between quotas per capita and revolution participation before and after the abolition using the following specification:

$$\mathrm{R}_{p,t} = \beta \ln(\frac{\mathrm{Quota}}{\mathrm{Pop}})_p \times \mathrm{Post}_t + \vartheta \ln \mathrm{Pop}_p \times \mathrm{Post}_t + \theta \mathrm{X}_p \times \mathrm{Post}_t + \lambda_p + \gamma_t + \delta_{prov} \times \gamma_t + \varepsilon_{p,t.}$$

The dummy variable $\mathrm{Post_t}$ is 0 for the years before 1905 and 1 for 1905 and 1906. $R_{p,t}$ is a dummy indicating whether there is any revolutionary in prefecture p and year t. $\ln(\frac{\mathrm{Quota}}{\mathrm{Pop}})_p$ is the logged quotas per capita for the entry-level exam and $\ln \mathrm{Pop}_p$ is the logged population size in 1880.

λ_p and γ_t indicate prefecture and year fixed effects to control for all time-invariant differences between prefectures and changes over time that affect all prefectures similarly. In addition, we also include very flexible provincial-specific trends: $\delta_{prov} \times \gamma_t$. This will help us deal with potential confounding factors at the province level such as the quotas at the province level for candidates in higher-level exams. This is feasible because within-province variations account for the major part of the variations in quotas.

X_p is a vector of other prefecture-level characteristics discussed in Section 2.4. To further control for size effects, we control for logged area size. Additionally, we include a set of dummy variables indicating whether the prefecture located on the coast, the Yangtze River or any major river, whether the prefecture is a treaty port and dummies for city ranks (to measure urbanization).

The results are presented in Table 2. Column (1) presents the results including logged quotas per capita, logged population and all the fixed effects. They show that prefectures with higher quotas per capita had a higher probability of revolution participation after the abolition of the exam. Table A.3 presents a robustness check including flexible nonlinear terms of $\ln \text{Pop}_p$, showing that the effect of population size is captured by the linear term in our baseline estimations.

Columns (2)-(4) further include different sets of controls and column (5) reports the results weighted by population sizes. On average, a one standard deviation increase in the logged quotas per capita (0.7) implies about a 7.7 percentage point higher probability of revolution participation, which is about 48% of the mean probability (16 percentage points).

Columns (6)-(7) report the results for the number of revolutionaries. Column (6) uses a linear estimation whereas column (7) employs a Poisson estimation. The results deliver the same message as the estimations using the revolutionary indicator: a one standard deviation increase in the logged quotas per capita increased the numbers of revolutionaries after the abolition by about 0.38, around half the mean number of revolutionaries in the prefecture-level data (0.7). Column (8) shows that the results are also robust to using the number of revolutionaries per 100,000 inhabitants as the dependent variable.

The Dynamic Impacts of Quotas Our baseline estimations focus on the average impacts of quotas before and after the abolition. We can also examine the link between the quotas and revolution participation year by year. This way, we can examine whether there were already different trends for prefectures with different quotas before and after the abolition. The specification is as follows:

$$\begin{aligned} \text{R}_{p,t} \quad = \quad & \sum_{\tau=1901}^{1906} \beta_\tau \ln(\frac{\text{Quota}}{\text{Pop}})_\text{p} \times \text{Year}_\tau + \sum_{\tau=1901}^{1906} \upsilon_\tau \ln \text{Pop}_p \times \text{Year}_\tau \\ & + \sum_{\tau=1901}^{1906} \theta_\tau \text{X}_p \times \text{Year}_\tau + \lambda_p + \gamma_t + \delta_{prov} \times \gamma_t + \varepsilon_{p,t}, \end{aligned}$$

where the year of 1900 is left as a comparison.

We leave the estimates across different specifications in Table A.4 in the appendix and visualize the main results in column (4) in panel (a) of Figure 3, where the solid line connects the estimates and the shaded area indicates the 95% confidence intervals with standard errors clustered at the prefecture level.

The figure shows that there were no significant differences in the pre-trends for the prefectures with high and low quotas while the positive impact of quotas occurred in 1905, when the exam system was abolished. The magnitudes of the impacts are around 0.13 for 1905 and 1906, similar to the baseline estimates in Table 2.

To clarify, the impact in 1905 in the yearly data is driven by the timing of the revolutionary groups. The majority of new members in 1905 belonged to the Revolutionary Alliance

that was officially established in August 1905. The Revolutionary Alliance was the largest revolution group in this period and later became the core of the KMT party. Among the members that joined in 1905, 25% joined before September 2, 1905 and 75% of the members joined after the abolition date. Therefore, it is not surprising that there was an impact in 1905.

We also have information on the exact date of participation for the Revolutionary Alliance.[33] The earliest members joined in July, 1905 (before its official establishment). This limitation implies that we do not have rich monthly information. Nevertheless, this information allows us to check whether quotas mattered for those who joined in July and August. We examine the correlation between quotas per capita and revolution participation month by month and visualize the results in the Figure A.4 in the appendix. As shown, quotas per capita were not significantly correlated with the participation before the abolition date but mattered after that. We do not have a structural theory to explain the effect month by month, but it is reasonable to see an immediate response after the abolition: the marginal individuals who were deciding to participate or not were likely to be mobilized quickly. One might be concerned about the communication technology in this period. Given the importance of the exam system, the abolition decision reached citizens very soon. As discussed in the qualitative evidence in Section 2.5, citizens who lived in a relatively isolated village in Shanxi Province (northwestern China) already learned about the abolition a few days after the official abolition. Moreover, to examine whether the effects of quotas per capita on revolution participation changed significantly after the abolition, we regress the revolutionary indicator on the interaction between logged quotas per capita and the post-September dummy. The results are presented in Table A.5, which shows that prefectures with higher quotas per capita had a higher probability of revolution participation after September 2, 1905.

We focus on the period between 1900 and 1906 because the majority of revolutionaries came from one province (Guangdong) before 1900. This limitation shortens the number of years for our estimations on the dynamic impacts. In addition, the number of revolutionaries is naturally smaller before the abolition, which might mechanically affect the finding of no-pretrends. To deal with this concern, we construct a county-level panel for 92 counties in Guangdong, where we can trace revolutionaries back to 1894. As shown in Figure A.5, quite a few counties already had revolutionary participation before 1900. Considering that counties could still compete for some quotas at the prefecture capital, we also control for prefecture-specific trends ($\delta_{pref} \times \gamma_t$) in our analysis.

Replacing the variables in the prefecture-level analysis with county-level information, the estimates on the dynamic impacts are presented in Table A.6 in the appendix. Panel (b) of Figure 3 visualizes the results in column (4) of Table A.6. Once again, it shows that the effect of quotas took place after the abolition of the exam.

[33] Unfortunately no such detailed information available for the other five revolutionary groups.

Correlation Between Quotas and The Incidence of Uprisings The previous results are obtained from difference-in-differences analysis. The incidence of early uprising in 1911 is cross-sectional information by definition. Hence, we can only examine a cross-sectional correlation as follows:

$$\mathrm{I}_{p,1911}= \alpha \ln(\frac{\text{Quota}}{\text{Pop}})_{\mathrm{p}}+\nu \ln \text{Pop}_p+\theta \mathrm{X}_p+\delta_{prov}+\varepsilon_{p,}$$

where $\mathrm{I}_{p,1911}$ indicates whether there was an early uprising in prefecture p in 1911.

The results are presented in columns (1)-(5) of Table 3. They show that quotas were positively correlated with the incidence of the early uprisings in 1911: a one standard deviation increase in logged quotas per capita was associated with about a five percentage point higher probability of early uprisings, which is around one third of the mean probability (15 percentage points). As shown in columns (4)-(5), newspapers per capita had no significant impact on the the incidence of uprisings while the impact of quotas varies little after including newspapers per capita.

Two main concerns about our baseline findings are whether the results are driven by the role of quotas and whether they are specific to the abolition of the exam. We examine these two issues in Section 3.2 and Section 3.3.

3.2 Using the Boxer Rebellion as a Placebo

We are concerned whether our findings on the role of quotas reflect the impacts of other prefecture characteristics. For instance, prefectures with higher quotas per capita might be more pro-conflict or different in political sentiment. To check this concern, we use the Boxer Rebellion between 1899 and 1901 to conduct a placebo test. Similar to the 1911 Revolution, the Boxer Rebellion was also motivated by proto-nationalist sentiments and opposition to foreign imperialism and Christianity. However, it had little to do with the exam system, as most of the participants were landless peasants (Esherick 1987). Therefore, we use it as a check to ensure that prefectures with higher quotas were not necessarily always pro-conflict or more motivated by proto-nationalist sentiments.

The data on the Boxer Rebellion comes from the appendix in the Boxer Protocol (1901). The Protocol was a treaty signed between the Qing government and eleven foreign powers involved in suppressing the Boxer Rebellion. It listed the prefectures and counties where the Boxer operated and killed foreigners, which gives us a dummy variable to measure the incidence of the rebellion.

In contrast to the impact on the 1911 Revolution, as shown in columns (8)-(10) of Table 3, quotas per capita were not at all correlated with the incidence of the Boxer Rebellion. This test implies that the above findings are specific to quotas rather than other omitted variables such as whether certain prefectures were more pro-conflict. Since the Boxer Rebellion affected the northern prefectures more, we also limit the sample to the prefectures with a latitude higher than that of the southernmost prefecture with the Boxer Rebellion. The results are

presented in columns (6), (7) and (11) and are similar to those obtained when using the whole sample.

Another related test that we conduct on potential ideological difference is to examine party identification after the success of the revolution. In particular, compared with the other parties (the Republican Party and the Democratic Party), *Kuomintang* (which literally means "Chinese Nationalist Party") was known to be more radical. In contrast, the party ideology of the Republicans was based on Jean-Jacques Rousseau's The Social Contract whereas the Democratic Party emphasized that stability was its primary goal. We do not find that quotas per capita were of importance for party identification, which is also consistent with the placebo test using the Boxer Rebellion. The results and discussions are presented in Table A.7 and Section A.1 in the appendix.

3.3 Checking the Impacts of Other Historical Events

Another main concern on our main findings is that the abolition of exam might be concurrent with other policy shocks. If these shocks increased a general revolutionary upheaval, our findings might capture the impact of such an upheaval rather than abolition of the exam. To speak to this concern, we examine the impacts of all the important historical events during 1895-1910 on revolution participation.

First, most of the important historical events during 1895-1910 were not concurrent with the abolition of the exam. There were three important events during 1895-1905 (Cameron 1931): the failure of the Qing government in the Sino-Japanese War in 1895, the Hundred Days' Reform in 1898,[34] and the Boxer Rebellion and the agreement to sign the Boxer Protocol in 1901. In particular, the treaty following the Sino-Japanese War and the Boxer Protocol required the Qing government to pay large indemnities that might indirectly increase the tax burden of citizens. Thus, these events might trigger some revolutionary upheaval. However, different from the abolition of the exam, the elite recruitment system was not changed in these events. We use the county-level information between 1894 and 1906 to check their impacts. As shown in Panel (b) of Figure 3, quotas per capita did not exhibit any significant effect in the years of 1895, 1898 or 1901. These results can be taken as placebo tests, confirming that our finding is specific to the year of the abolition of the exam.

Second, besides the domestic events, some international ones might also create revolutionary upheaval in China. Our main findings might capture the interaction between quotas per capita and general upheaval. If this story were true, we would expect that such effects were larger in regions with more information exposure or higher foreign penetration. To test this prediction, we employ newspaper density and a dummy indicating foreign enclaves as the pertinent proxies.[35] We examine the triple effect of logged quotas per capita, the abolition

[34]The Hundred Days' Reform was a failed 104-day national cultural, political and educational reform movement from 11 June to 21 September 1898. The reform touched the economic and political system, the education system as well as the military. But none of them really succeeded.

[35]The data on foreign enclaves comes from Yan (1955).

timing dummy, and the two proxies. The results are presented in Table A.8 in the appendix. As shown in columns (1)-(2), information exposure and foreign penetration cannot explain our findings. We do not find significant heterogeneous effects regarding foreign penetration either.

Finally, we focus on one of the most influential international events in 1905 – the Russo-Japan war, which partly triggered the abolition of the exam. We hypothesize that the impact of quotas per capita would be strengthened by Japanese exposure if the change in the quota's effect captures the revolution upheaval due to the Russo-Japan war. With the inclusion of the triple interaction of logged quotas per capita, the post-abolition dummy, and the Japanese enclave dummy, our baseline results still hold and we do not find any significant triple effect (Columns (3)-(4)). Moreover, we further check the influence of the Russo-Japan using the number of students studying in Japan. We collect yearly information on the origins of Chinese students studying in Japan. We will discuss these results in more detail in Section 4.4 when examining the impact of modern human capital. In short, we find a positive impact of them on revolution participation but this effect did not change before and after 1905.

Together, these tests show that our baseline findings are unlikely to be driven by historical events other than the abolition of the exam.

3.4 Results from Instrumental Variables

Using the difference-in-differences strategy, we can rule out the effects of omitted variables only when their effects did not change before and after the abolition of the exam. Given that the government still selected bureaucrats after the abolition, which was likely to be affected by omitted variables (OV) positively correlated with quotas (such as political networks). The role of such omitted variables was likely to become more important in elite recruitment after the abolition and hence decreased the probability of revolution participation, i.e., $\beta^{\text{OV}}_{\text{post}} - \beta^{\text{OV}}_{\text{pre}} < 0$. Given that $\beta = (\beta_{\text{post}} - \beta_{\text{pre}}) + \frac{\text{cov(Quota,OV)}}{\text{var(Quota)}}(\beta^{\text{OV}}_{\text{post}} - \beta^{\text{OV}}_{\text{pre}})$, the DID estimate is likely to be biased downwards. For this concern, we further employ explore two instruments for quotas.

Instrument I: The number of small 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 tended to have more quotas, because the quota assignment followed the stepwise role and each county would get some quota. Therefore, we would like to find an instrument that affected the formation of counties in a prefecture but did not affect revolution through any other channels such as economic development. The number of rivers is a reasonable candidate for two reasons. First, counties were usually formed around rivers. As shown in Figure A.8 in the appendix, county seats were generally located on rivers. Second, it is not efficient to have many rivers within a county due to high administrative costs (e.g. tax collection costs). These two reasons lead to a positive link

between the number of rivers and the number of counties.

However, the number of rivers might affect other dimensions besides the number of counties (e.g. economic development). To take into consideration potential confounding impacts of rivers on development, we exclude major rivers and use the number of small rivers normalized by the total length of rivers. The idea is that the shape of rivers affected the number of counties, given their length.

In sum, the channel that number of small rivers affects the prefecture-level is as follows:

$$(\frac{\#\text{small rivers}}{\text{River length}})_p \xrightarrow{(a)} (\frac{\#\text{counties}}{\text{River length}})_p \xrightarrow{(b)} (\frac{\text{Quota/Pop}}{\text{River length}})_p.$$

Figure 4 illustrates this channel. Panel (a) visualizes the positive correlation between the number of counties and the number of small rivers, given the length of rivers. Panel (b) visualizes the positive correlation between logged quotas per capita and the number of counties, given the length of rivers. The two links together imply that the number of small rivers has a strong positive impact on quotas per capita, as presented in columns (1)-(2) of panel (a) in Table 4. Column (3) further shows no significant correlation between the instrument and the change in quotas per capita, which happened once due to the fighting of the Taiping Rebellion and should not be explained by geography. Section A.2 in the appendix further gives an example in the data to further illustrate the channel behind the instrument.

We also conduct four sets of tests to check whether our instrument might affect other dimensions besides quotas. First, we examine whether the river feature affects transportation conditions. Using the official designation of transportation centers (see Section 2.4 for discussions of the data source), columns (4) and (5) show that our instrument is uncorrelated with the importance for transportation regardless of using a dummy for a prefecture or the average of the counties in a prefecture. As expected, being located on a major river is correlated with transportation importance. Second, we examine whether the instrument is correlated with the suitability of different crops, premised on the notion that the number of small rivers might be correlated with agricultural suitability. We employ the suitability for three crops: wetland rice - a stable food highly dependent on water; foxmillet - a traditional Chinese drought-resistant crop; and sweet potato - the main New World crop adopted in China.[36] Columns (6)-(8) show that there is no significant correlation between our instrument and crop suitability. Third, we also wonder whether the incidence of climate disasters might systematically differ between the two prefectures with a different density of small rivers. We construct a measure on the drought/flood index during 1800-99, and find that our instrument is not significantly correlated with it, as reported in column (9).[37] Finally, we check whether the number of small rivers affects the fragmentation of basins that may also affect the suitability of agriculture. As shown in column (10), we do not any significant impact

[36]The suitability data is from FAO (2012).

[37]The weather data comes from the State Meteorological Society (1981). Weather conditions are coded into five indicators: -2(extreme flood), -1 (flood), 0 (normal), 1 (drought) and 2 (extreme drought).

on basin fragmentation measured by the Herfindahl-Hirschman index. In Section 4.1 below, we examine the impact of language fragmentation on revolution participation and find that language fragmentation dampened the impact of quotas. This is another piece of evidence suggesting that the concern of fragmentation is unlikely to drive our findings. Of course, there may still be some dimensions these tests do not capture. But they suggest that the major omitted variables are unlikely to be a critical concern.

Together with the relevance tests, these placebo tests suggest that the number of small rivers is a reasonable instrument. Additionally, we define small rivers as rivers of less than 70, 80, ..., 120 km and show that the results are robust to such variations. These checks are presented in Table A.9 and discussed in Section A.3 in the appendix.

Instrument II: Exam performance before the quota system Our alternative instrument stems from historical roots of the quota system. The regional quota system was initially employed during the Ming dynasty (AD 1368-1644). In 1425, a provincial-level quota system was introduced to balance the opportunity to pass the national exam. In 1436, the central government began to appoint government officials to each prefecture to select candidates for the province-level exam (Li 1989). In short, the quota system was initially introduced during 1425-36.

We hypothesize that the performance in the exam before 1425, measured by the number of presented scholars (those succeeding in the national-level exam), could affect the subsequent quota assignment. However, instead of using the level of the performance as an instrument, we employ changes in the performance in the very short run as another instrument for two reasons. First, the short-run change rules out the time-invariant prefecture-specific factors that can have long-run impacts. Compared with the level of performance, the short-run change is more like be driven by random factors. For instance, it could capture the supply of exceptional students that did not persist in the long run. Another example is the idiosyncratic preference of an emperor could also affect the short-run performance of a prefecture but did not have a persistent effect. Second, the change also captures the fact that the performance in more recent years played a more important role than that in more distant years when the quotas got assigned.

Following this thought experiment, we divide the pre-1425 period into two sub-periods of similar length (1368-1398 and 1399-1425). Denote the logged number of presented scholars in the first three decades as $\ln(1+\text{PresentedScholar}_0)$ and that during the second three decades $\ln(1+\text{PresentedScholar}_1)$. We employ the first difference of exam performance $\Delta\ln\text{PresentedScholar}$ as our alternative instrument. To further control for potential level effects, we also include the initial level in our analysis.

Similar to the first instrument, we examine the relevance of this instrument and whether it affects other factors besides the quota. Columns (1)-(3) of panel (b) in Table 4 present the results from the relevance tests. As placebo tests, we examine whether this instrument affects changes in the number of presented scholars in longer periods. We looked at seven periods

(defined by the tenures of emperors), and take the first difference in the number of presented scholars. By regressing these differences on our instrument, we do not find any significant correlations, as shown in columns (4)-(9). Thus, the relevance and placebo tests in panel (b) suggest that the short-run performance before the quota system is another reasonable instrument.

Estimation results from two instruments Given the relevance tests as well as the placebo tests, we perform the instrument variable estimations. The first-stage and second-stage estimations are as follows:

$$\begin{aligned}\ln(\frac{\text{Quota}}{\text{Pop}})_{\text{p}}\times\text{Post}_t &= \rho_1(\frac{\#\text{small rivers}}{\text{River length}})_p\times\text{Post04}_t + \delta\ln\text{River length}_p\times\text{Post}_t \\ &+\rho_2\Delta\ln\text{Pres.Scholar}_p\times\text{Post04}_t+\sigma\ln(1+\text{Pres.Scholar}_0)_p\times\text{Post04}_t \\ &+\nu\ln\text{Pop}_p\times\text{Post}_t+\theta\text{X}_p\times\text{Post}_t+\lambda_p+\gamma_t+\delta_{prov}\times\gamma_t+\varepsilon_{p,t},\end{aligned}$$

and

$$\begin{aligned}\text{R}_{p,t} &= \beta\ln(\widehat{\frac{\text{Quota}}{\text{Pop}}})_{\text{p}}\times\text{Post04}_t+\delta\ln\text{River length}_p\times\text{Post}_t+\sigma\ln(1+\text{Pres.Scholar}_0)_p\times\text{Post04}_t \\ &+\nu\ln\text{Pop}_p\times\text{Post}_t+\theta\text{X}_p\times\text{Post}_t+\lambda_p+\gamma_t+\delta_{prov}\times\gamma_t+\varepsilon_{p,t}.\end{aligned}$$

The results are presented in Table 5. Before presenting the results using both instruments, columns (1)-(3) report the results using the river instrument. Column (1) reports the reduced-form result and shows that this instrument is significantly correlated with revolution participation. Column (2) reports the IV estimate (0.38). Column (3) includes the second instrument as a regressor. The insignificant effect of the second instrument suggests that it does not have any direct effect on revolutionaries besides the channel of quotas – this method can be regarded as an easy-to-interpret version of the over-identification test. The first stage F-statistics are above 40, implying that this instrument is not weak. Similarly, columns (4)-(6) report the corresponding results using the second instrument. The estimate from the instrument is around 0.24.

Columns (7)-(9) combine the two instruments. Column (7) reports the reduced-form result while column (8) presents the IV estimate. Column (9) further includes all variables used in the placebo tests (transportation, crop suitability, climate shocks and basin fragmentation index) and the estimate varies very little. Consistent with the tests in columns (3) and (6), the p-value of the over-id test is around 0.5.

The estimate using the two instruments is about twice that of the estimate using the differences-in-differences method. This difference is consistent with the concern of omitted variable. Naturally, another explanation for the difference is that the IV estimates provides local average treatment effects specific to the two instruments.

4 Understanding the Mechanism

Having established the link between quotas and revolution participation after the abolition of the exam system with different methods, we now turn to understanding the mechanism. It is worthwhile emphasizing that for any factor to account for our main findings, it needs to explain two patterns in the data: (1) its effect should be correlated with quotas per capita, and (2) its effect changed discontinuously before and after the abolition of the exam.

Using these two criteria, we lay out four hypotheses based on the role of the state and that of different groups of citizens. The first hypothesis is the role of "*state capacity*": the abolition of the exam might signal or was driven by deterioration in state capacity and the impact might be larger in regions with higher quotas per capita. A second hypothesis is "*elite eligibility*": the abolition of the exam affected the prospect of becoming an elite for a large group of commoners and the impact is larger in prefectures with higher quotas per capita that determine the probability of becoming an elite. A third hypothesis is "*elite resistance*": the existing elites might dislike the abolition and the amount of them was also positively correlated with quotas. A final hypothesis is "*modern human capital*": there might also be more modern human capital in prefectures with higher quotas per capita and modern education facilitated revolution.

We present multiple pieces of evidence for or against each hypothesis and find that the empirical patterns appear most consist with the "*elite eligibility*" hypothesis. So we first present evidence for this hypothesis and formalize it in a simple model. Then, we come to the other three hypotheses and point out why they differ from the data in important ways.

4.1 Elite Eligibility

One interpretation of the empirical findings is that the abolition affected the prospect of a large group of commoners who hoped to become elites through the exam system. To check whether this hypothesis is reasonable, we would like to check whether the prospect for commoners changed before and after the abolition of the exam. We find supportive evidence for this hypothesis. Given this finding, we formalize the logic in a simple model, which delivers a further prediction on social capital. Thus, we also bring the role of social capital to data.

Evidence for the Change in Prospect To show that the quotas mattered for the prospect of upward mobility, we link quota per capita for a prefecture to the number of presented scholars and key officials from each prefecture during the Qing dynasty (1644-1904), while controlling for province fixed effects and population sizes in the mid-Qing period. The results are presented in columns (1)-(4) of Table 6. To facilitate the comparison across regimes, beta coefficients are reported so that the coefficients should be interpreted as how many standard deviations the dependent variable will change, per standard deviation increase in logged quotas per capita. p-values are reported in squared brackets.

To examine the change in the influence of quotas before and after the abolition of exam, we examine the link between quotas and the origins of political newcomers. For the period before the abolition, the political newcomers were the presented scholars that succeeded in the national exam who were eligible to become top officials. After the abolition, the government selected people with a foreign-educational background and gave them a degree of quasi-presented scholars. Columns (5)-(6) of Table 6 present the correlations between quotas per capita and the number of newcomers in 1904 (before the abolition), while columns (7)-(8) present that for case in 1907 (after the abolition). They show that the importance of quotas per capita in determining the number of newcomers decreased significantly after the abolition. In 1904, a one standard deviation in logged quotas per capita explains about a 0.3 standard deviation of political newcomers and the correlation is significant at the 1% level. In contrast, in 1907, the correlation between quotas per capita and political newcomers is not significant and the magnitude of the correlation is also halved. The difference between the impacts of quotas in 1904 and 1907 is significantly different, with p-values of 0.046 and 0.009 for the newcomer dummy and the number of newcomers, respectively.

This quantitative evidence is also consistent with a large historical literature on the role of the exam in social mobility. There is not enough space to list all contributions by historians and sociologists to this literature. On average, the literature on the role of the exam in social mobility documents that 40-60 percent of the successful candidates came from non-official backgrounds (i.e., neither their fathers nor their grandfathers had earned a degree) and that 80 percent of the descendants beyond the grandson generation of the local prominent individuals became unknown due to the exam system.[38] This line of historical research is sometimes criticized for not considering the background of extended families or even more generations (Hymes 1986, Hao and Clark 2012). Conceptually, including larger kin network or lineage could decrease the estimates and reveal more advantages of those from elite families than focusing on grandfather-father-son associations. However, using detailed inter-generational data, Campbell and Lee (2003) find that kin networks did not monopolize opportunities, even though distant kin influenced the chances of obtaining a title.

For our interpretation, what matters is the weakening of the role of quotas after the abolition of the exam. The weakening link made prefectures with higher quotas per capita more likely to lose from the reform. Consequently, the likelihood of revolution participation became higher in the prefectures that lost more. To formalize this logic, we construct a

[38]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. Chang (1955) indicates that at least 35 percent of the gentry class in the 19th century were "newcomers" (neither their fathers nor their grandfathers had held gentry status.) Studying the biographies of the candidates in Ming and Qing dynasties, Ho (1962) finds that over 40 percent of those succeeding at the highest level (i.e., the presented scholars) came from non-official backgrounds. Using a different method, Hsu (1949) studied the background of prominent individuals mentioned in the gazetteers of four widely separated regions in China and found that roughly 50 percent of the local prominent individuals came from unknown origins and roughly 80 percent of the descendants beyond the grandson generation of the local predominant became unknown. He also pointed out that the fairly high degree of mobility was driven by the civil service exam system.

simple model of revolution participation to highlight the role of prospect of upward mobility (or perceived mobility). The model borrows several elements from the model on riots in Passarelli and Tabellini (2013). The model provides a reduced-form way of capturing the change in prospect of upward mobility, which can also be interpreted as a change in the expected returns on the investment in the exam. This formalization also delivers additional predictions that can be further tested.

A Simple Model on Prospect and Revolution There are two types of agents in economy: the poor commoners with income w_0 and the small group of rich elites with income w_1, where $w_1 > w_0$. Under the status quo without revolution, a commoner perceives that he will become a rich elite in the next period with probability $\eta_0(q)$ and stay poor with probability $1 - \eta_0(q)$, where q indicates quotas per capita and η_0 is increasing in q.[39] The abolition of the exam can be considered as a decease in $\frac{\partial \eta_0(q)}{\partial q}$.

The commoner decides whether or not to participate in the revolution. If the revolution succeeds, the probability of becoming rich becomes $\eta_1(q)$ instead of $\eta_0(q)$. Joining a revolution is costly. The cost is the sum of two components: $\mu + \varepsilon^i$, where μ is known and common to all agents and ε^i reflects individual heterogeneity. ε^i follows a distribution $G(\varepsilon)$, which is continuous and has density $g(\varepsilon)$.

Following Passarelli and Tabellini (2013), we use a simplified way of capturing the complementarity in participation, namely that the benefit of participation grows proportionately with the number of other members also participating in the revolution, p. λ captures how easy it is to overcome the collective action problem. One natural measure of λ is social capital: in prefectures with more social capital, it is easier for people to coordinate and overcome the collective action problem. Another way of interpreting λ is that the value of revolution is higher or the probability of being reported to the government is lower for people with stronger group identity.

Given the cost and benefit of revolution, a poor agent i participates in the revolution if:

$$p\lambda[\eta_1(q) - \eta_0(q)](w_1 - w_0) - \mu - \varepsilon^i \geq 0.$$

The probability of participation becomes a fixed point of the following condition:

$$p = G(p\lambda[\eta_1(q) - \eta_0(q)](w_1 - w_0) - \mu). \tag{1}$$

We focus on the interior solution.[40] The revolution condition gives the following compar-

[39] Similarly, a rich agent perceives that he will become poor in the next period with probability η_0^r and stay as rich with probability $1 - \eta_0^r$. The participation of such agents in the revolution is trivial.

[40] Similar to Passarelli and Tabellini (2013), we assume $\lambda(\eta_1 - \eta_0)(w_1 - w_0)g(p\lambda(\eta_1 - \eta_0)(w_1 - w_0) - \mu) < 1$ to rule out the case of multiple equilibria.

ative statics:

$$\frac{\partial p}{\partial q} = \frac{gp^*\lambda(w_1 - w_0)[\frac{\partial \eta_1(q)}{\partial q} - \frac{\partial \eta_0(q)}{\partial q}]}{1 - g\lambda(\eta_1 - \eta_0)(w_1 - w_0)} \tag{2}$$

Under the exam system, equation (2) captures the impact of quotas per capita on revolution participation. After the abolition of the exam, the link between quotas per capita and upward mobility gets changed: $\frac{\partial \eta_0(q)}{\partial q}$ is changed to be $\frac{\partial \eta_0'(q)}{\partial q}$. As a result, the comparative statics after the abolition of the exam becomes:

$$\frac{\partial p'}{\partial q} = \frac{gp^*\lambda(w_1 - w_0)[\frac{\partial \eta_1(q)}{\partial q} - \frac{\partial \eta_0'(q)}{\partial q}]}{1 - g\lambda(\eta_1 - \eta_0)(w_1 - w_0)} \tag{3}$$

The difference between equations (3) and (2) gives the impact of quotas on the participation before and after the abolition of the exam:

$$\frac{\partial p'}{\partial q} - \frac{\partial p}{\partial q} = \frac{gp^*\lambda(w_1 - w_0)}{1 - g\lambda(\eta_1 - \eta_0)(w_1 - w_0)}[\frac{\partial \eta_0(q)}{\partial q} - \frac{\partial \eta_0'(q)}{\partial q}] > 0. \tag{4}$$

As discussed in the previous subsection, $\frac{\partial \eta_0'(q)}{\partial q} < \frac{\partial \eta_0(q)}{\partial q}$. Thus, equation (4) implies that individuals of status w_0 is more likely to participate in the revolution in prefectures with a higher q after the abolition of the exam. This prediction is consistent with the differences-in-differences strategy in our baseline analysis: the first difference is with respect to q and the second difference is with respect to the abolition of the exam.

In addition, this simple model also delivers a few other predictions. For example, the impact of q is strengthened by inequality $(w_1 - w_0)$ and social capital (λ). We do not have information on inequality in this period.[41] However, we can explore the measure of social capital across prefectures to test whether the impact of quotas per capita was strengthened by social capital.

Evidence on the Role of Social Capital λ in the model captures the role of social capital and can be interpreted as how easy it is to coordinate in revolution participation or how strong group identity is. A higher λ can increase the expected benefits of revolution or decrease the probability of being reported to the government. One inverse measure for λ is language diversity explored in the ethno-linguistic fragmentation literature (Alesina and La Ferrara 2000). Specifically, we calculate an ethno-linguistic fragmentation (ELF) measure proposed by Alesina and LaFerrara (2005b): $ELF = 1 - \sum_{i=1}^{N} s_i^2$, where s_i represents the share of dialect i over the total area in a prefecture. The information on dialects comes from the Language Atlas of China (1988).

Moreover, considering that it may be more difficult to organize two large distinct groups than many small groups, we borrow the polarization index (PI) in the ethnic conflict litera-

[41] Inequality itself is unlikely to explain our findings as it could not change dramatically in the short period. However, it can strengthen the impact of the abolition.

ture (Garcia-Montalvo and Reynal-Querol 2002), where $PI = 1 - \sum_{i=1}^{N} s_i(\frac{1/2 - s_i}{1/2})^2$.

To test whether the impact of quotas per capita was strengthened by social capital, we examine the triple effect of logged quotas per capita, the abolition timing dummy and the measures of linguistic fragmentation or polarization. The results are presented in Table 7. Columns (1)-(3) use the fragmentation index whereas columns (4)-(6) use the polarization measure. Both groups of results show that the effect of quotas was smaller in prefectures with lower social capital. This finding is consistent with the role of social capital in strengthening the impact of quotas per capita.

4.2 State Capacity

Another interpretation of our findings is that the abolition of the exam *signaled* or *was driven by* a dramatic deterioration in state capacity. We test three predictions based on this hypothesis. First, if signaling were the main driver of findings, we expect that other historical events in this period (that might also signal a deterioration in state capacity) would also have a similar impact on revolution participation. But as shown in Section 3.3, other historical events in this period did not exhibit a similar impact to that of the abolition of the exam.

Below we present evidence from two new tests. We employ tax revenues as a measure of state capacity and examine whether there was any dramatic change in different types of tax revenues. Further, if state control were the main driver of our findings, we would expect to see a larger impact in regions where political control was more important. We collect various measures of political and economic importance for all prefectures and examine whether these measures explain our finding.

Checking Changes in Capacity: Using Information on Tax Revenues One measure of state capacity is tax revenues (Besley and Persson 2011). There were three major tax sources in this period: land tax, internal tariffs (known as likin in Chinese) and customs duties. Together, they accounted for over 80% of the total tax revenues. Information on the prefecture-level taxes is very limited, but we can examine the impact of quotas on different tax revenues before and after the abolition of exam at the provincial level.

On land taxes, we collect province-level information in 1893, 1903, and 1908.[42] With this information, we examine whether land taxes responded to the interaction of quotas per capita and the abolition of the exam. The results are reported in columns (1)-(2) of Table 8A. They show that $\ln\frac{\text{Quota}}{\text{Pop}} \times \text{Post}$ is not significantly correlated with land taxes.

On internal tariffs, we collect yearly information at the provincial level during 1900-08.[43] As shown in columns (3) and (4), $\ln\frac{\text{Quota}}{\text{Pop}} \times \text{Post}$ is not significantly correlated with internal tariffs either.

Customs duties were the revenue source that experienced dramatic increase in this period. We collect yearly data on the revenues for each customs and match the data with the province-

[42] The data comes from Wang (1973) and Liang (1981).
[43] The data comes from Luo (1936).

level information.[44] Once again, as shown in columns (5)-(6), we find that $\ln\frac{\text{Quota}}{\text{Pop}} \times \text{Post}$ did not significantly affect the customs duties.

Checking the Role of Capacity: Employing Importance Measures Thanks to the rich historical information, we can measure the importance in various ways: (i) the land tax per capita in 1820,[45] (ii) whether a prefecture is a provincial capital, and (iii) the designations by the government indicating the characteristics of a prefecture: *chong* (important in transportation/communication), *fan* (important 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 based on Liu (1993).

These results are presented in Table 8B. Among these characteristics, only the difficulty in taxing had a weak and positive impact on revolution participation after the abolition of the exam. As they show, the impact of quotas per capita varies little after controlling for these factors and their interactions with the post dummy. Therefore, these measures cannot explain the impact of quotas. If our assumption that the decline in state capacity had a larger impact on the regions of more importance holds, this finding suggests no discontinuous change in state control.

Thus, neither the direct evidence based on tax revenues nor indirect evidence based on political importance can explain our main findings.

4.3 Elite Resistance

Existing elites could contribute to revolution in two ways. First, they could participate in revolution because their prospect of upward mobility was negatively affected. Second, they played an important role in organizing local affairs including providing public goods. Even if they did not participate in the revolution themselves, they might have become less willing to contribute to local affairs so that other individuals became more likely to participate in the revolution. We examine the two possibilities.

The Prospect for the Existing Elites To measure the prospect for the existing elites, we collect information candidates at higher levels (presented scholars and key officials) and examine whether the probability of moving up to these higher levels could account for our main finding by including $\ln(1 + \#\text{PresentedScholars})$ and $\ln(1 + \#\text{Officials})$ in the estimations. In addition, as a further measurement check, we examine the role of the prospect for each level by estimating the impacts of $\frac{\text{Quota}}{\text{Pop}}$, $\frac{\#\text{presented scholar}}{\text{Quota}}$, and $\frac{\#\text{official}}{\#\text{presented scholar}}$ on revolution participation.

The results are presented in Table 9A. Similar to our baseline, columns (1)-(4) show the results on logged quotas per capita, logged numbers of presented scholars per capita and

[44] The data comes from Tang (1992).

[45] The prefecture-level information on land tax is only avaialbe in the year of 1820, which comes from Liang (1981).

logged numbers of key officials per capita. Columns (5)-(8) present the results using the ratios to measure the impacts. Both groups of results show that what mattered is the entry-level quotas per capita. This finding is not surprising, considering that the size of existing elites was very limited. In addition, they could easily adapt to the new system, as discussed in the background.

The Importance of Public Goods Provision by the Elites The gentry class created by the exam system played an important role in local governance. For example, they contributed to the provision of public goods including the provision of schooling, the promotion of irrigation projects as well as disaster relief (Chang 1955). Considering the importance of the gentry class, another hypothesis is that the role of the gentry class was more important in prefectures with higher quotas per capita. Therefore, these prefectures responded more aggressively to the abolition of the exam by participating in revolution.

To test whether this hypothesis explains our main finding, we need to measure the importance of public goods. One candidate is the weather condition in a prefecture. Since historical China was an agrarian economy vulnerable to weather shocks, it is reasonable to assume that the contribution of public goods by the local gentry was more important in regions suffering more frequently from droughts and floods. Hence, we employ long-run measures of weather conditions to examine the importance of this alternative hypothesis.[46] In particular, we employ the standard deviation of the weather indicators during the past century (1800-1899). As shown in columns (1)-(2) of Table 9B, the importance of public goods cannot explain our main findings. For completeness, we also include weather shocks in the short run. Columns (3)-(4) further show that short-run weather shocks cannot explain main our findings.

Therefore, neither the prospect of the existing elite nor the importance of public goods provided by them can explain our main findings.

4.4 Modern Human Capital

A final hypothesis to explain the republic revolution is that individuals who got educated in foreign and modern schools were exposed to revolutionary ideology and participated in the revolution to modernize China. Conceptually, the role of modern human capital does not imply a discontinuous effect in 1905. Even though prefectures with higher quotas might also be rich in modern human capital, the amount of modern human capital could not increase immediately with the abolition of the exam. Nevertheless, we construct a dataset on modern human capital to evaluate its contribution to the revolution, including the number of students studying in Japan between 1900 and 1906, the number of modern firms between 1900 and 1906 as well as the number of students in modern primary schools in 1920. These measures could also potentially mitigate the impact of the abolition on revolution because they capture alternative mobility channels. Additionally, as discussed in the background, men with a

[46] The data comes from the same source as that used in the placebo tests for the instrument.

modern educational background were favored in elite recruitment after the abolition. What we can evaluate is only the net effect.

The Number of Students Studying in Japan The number of students studying in Japan is from Shen (1978), who edited the lists of all Chinese students in technological academies, higher education institutions and universities based on the rosters of Japanese institutions. This gives us prefecture-by-year information on the number of students. Among the students studying abroad, we focus on those in Japan as it was the primary foreign country for Chinese students in the late Qing period. For instance, the total number of Chinese students overseas was estimated to be around 20,000 during 1900-1911, 90% among whom studied in Japan (Yao, 2004).

We investigate the impacts of these students on revolution participation before and after the abolition. Moreover, we allow for the triple effect of logged quotas, modern human capital and the abolition of the exam. Columns (1)-(2) in Table 10 show that the number of students studying in Japan per se had a positive impact on the participation in revolution but its impact did not differ before and after the abolition of the exam. We do not find that the effect of quotas varied with the number of students studying in Japan either.

The Number of Modern Firms The information on firms is obtained from Chang (1989), who compiled ten series of detailed information on Chinese private enterprises including their locations and establishment dates.[47] Based on this information, we construct a prefecture-by-year dataset on modern firms between 1900 and 1906. Similar to that using the number of students studying in Japan, we examine the impacts of the number of firms before and after the abolition as well as the triple effect related to logged quotas.

Columns (3)-(4) in Table 10 show that the number of modern firms had little impact on revolution participation.

The Number of Students in Modern Primary Schools There is no systematic information on modern schools at the time of the abolition of the exam, as they were very limited. The closest data we can get is the number of students in modern primary schools in 1920, based on the surveys conducted by Christian organizations (Stauffer 1922). We use this information as another proxy for modern human capital. The results are presented in columns (5)-(6) in Table 10. Once more, it cannot explain the roles of quotas.

Column (7) reports the results after including all three measures. The impact of quotas is still close to that from the baseline estimations, showing that these factors cannot explain our findings. However, we do find that the association between the number of students studying in Japan and revolution participation was significantly positive. This finding provides some

[47] All firms in this study meet the following five criteria: (i) the firm is organized as a company; (ii) the capital is over 10,000 dollars; (iii) mechanization is used; (iv) there are over 30 employees; and (v) the value of the output is over 50,000 dollars.

quantitative evidence for the modernization hypothesis in Huntington (1968).[48] However, it cannot explain our main findings on the change before and after the abolition.

5 Conclusion

This paper studies an important elite recruitment system in historical China and documents its role in political stability. Exploring the unique historical event of the system, we find that higher quotas per capita were associated with higher probability of revolution participation after the abolition. After comparing various hypotheses, the data appears most consistent with a theory where the abolition of the exam affected citizens' prospect of upward mobility and, therefore, their decision of revolution participation. These findings contribute to the growing literature on the impact of political institutions on development. More specifically, they provide new evidence on the role of perceived mobility on political stability.

In this process, we also document the roles of a few other factors in the revolution such as modern human capital and social capital. Even though the event is unique for historical China, the role of the elements on revolution documented in our study might apply to other contexts of riots and revolution. For instance, the limitation of the elite recruitment mechanisms was also argued to contribute to the French Revolution (Brinton 1938, Goldstone 1991).

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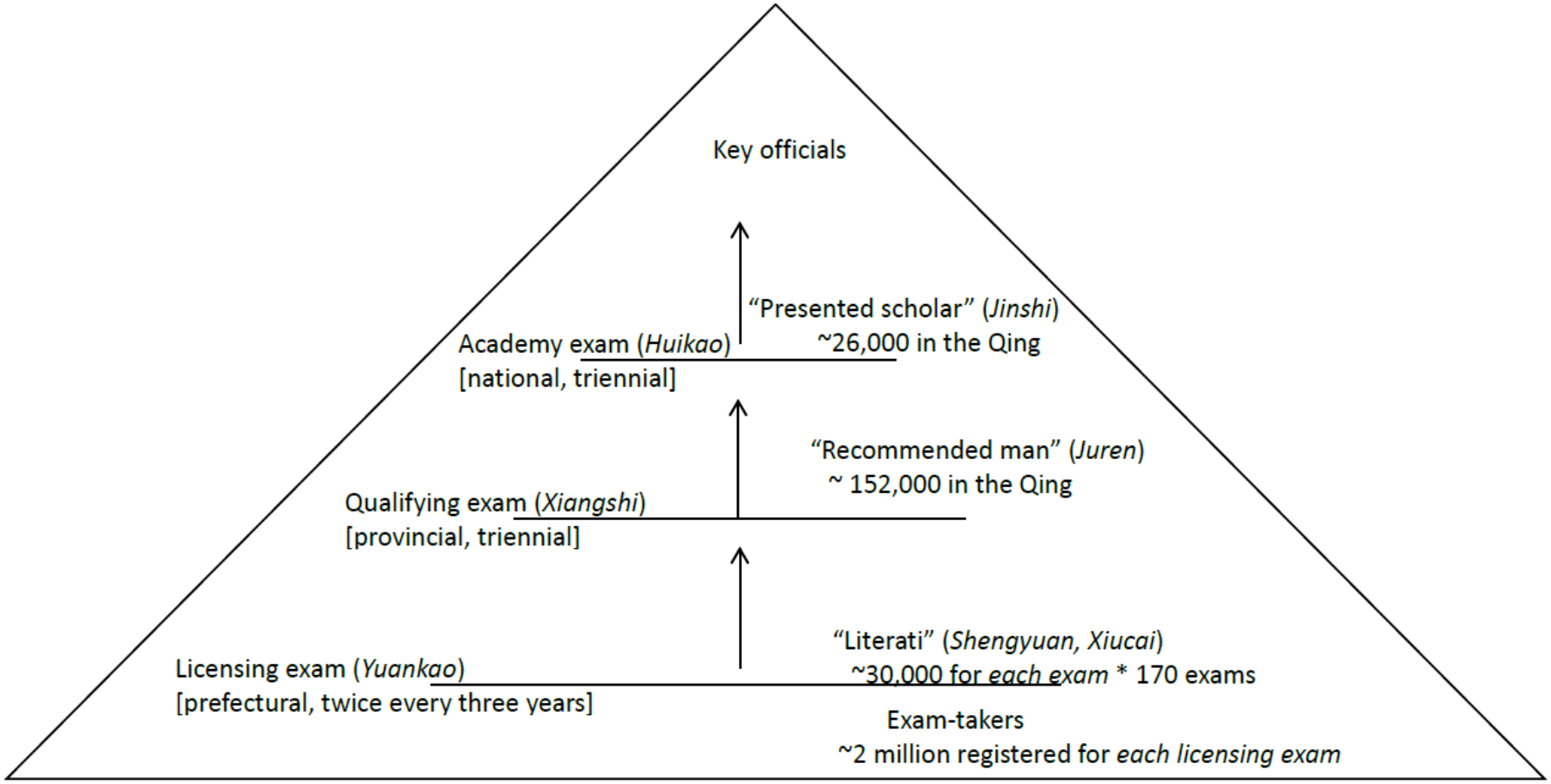
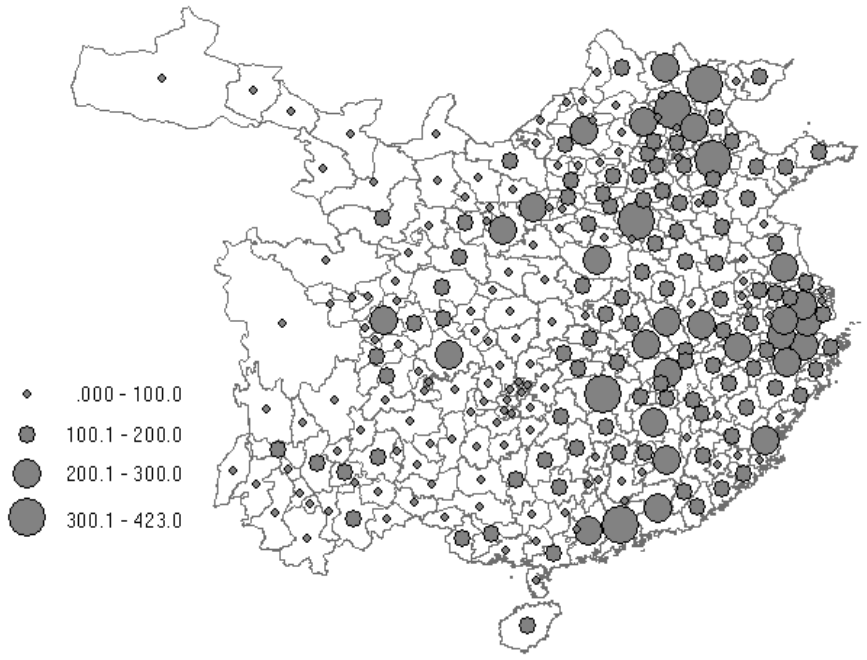
Figure 1: The Structure of the Civil Service Exam



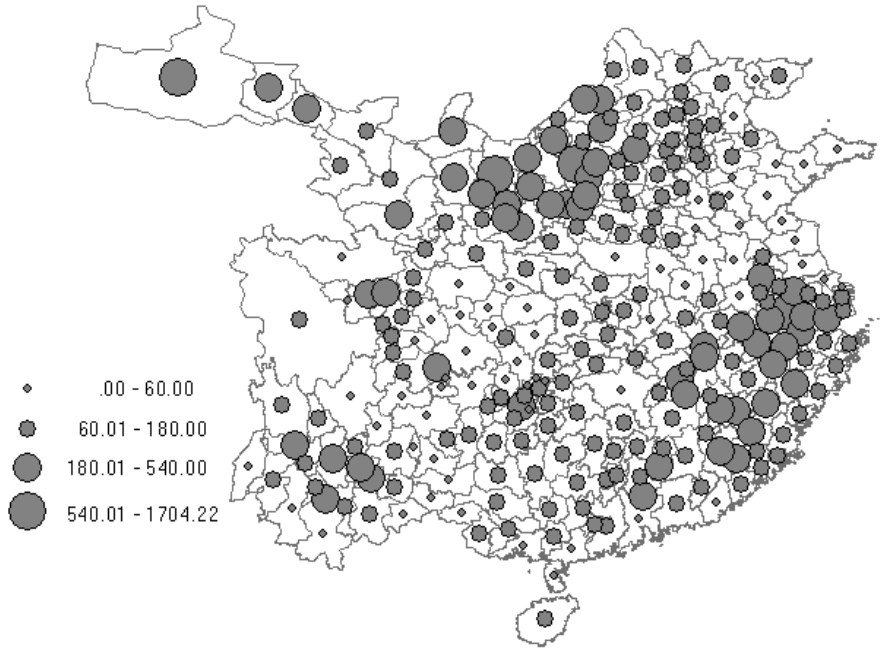
Notes: The number of prefecture-level exam graduates was governed by a prefecture-level quota. We code the prefecture-level data based on Kun, Gang et al. (1899).
The number of national-level exam graduates was governed by a province-level quota. We coded their prefectures of origin based on the lists of names and origins in Zhu and Xie (1980).
The number of provincial-level exam graduates was governed by provincial-level quota. We do not have prefecture-level information on these graduates.
The number of exam-takers comes from Elman (2013). Note that there was no limit on age or the number of attempts to take the exam.

Figure 2: Distribution of Quotas Across Prefectures

(a) Spatial Distribution of Quotas



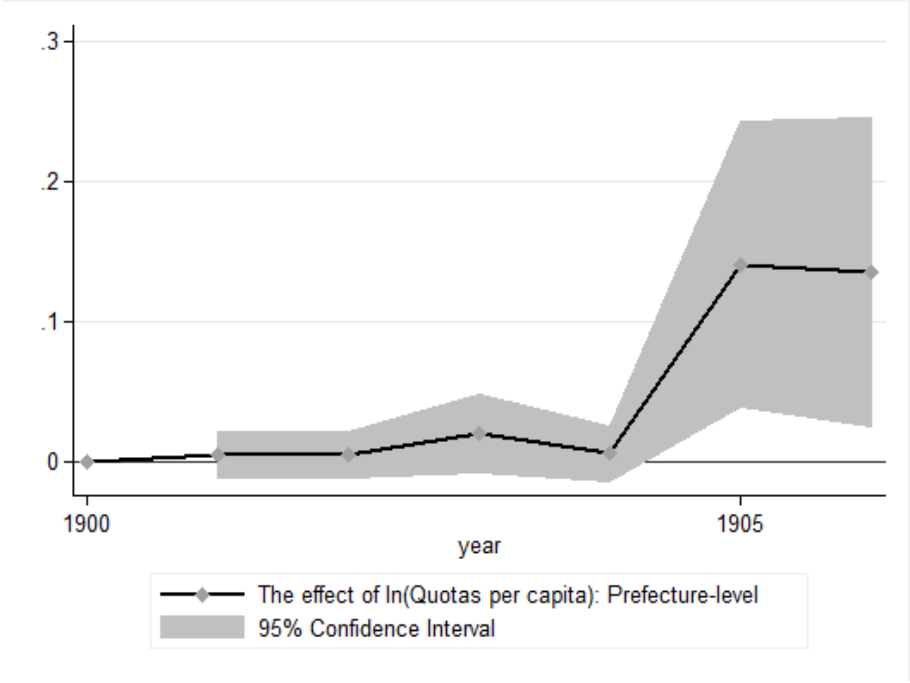
(b) Spatial Distribution of Quotas per Million People



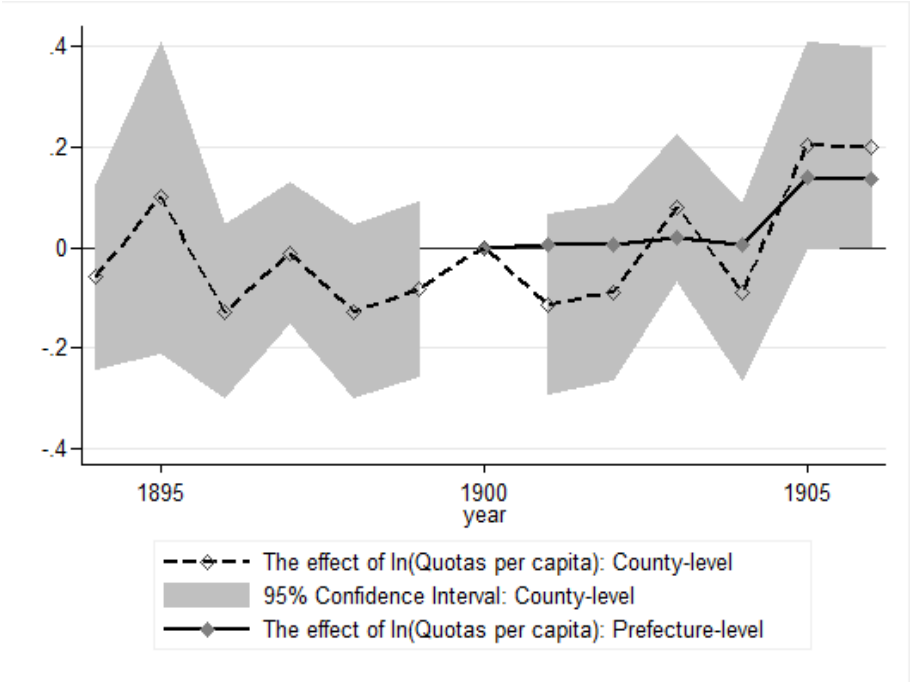
Notes: This figure shows that there are great regional variations in quotas and quotas per capita. For example, province fixed effects only explain 30% of the variations in the quotas across prefectures.

Figure 3: The Dynamic Impacts of ln (Quotas per capita) on Revolution Participation

(a) Prefecture-level Analysis (1900-1906)



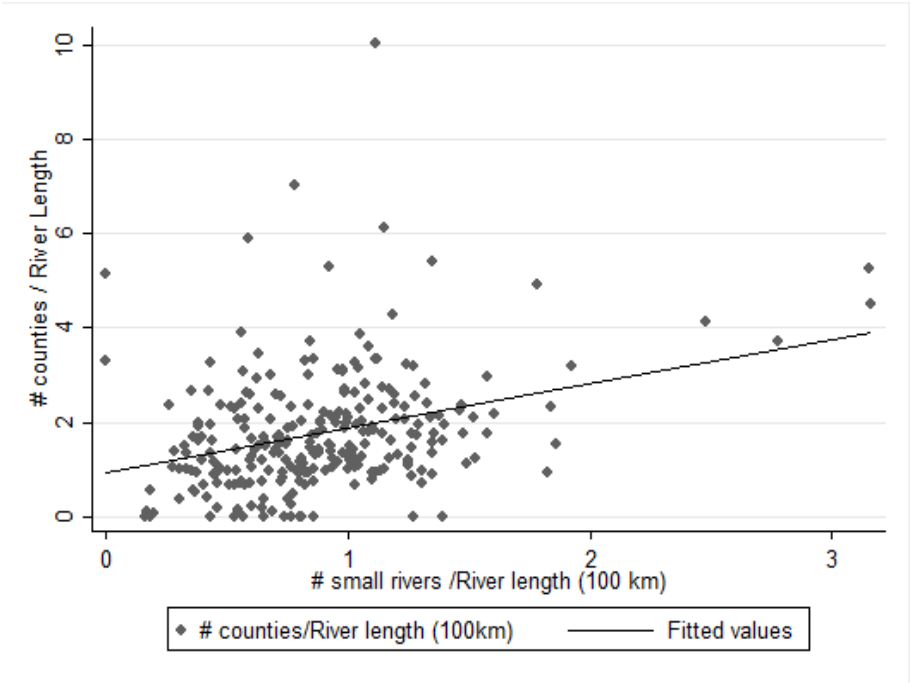
(b) County-level Analysis (1894-1906)



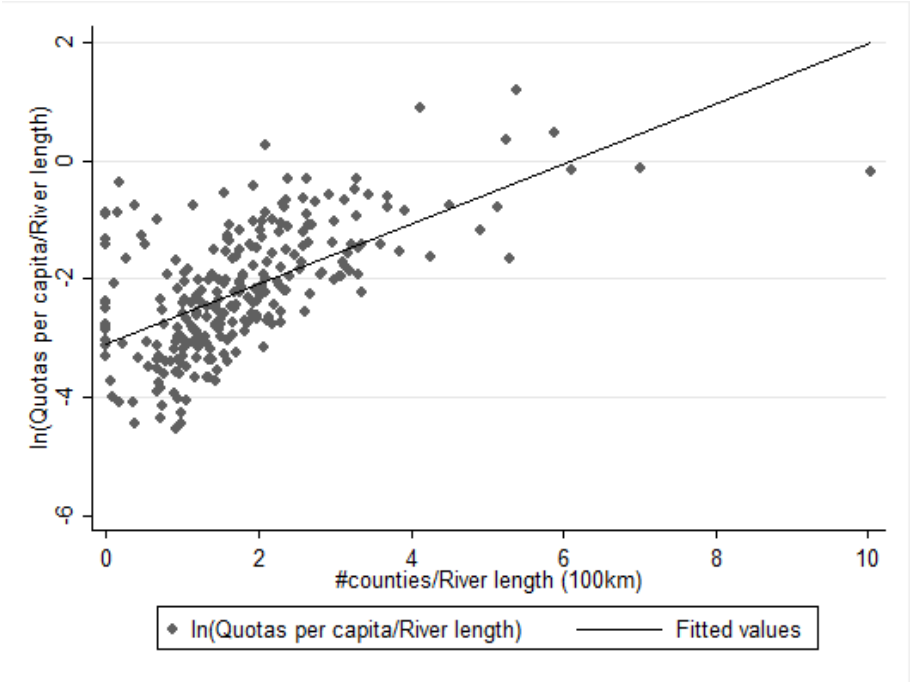
Notes: These figures present the dynamic effects of quotas per capita on revolution participation, using the year 1900 as the reference. Panel (a) presents the results using the prefecture-level data between 1900 and 1906, where the solid line connects the estimates and the shaded area indicates the 95% confidence intervals. Panel (b) adds the results using the county-level data between 1894 and 1906, where the dashed line connects the estimates.

Figure 4: Small Rivers, Counties and Quotas

(a) #Small Rivers/Riv.Length and #Counties



(b) #Counties and the Quota



Notes: Figure (a) shows that the number of small rivers (given the length of river) in a prefecture is positively correlated with the number of counties. Figure (b) shows that the number of counties is positively correlated with quotas per capita.

Table 1: Summary Statistics for the Main Variables

Variables	Variables Definition	Data Sources	Obs.	Mean	S.D.
Revolutionaries	Having or not	1, 2	1,834	0.155	0.362
	# revolutionaries	1, 2	1,834	0.696	3.231
Early Uprisings in 1911	Incidence of early uprisings in 1911	3	262	0.160	0.367
Measures of the Exam	Quotas	4	262	113.771	75.604
	ln (Quotas per million)	4	262	4.636	0.700
	# presented scholars	5	262	95.977	146.355
	# key officials	6	262	15.580	30.390
Baseline Controls	ln (Pop in 1880)	7	262	13.620	1.074
	ln Area	8	262	9.336	0.770
	Treaty port	9	262	0.115	0.319
	Small city	10	262	0.198	0.400
	Middle city	10	262	0.122	0.328
	Large city	10	262	0.038	0.192
	Major river	8	262	0.618	0.487
	Coast	8	262	0.134	0.341
Instrumental Variables	# small rivers/river length	8	262	0.886	0.435
	River length	8	262	6.847	0.713
	Δ Presented scholars before 1425	5	262	0.377	0.727
Placebo Tests	Incidence of the Boxer Rebellion	11	262	0.099	0.300
	Transportation (pref)	12	262	0.615	0.488
	Transportation (cnty)	12	262	0.380	0.300
	Fox millet suitability	13	262	2.877	1.334
	Rice suitability	13	262	1.991	1.075
	Sweet Potato suitability	13	262	2.622	0.992
	Climate shocks	14	262	0.063	0.092
	Basin HHI	8	262	0.608	0.243
Modern Human Capital	# domestic modern firms	15	1,834	0.097	0.573
	# oversea students in Japan	16	1,834	0.793	2.725
	# students in modern primary schools	17	262	10,540	14,600
Social Capital	Language fragmentation index	18	262	0.087	0.164
	Language polarization index	18	262	0.162	0.298

Data Sources:
1: Chang, Yu-fa (1982), Revolutionary Organizations of the Qing Period.
2: Luo, Jialun (1958), Documents on the Revolutionary, vol. 2.
3: The Tokyo Nichi Nichi Shimbun, 3 November, 1911.
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Table 2: The Impact of Quotas I: On Revolution Participation

	Revolutionary = 0/1					#Revolutionaries		Revolutionaries per 100,000
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Linear	Linear	Linear	Linear	Weighted	Linear	Poisson	Linear
ln (Quota/Pop) * Post	0.139***	0.148***	0.124***	0.111**	0.131***	0.539**	0.980**	1.162***
	(0.044)	(0.044)	(0.045)	(0.045)	(0.050)	(0.211)	(0.418)	(0.216)
ln Pop * Post	0.216***	0.242***	0.235***	0.221***	0.191***	0.815***	1.290***	0.688***
	(0.025)	(0.029)	(0.029)	(0.031)	(0.032)	(0.176)	(0.282)	(0.169)
ln Area * Post		-0.050	-0.059*	-0.057*	-0.019	-0.063	-1.433***	-0.664***
		(0.033)	(0.034)	(0.035)	(0.027)	(0.111)	(0.285)	(0.173)
Coastal * Post			-0.075	-0.109	-0.077	-0.168	-0.802**	-0.079
			(0.086)	(0.087)	(0.086)	(0.496)	(0.344)	(0.379)
Major River * Post			0.094**	0.088*	0.086*	-0.032	-0.959***	0.566**
			(0.046)	(0.048)	(0.044)	(0.181)	(0.252)	(0.225)
Treaty Port * Post				0.108	0.130*	0.408	-0.153	0.616*
				(0.078)	(0.078)	(0.384)	(0.250)	(0.347)
Small City * Post				-0.013	0.021	0.022	0.527*	0.476*
				(0.056)	(0.092)	(0.427)	(0.296)	(0.276)
Middle City * Post				0.013	-0.012	0.587	0.437	-0.010
				(0.082)	(0.083)	(0.627)	(0.278)	(0.337)
Large City * Post				0.136	0.258*	1.428	-0.295	-0.529
				(0.137)	(0.131)	(1.449)	(0.321)	(0.591)
Prefecture FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Prov. FE * Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834	1,057	1,834
R-squared	0.450	0.452	0.456	0.461	0.396	0.244		0.270

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

Table 3: The Impact of Quotas II: On Early Uprisings in 1911 and the Boxer Rebellion

	Incidence of the Republic Revolution 1911							Incidence of the Boxer Rebellion 1899-1901			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	All	All	All	All	All	Northern	Northern	All	All	All	Northern
ln (Quota/Pop)	0.094**	0.085**	0.075*	0.094**	0.076*	0.123**	0.128**	0.023	0.010	0.000	0.013
	(0.040)	(0.043)	(0.044)	(0.040)	(0.045)	(0.051)	(0.052)	(0.023)	(0.024)	(0.024)	(0.036)
lnPop	0.108***	0.132***	0.122***	0.109***	0.123***	0.135***	0.137***	0.062***	0.041**	0.026	0.041
	(0.027)	(0.032)	(0.035)	(0.027)	(0.036)	(0.041)	(0.041)	(0.017)	(0.018)	(0.020)	(0.025)
Newspaper density				-0.232	-0.597		-1.513				
				(1.027)	(1.221)		(1.408)				
ln Area		-0.035	-0.039		-0.040	-0.043	-0.046		0.045**	0.058***	0.073***
		(0.040)	(0.041)		(0.041)	(0.050)	(0.050)		(0.020)	(0.022)	(0.027)
Coastal		-0.126	-0.130		-0.128	-0.196*	-0.186		-0.052	-0.046	-0.032
		(0.081)	(0.088)		(0.089)	(0.111)	(0.113)		(0.053)	(0.056)	(0.092)
Main River			0.038		0.038	0.005	0.002			-0.046	-0.056
			(0.050)		(0.050)	(0.057)	(0.057)			(0.037)	(0.049)
Treaty Port			0.046		0.051	0.177	0.196			-0.062	-0.062
			(0.087)		(0.090)	(0.117)	(0.124)			(0.039)	(0.060)
Small City			-0.004		-0.002	-0.057	-0.053			-0.013	-0.017
			(0.071)		(0.071)	(0.076)	(0.077)			(0.035)	(0.046)
Middle City			-0.016		-0.016	-0.033	-0.032			0.156**	0.194**
			(0.084)		(0.084)	(0.099)	(0.099)			(0.064)	(0.080)
Large City			0.077		0.083	-0.064	-0.050			0.064	0.058
			(0.150)		(0.146)	(0.175)	(0.171)			(0.084)	(0.106)
Province FE	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y
Observations	262	262	262	262	262	191	191	262	262	262	191
R-squared	0.231	0.242	0.248	0.231	0.248	0.326	0.328	0.385	0.394	0.422	0.417

Notes: Columns (1)-(7) shows that higher quotas were associated with higher probability of early uprisings in 1911. Columns (8)-(11) show that the quota did not affect the Boxer Rebellion. The Boxer Rebellion was motivated by proto-nationalist sentiments and opposition to foreign imperialism and Christianity, which was unlikely to be correlated with the exam system. Columns (6), (7), (11) limit the sample to the prefectures with latitude higher than that of the southernmost prefecture with the Boxer Rebellion. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: Relevance and Placebo Tests of the Two Instruments

(a) IV1: #small river / river length

	Relevance Tests			Placebo Tests						
	ln (Quota/Pop)			Transportation		Suitability			Climate	Basin
	Late Qing	Early Qing	Change	Pref.	County Average	Rice	Foxmillet	Sweet Potato	Drought /Flood	HH Index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
#Small River/RiverLeng.	0.260**	0.262*	-0.001	-0.118	-0.071	0.172	0.034	0.135	0.010	0.034
	(0.121)	(0.140)	(0.029)	(0.084)	(0.060)	(0.124)	(0.184)	(0.132)	(0.014)	(0.053)
ln (River Length)	0.213*	0.223	-0.009	0.020	0.033	0.066	-0.064	-0.273*	0.020*	-0.068
	(0.126)	(0.140)	(0.032)	(0.087)	(0.072)	(0.143)	(0.201)	(0.144)	(0.011)	(0.042)
Major River	0.131*	0.113	0.018	0.150**	0.126***	0.010	-0.078	0.101	0.011	-0.020
	(0.069)	(0.069)	(0.015)	(0.070)	(0.046)	(0.106)	(0.123)	(0.116)	(0.009)	(0.035)
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	262	262	262	262	262	262	262	262	262	262
R-squared	0.772	0.749	0.702	0.287	0.237	0.690	0.720	0.541	0.400	0.378

(b) IV2: short-run change in performance

	Relevance Tests			Placebo Tests: Changes in Presented Scholars in the Long Run					
	ln (Quota/Pop)			1436-1505vs.	1506-1572vs.	1573-1643vs.	1644-1722vs.	1723-1795vs.	1796-1861vs.
	Late Qing	Early Qing	Change	1368-1435	1436-1505	1506-1572	1573-1643	1644-1722	1723-1795
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δln(PresentedScholar)	0.224***	0.214***	0.009	-0.024	-0.104	-0.084	-0.125	0.037	-0.058
	(0.044)	(0.044)	(0.013)	(0.087)	(0.079)	(0.064)	(0.081)	(0.096)	(0.072)
ln (PresentedScholar$_0$)	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	0.785	0.761	0.704	0.424	0.135	0.160	0.273	0.471	0.183

Notes: Columns (1)-(3) show that the instrument is correlated with the level of quotas but not the change. The other columns present different sets of placebo tests. Columns (4)-(10) in panel (a) show that the instrument was not correlated with transportation importance, agricultural suitability, climate shocks or basin fragmentation. Columns (4)-(9) in panel (b) show that the instrument did not affect the growth of successful candidates in the long run. The baseline controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: The Impact of Quotas III: Results from Instrumental Variables

	IV1: #SmallRivers./Riv. L. * Post			IV2: Δln (Pres. Scholar) * Post			Both		
	Reduce Form	IV	IV	Reduced Form	IV	IV	Reduced Form	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln (Quota/Pop) * Post		0.383**	0.407**		0.245**	0.238**		0.289**	0.294***
		(0.167)	(0.190)		(0.112)	(0.118)		(0.098)	(0.089)
#SmallRivers./Riv. L. * Post	0.100**					0.039	0.094*		
	(0.044)					(0.052)	(0.044)		
Δln (Pres. Scholar) * Post			-0.022	0.055**			0.050*		
			(0.048)	(0.026)			(0.026)		
		First Stage			First Stage			First Stage	
#SmallRivers./Riv. L. * Post		0.260***	0.231***			0.231***		0.231***	0.282***
		(0.036)	(0.034)			(0.034)		(0.034)	(0.033)
Δln (Pres. Scholar) * Post			0.212***		0.224***	0.212***		0.212***	0.227***
			(0.020)		(0.021)	(0.020)		(0.020)	(0.020)
Baseline Controls * Post	Y	Y	Y	Y	Y	Y	Y	Y	Y
ln (River Length) * Post	Y	Y	Y			Y	Y	Y	Y
ln (Pres. Scholar$_0$) * Post			Y	Y	Y	Y	Y	Y	Y
Placebo Variables * Post									Y
Prefecture FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province FE * Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834	1,834	1,834	1,834
R-squared	0.458	0.433	0.429	0.458	0.454	0.455	0.460	0.449	0.451
F-stat		51.96	44.75		118.62	109.62		80.36	105.89
p-value of the over-id Test								0.413	0.496

Notes: Columns (3) and (6) show that the effect of one instrument is not significant once the other is employed, suggesting that the instrument did not affect revolutionaries beyond the quota channel. This is also confirmed by the p-value of the over-id test reported in the last row. The baseline controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. The placebo variables are the transportation importance, crop suitability, climate shocks and basin fragmentation. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: The Impacts of Quotas on Political Newcomers Under Different Regimes

	Quotas and Elite Recruitment 1644-1904				Before the Abolition 1904		After the Abolition 1907	
Title	Presented Scholar		Key Official		New Presented Scholar		Quasi-Presented Scholar	
	0/1	Number	0/1	Number	0/1	Number	0/1	Number
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln (Quota/Pop)	0.309***	0.381***	0.246***	0.335***	0.226***	0.271***	0.112	0.137
p-value	[0.000]	[0.000]	[0.002]	[0.000]	[0.007]	[0.002]	[0.151]	[0.106]
ln Pop	0.661***	0.578***	0.671***	0.463***	0.515***	0.556***	0.260***	0.293***
p-value	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]
Prov. FE	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	262	262	262	262	262	262	262	262
R-sq.	0.322	0.366	0.358	0.337	0.260	0.202	0.365	0.241
p-value							0.046	0.009

Notes: The table shows the link between the quota density and the number of political newcomers across prefectures under different regimes: there was a strong link between the quota density and the number of political newcomers (shown in columns (1)-(6). This link was very much weakened with the abolition of the exam (shown in in columns (7)-(8)).
Beta coefficients are reported. p-values are reported in squared brackets: * significant at 10%; ** significant at 5%; *** significant at 1%. In the last row, the number in column (7) reports the *p*-value from the test on the difference between the impacts of quotas in 1904 and 1907 on the newcomer dummy (0.226 in column (5) vs. 0.112 in column (7)). Similarly, the number in column (8) reports that on the number of newcomers (0.271 in column (6) vs. 0.137 in column (8)).

Table 7: Examining the Impact of Social Capital
D.V.: Revolutionary = 0/1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln (Quota/Pop) * Post	0.144***	0.114**	0.142***	0.113**	0.143***	0.114**	0.143***	0.114**
	(0.045)	(0.046)	(0.044)	(0.046)	(0.044)	(0.046)	(0.044)	(0.045)
Fragmentation index * ln (Quota/Pop) * Post			-0.454**	-0.378*				
			(0.215)	(0.225)				
Fragmentation index * ln Pop * Post			-0.327**	-0.306**				
			(0.143)	(0.145)				
Polarization index * ln (Quota/Pop) * Post							-0.243**	-0.213*
							(0.117)	(0.120)
Polarization index * ln Pop * Post							-0.154**	-0.145**
							(0.071)	(0.071)
Fragmentation index * Post	-0.095	-0.091	-0.010	-0.033				
	(0.138)	(0.146)	(0.153)	(0.156)				
Polarization index * Post					-0.056	-0.069	-0.018	-0.042
					(0.078)	(0.082)	(0.083)	(0.086)
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
ln Pop * Post	Y	Y	Y	Y	Y	Y	Y	Y
Other Baseline Controls * Post			Y	Y			Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834	1,834	1,834
R-squared	0.450	0.461	0.454	0.463	0.451	0.461	0.454	0.464

Notes: The table shows that the impact of quotas was smaller in regions with lower social capital. The other baseline controls include (i) logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8A: Checking Changes in State Capacity I: Examining Taxes

	ln (Land Tax)		ln (Internal Tariff)		ln (Custom Duties)	
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Quota/Pop) * Post	-0.067	-0.124	0.061	0.604	-0.304	-0.882
	(0.170)	(0.153)	(0.390)	(0.347)	(0.631)	(1.172)
ln Pop * Post	0.184	0.233*	-0.068	0.495	0.006	0.088
	(0.185)	(0.126)	(0.403)	(0.282)	(0.460)	(0.600)
Province FE	Y	Y	Y	Y	Y	Y
Other Baseline Controls * Post		Y		Y		Y
Observations	52	52	126	126	117	117
R-squared	0.823	0.953	0.231	0.397	0.193	0.286

Notes: This table shows that provincial-level taxes did not respond to the interaction of quotas per capita and the abolition. Other baseline controls include (i) logged area of a province; (ii) the share of prefectures located on the coast or a major river; (iii) the share of prefectures being treaty ports; and (iv) the share of prefectures counted as big cities, middle-size cities or small cities. Standard errors in parenthesis are clustered at the province level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8B: Checking the Role of State Capacity II: Results Using Importance Measures
D.V.: Revolutionary = 0/1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln (Quota/Pop) * Post	0.110**	0.127**	0.108**	0.109**	0.104**	0.108**	0.114**
	(0.045)	(0.051)	(0.046)	(0.047)	(0.046)	(0.044)	(0.052)
Taxes per capita in 1820 * Post	-0.135						-0.099
	(0.260)						(0.240)
Province Capital * Post		0.098					0.110
		(0.120)					(0.118)
Communication (Chong) * Post			0.021				0.043
			(0.049)				(0.050)
Business (Fan) * Post				0.011			-0.040
				(0.053)			(0.061)
Difficulty of taxing (Pi) * Post					0.090*		0.092
					(0.054)		(0.056)
Crime (Nan) *						0.075	0.070
						(0.046)	(0.053)
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	1,799	1,834	1,834	1,834	1,834	1,834	1,799
R-squared	0.463	0.461	0.461	0.461	0.463	0.463	0.468

Notes: This table shows that prefectures of more importance generally did not respond more to the abolition, and that the impact of quotas per capita cannot be explained by the importance measures. The only importance measure that has a weak effect is the difficulty of taxing. The baseline controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9A: Investigating the Role of Existing Elites I
D.V.: Revolutionary = 0/1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln (Quota/Pop) * Post	0.111**			0.115**				
	(0.045)			(0.052)				
ln (Pres. Scholar+1/Pop) * Post		0.033		-0.026				
		(0.026)		(0.036)				
ln (Official+1/Pop) * Post			0.041	0.038				
			(0.026)	(0.030)				
$100*\frac{Quota}{Pop}$ * Post					0.035***			0.040***
					(0.009)			(0.011)
$100*\frac{Pres.Scholar}{Quota}$ * Post						0.063		0.043
						(0.077)		(0.076)
$\frac{Official}{Pres.Scholar}$ * Post							-0.031	0.015
							(0.072)	(0.071)
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
Baseline controls * Post	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834	1,834	1,778	1,778
R-squared	0.461	0.457	0.458	0.462	0.463	0.456	0.458	0.466

Notes: This table shows that what mattered for revolution participation is the prospect for those who had not become elites (measured by ln Quota or Quota/Popu) rather than that for the existing elites. The baseline controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9B: Investigating the Role of Existing Elites II
D.V.: Revolutionary = 0/1

	(1)	(2)	(3)	(4)
	S.D. of Indictors 1800-1899		Drought/Flood in year t	
ln (Quota/Pop)*Post	0.111**	0.123**	0.108**	0.111**
	(0.046)	(0.050)	(0.046)	(0.047)
Weather*Post	0.011	-0.038	0.066	0.050
	(0.086)	(0.083)	(0.098)	(0.106)
Weather* ln (Quota/Pop)*Post		-0.030		0.091
		(0.152)		(0.184)
Weather* ln Pop*Post		0.122		0.027
		(0.106)		(0.116)
Weather			0.031	0.032
			(0.026)	(0.026)
Prefecture FE	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y
Baseline Controls*Post	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834
R-squared	0.461	0.463	0.462	0.462

Notes: The table shows that the demand for public goods provision by the elites (proxied by weather shocks) did not have any significant impact on revolution participation. The baseline controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10: Evaluating the Impact of Modern Human Capital
D.V.: Revolutionary = 0/1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln (Quota/Pop) * Post	0.098**	0.094**	0.112**	0.123***	0.090*	0.134**	0.102*
	(0.044)	(0.044)	(0.046)	(0.047)	(0.047)	(0.061)	(0.060)
ln (Japan stu.+1)	0.121***	0.117***					0.119***
	(0.035)	(0.034)					(0.034)
ln (Japan stu. +1) * Post	0.002	0.016					0.019
	(0.052)	(0.059)					(0.059)
ln (Japan stu. +1) * ln (Quota/Pop) * Post		0.078					0.048
		(0.065)					(0.074)
ln (Japan stu. +1) * ln Pop * Post		0.000					-0.027
		(0.044)					(0.047)
ln (Firm+1)			0.075	0.076			0.047
			(0.084)	(0.084)			(0.084)
ln (Firm+1) * Post			-0.063	-0.115			-0.081
			(0.117)	(0.144)			(0.144)
ln (Firm+1) * ln (Quota/Pop) * Post				0.300			0.349*
				(0.184)			(0.191)
ln (Firm+1)* ln Pop * Post				0.140			0.148
				(0.115)			(0.111)
ln (Stu. in 1920+1) * Post					0.011	0.017*	0.016
					(0.009)	(0.010)	(0.010)
ln (Stu. +1) * ln (Quota/Pop) * Post						0.012	0.004
						(0.008)	(0.009)
ln (Stu. +1)* ln Pop * Post						0.014**	0.013*
						(0.006)	(0.007)
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	0.474	0.476	0.461	0.463	0.462	0.465	0.482

Notes: The table shows that the number of students studying in Japan had a positive impact on revolution participation but the effects did not change before and after the abolition of the exam in 1905. The other measures did not have a significant impact on revolution participation. The baseline controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

A Appendix

A.1 Results on the Party Identification

We link the quotas to individuals' party identification among parliament members in 1912, using the following cross-sectional specification:

$$KMT_{i,p} = \varphi \ln(\frac{\text{Quota}}{\text{Pop}})_{\text{p}} + \nu \ln \text{Pop}_p + \theta \text{X}_p + \delta_{prov} + \varepsilon_{i,p},$$

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 Republican Party (*Kunghotang*) and the Democratic Party(*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 their primary goal.

The results are presented in columns (1)-(2) in Table A.7. Among the 703 party members for whom we can identify the origins and ages, 434 were identified with the *Kuomintang*. Based on the individual-level information, we do not find any significant impact of quotas per capita on party identification. However, consistent with the hypothesis that the *Kuomintang* was more radical, we find that younger people were more likely to identify themselves as *Kuomintang* members.

Columns (4)-(8) report the results using prefecture-level information to examine the link between the quotas and the number of party members. As is shown, quotas per capita increased the party member probability for both the *Kungmintang* and the other parties. This finding is expected because more revolutionaries should be associated with a higher probability of party members after the success of the revolution. However, the magnitudes of the impacts for the *Kungmintang* and the other parties are not significantly different. Consistent with the placebo test using the Boxer Rebellion, the finding on party identification once again shows that potential ideological differences cannot explain the impact of quotas.

A.2 An Example for the Instrument

Qingzhou and Xuzhou were two prefectures of similar population size and area size. Qingzhou had a population of 3.8 million and an area of 17,000 km^2, whereas Xuzhou had a population of 4 million and an area of 17,000 km^2. There were 21 small rivers in Qingzhou and 18 small rivers in Xuzhou. As a result, Qingzhou was divided into 11 counties while Xuzhou 8 counties. Due to the stepwise rule, each county was assigned a positive quota. Adding the additional quota for the whole prefecture, Qingzhou had a quota of 195, higher than that of Xuzhou (167). Consequently, the quotas per capita at the prefecture-level was higher in Qingzhou (51.3 per million) than that in the Xuzhou (41.8 per million). This is the variation we explore in our analysis.

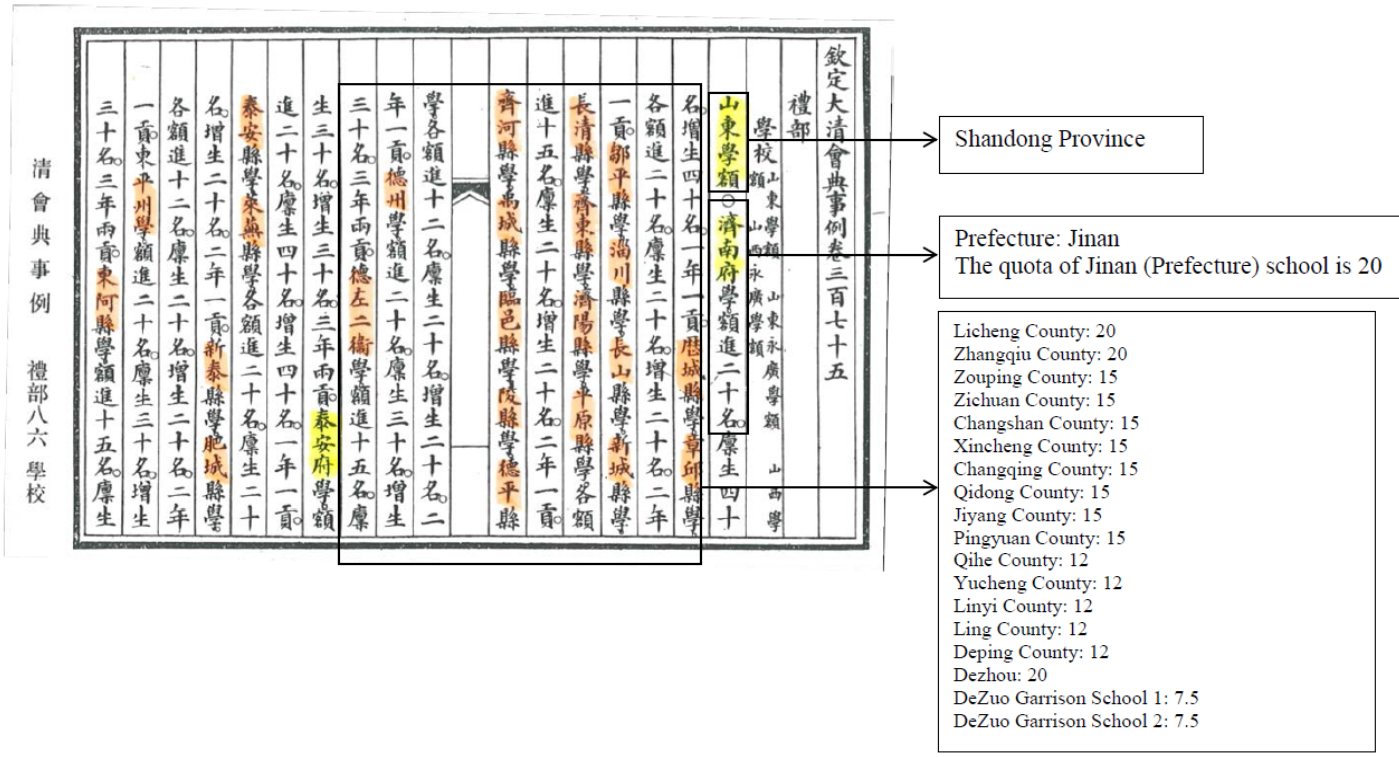
Note that this difference also holds at the county level due to the fact that county-level population sizes were smaller in Qingzhou (with more counties). There was no systematic information on the county-level population, but we can rely on average population sizes. On average, a county in Qingzhou had a population of 0.35 million while a county in Xuzhou had a population of 0.5 million. Depending on the scale and importance, counties in Qingzhou got assigned quota values of 12, 15 and 20. Thus, quotas per capita for a country in Qingzhou ranged between 34.3 per million to 57 per million. In contrast, counties in Xuzhou got assigned quota values of 16 and 20. Hence, quotas per capita for a county in Xuzhou ranged between 32 per million to 40 per million.

A.3 Varying the Definition of Small Rivers

For robustness checks of using small rivers as an instrument, we vary the definition of small rivers to be those under the length of X km (X = 70, 80, 90,...,120), while controlling for the interaction of the post dummy and those above X km. These results are presented in Table A.9. They show that the results are robust to these variations.

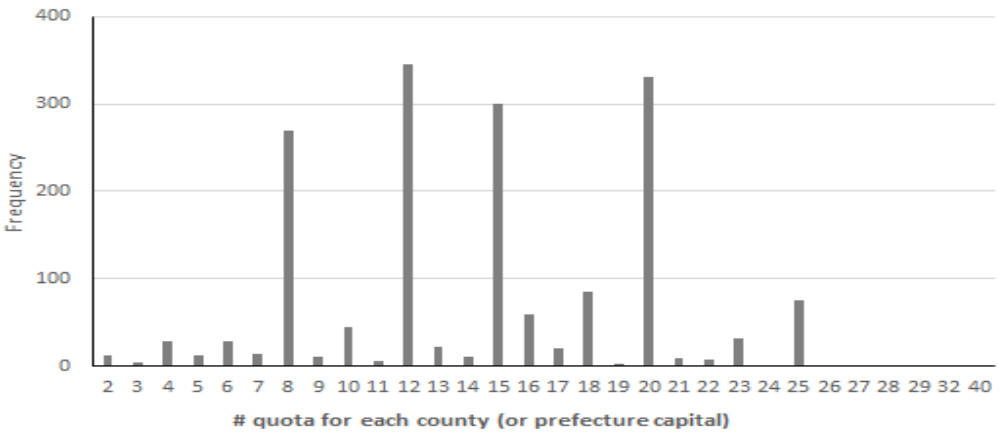
Moreover, we find no similar impact of the number of big rivers per se, which once again confirms that our river instrument is reasonable.

Figure A.1: The Data on Quotas



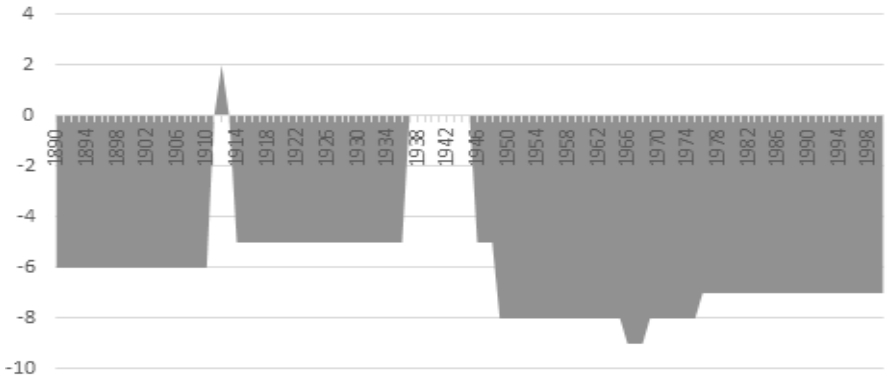
Notes: The data on the Quotas was recorded in the Qing Hui Dian Shi Li (edited by Kun, Gang). This figure gives an example for one prefecture (Jinan in Shandong Province). The quota for the prefecture capital is 20 and the total quota of the counties is 255. Thus, the total quota for the Jinan prefecture is 275.

Figure A.2: Distribution of Quotas for Each County



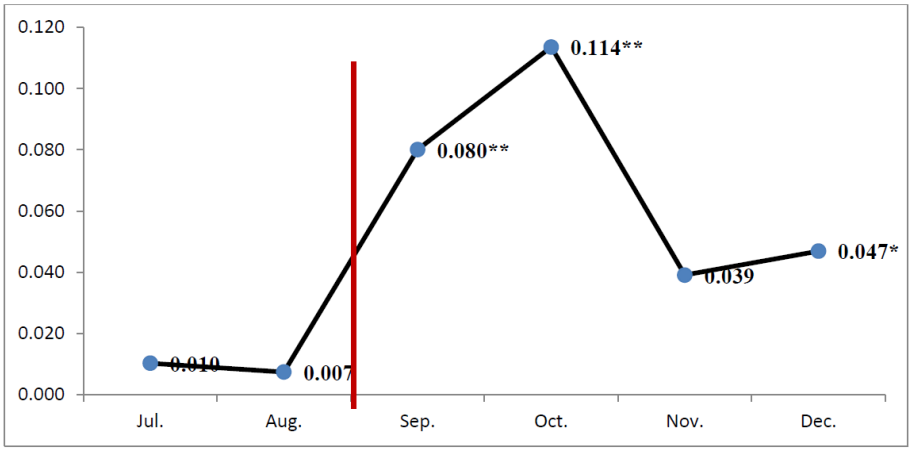
Notes: This figure shows that the quota values assigned to counties within a prefecture follows a stepwise rule: the most frequent values are 8, 12, 15 and 20. This is because the government did not have the capacity to implement a complicated proportional system and needed a simplified way of implementing the quota system.

Figure A.3: Polity Scores for China between 1890 and 2000



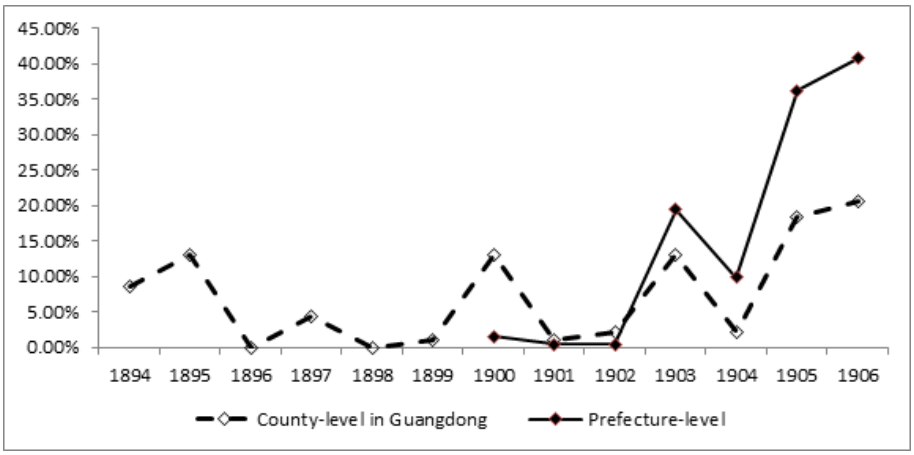
Notes: This figure reports the polity scores of China between 1890 and 2000, based on the information from Polity IV. The range of the score is between -10 and 10.

Figure A.4: The Monthly Impacts of Quotas per capita in 1905



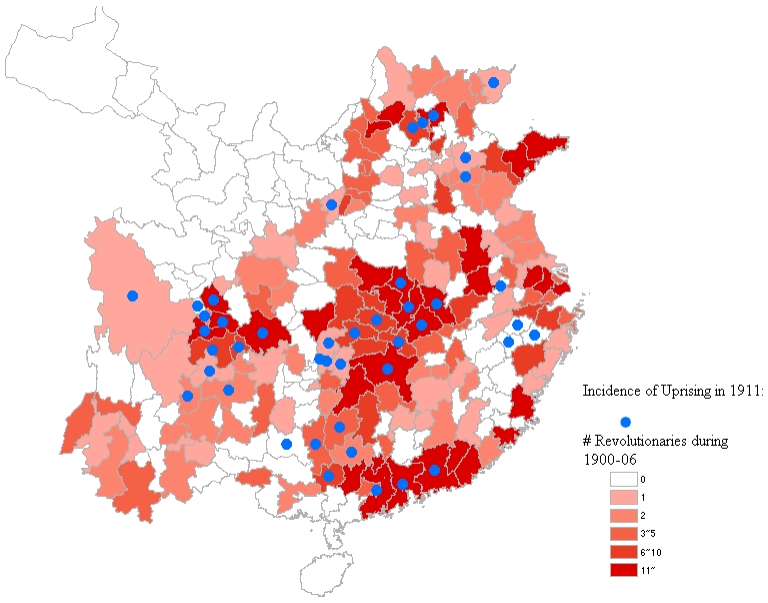
Notes: This figure plots the impact of logged quotas per capita on the participation in the Revolution Alliance in 1905 and shows no pre-trends before September.

Figure A.5: Revolution Participation Over Time



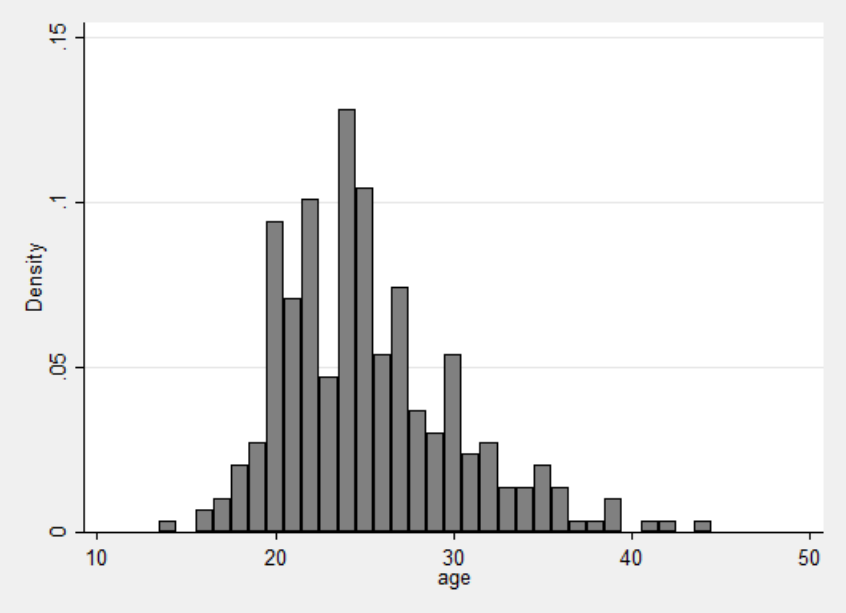
Notes: This figure plots the mean of revolutionary probability in the prefecture-level data between 1990 and 1906 and in the county-level data between 1894 and 1906.

Figure A.6: Revolutionaries and the 1911 Revolution



Notes: This map shows that the origins of revolutionaries are correlated with the incidence of uprisings in 1911.

Figure A.7: Age Distribution of the Revolutionaries in the Chinese Revolution Alliance



Notes: This figure plots the age distribution of the revolutionaries in the Chinese Revolution Alliance.

Figure A.8: Rivers and County Seats

Notes: This map shows that county seats (indicated by the dots) are generally located on rivers. The bold rivers indicate the major ones (those ranked as the first and second order streams in the Chinese river hierarchy).

Table A.1: Revolutionary Groups between 1900 and 1906

Revolutionary Group	Year of Estab.	Origin
(i) *Xingzhonghui* (the Revive China Society)	1894	Honolulu
(ii) *Junguomin Jiaoyuhui* (the Society of National Military Education)	1903	Japan
(iii) *Huaxinghui* (the China Arise Society)	1903	Changsha, Hunan
(iv) *Guangfuhui* (the Revive the Light Society	1904	Shanghai
(v) *Tongmenghui* (the Chinese Revolutionary Alliance)	1905	Alliance between (i) and (iii)
(vi) *Rizhihui* (the Society for Daily Improvement)	1905-06	Wuhan, Hubei

Notes: The table lists the information on the six major revolutionary groups between 1900 and 1906. The data source is Chang (1982).

Table A.2: The Quotas and Prefecture Characteristics

Dependent Var.	ln (Quota/Pop)				
	(1)	(2)	(3)	(4)	(5)
ln Pop	-0.370***	-0.335***	-0.359***	-0.414***	-0.493***
	(0.042)	(0.042)	(0.065)	(0.068)	(0.064)
ln Area			0.112	0.102	0.134*
			(0.079)	(0.081)	(0.079)
Coastal			-0.339***	-0.280**	-0.154
			(0.108)	(0.114)	(0.102)
Major Rivers				0.079	0.025
				(0.070)	(0.063)
Treaty Ports				-0.077	-0.060
				(0.087)	(0.087)
Small City				0.096	0.034
				(0.083)	(0.072)
Middle City				0.229***	0.129
				(0.087)	(0.085)
Large City				0.567***	0.415***
				(0.111)	(0.155)
Province Capital					0.133
					(0.112)
Tax per capita in 1820					1.713**
					(0.772)
Communication (Chong)					0.172**
					(0.072)
Business (Fan)					0.178**
					(0.086)
Difficulty of taxing (Pi)					0.098
					(0.063)
Crime (Nan)					-0.035
					(0.068)
Prov. FE		Y	Y	Y	Y
Observations	262	262	262	262	257
R-squared	0.321	0.562	0.586	0.615	0.702

Notes: This table reports the correlations between quotas and other prefecture characteristics. Standard errors in parenthesis are clustered at the county level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.3: Including Flexible Forms of Population Size
D.V.: Revolutionary = 0/1

	(1)	(2)	(3)
ln Quota * Post	0.111**	0.113**	0.108**
	(0.045)	(0.044)	(0.046)
ln Pop * Post	0.110**	0.136***	0.163***
	(0.043)	(0.051)	(0.062)
$(\ln \text{Pop})^2$ * Post		0.020	0.011
		(0.015)	(0.023)
$(\ln \text{Pop})^3$ * Post			-0.007
			(0.010)
ln Area * Post	-0.057*	-0.070**	-0.074**
	(0.035)	(0.035)	(0.035)
Coastal * Post	-0.109	-0.131	-0.135
	(0.087)	(0.088)	(0.089)
Major River * Post	0.088*	0.086*	0.085*
	(0.048)	(0.048)	(0.048)
Treaty Port * Post	0.108	0.111	0.111
	(0.078)	(0.078)	(0.078)
Small City * Post	-0.013	-0.015	-0.016
	(0.056)	(0.056)	(0.056)
Middle City * Post	0.013	-0.001	-0.003
	(0.082)	(0.082)	(0.082)
Large City * Post	0.136	0.099	0.112
	(0.137)	(0.141)	(0.136)
Prefecture FE, Year FE	Y	Y	Y
Province FE * Year FE	Y	Y	Y
Observations	1,834	1,834	1,834
R-squared	0.461	0.462	0.462

Notes: The table shows that the baseline estimates in Table 2 are robust to including nonlinear functions of population size. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.4: The Dynamic Effects of Quotas on the Revolutionary Indicator
D.V.: Revolutionary = 0/1

	(1)	(2)	(3)	(4)
Ln(Quota/Pop) * 1901	-0.003	-0.001	-0.005	0.005
	(0.012)	(0.014)	(0.016)	(0.008)
Ln(Quota/Pop) * 1902	-0.003	-0.001	-0.005	0.005
	(0.012)	(0.014)	(0.016)	(0.008)
Ln(Quota/Pop) * 1903	0.053	0.062	0.048	0.020
	(0.037)	(0.038)	(0.038)	(0.014)
Ln(Quota/Pop) * 1904	0.008	0.011	-0.012	0.005
	(0.028)	(0.028)	(0.029)	(0.010)
Ln(Quota/Pop) * 1905	0.172***	0.160***	0.135**	0.141***
	(0.051)	(0.054)	(0.054)	(0.052)
Ln(Quota/Pop) * 1906	0.129**	0.115**	0.098*	0.136**
	(0.053)	(0.057)	(0.058)	(0.056)
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. variables * Year FE			Y	Y
Observations	1,834	1,834	1,834	1,834
R-squared	0.454	0.462	0.474	0.409

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

Table A.5: The Impact of Quotas: Monthly Data

	(1)	(2)	(3)	(4)	(5) Weighted
ln(Quota/Pop) * Post	0.062**	0.057**	0.065**	0.061**	0.053**
	(0.026)	(0.027)	(0.027)	(0.028)	(0.025)
ln Pop * Post	0.040**	0.024	0.029	0.042**	0.039**
	(0.016)	(0.019)	(0.019)	(0.020)	(0.015)
ln Area * Post		0.031	0.036	0.029	-0.003
		(0.023)	(0.023)	(0.024)	(0.012)
Major River * Post			-0.050*	-0.050*	-0.023
			(0.030)	(0.030)	(0.020)
Coastal * Postt				-0.110*	-0.081
				(0.062)	(0.052)
Treaty Port * Post				0.049	-0.014
				(0.073)	(0.058)
Small City				0.034	0.074
				(0.042)	(0.051)
Middle City				-0.103	-0.104
				(0.068)	(0.068)
Large City				0.003	0.079
				(0.102)	(0.098)
Prefecture FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y	Y
Observations	1,572	1,572	1,572	1,572	1,572
R-squared	0.149	0.150	0.151	0.158	0.097

Notes: This table reports the impact of quotas per capita on the revolutionary indicator after Sep. 1905. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.6: Year-by-Year Impacts across Counties in Guangdong
D.V.: Revolutionary = 0/1

	(1)	(2)	(3)	(4)
ln (Quota/Pop) * 1894	-0.087	-0.095	-0.065	-0.059
	(0.109)	(0.116)	(0.126)	(0.091)
ln (Quota/Pop) * 1895	0.028	0.051	0.080	0.099
	(0.137)	(0.135)	(0.156)	(0.155)
ln (Quota/Pop) * 1896	-0.188*	-0.178	-0.145	-0.127
	(0.106)	(0.109)	(0.122)	(0.086)
ln (Quota/Pop) * 1897	-0.067	-0.038	0.034	-0.011
	(0.121)	(0.116)	(0.132)	(0.069)
ln (Quota/Pop) * 1898	-0.188*	-0.178	-0.145	-0.127
	(0.106)	(0.109)	(0.122)	(0.086)
ln (Quota/Pop) * 1899	-0.138	-0.122	-0.073	-0.083
	(0.108)	(0.111)	(0.123)	(0.086)
ln (Quota/Pop) * 1901	-0.149	-0.145	-0.100	-0.114
	(0.124)	(0.125)	(0.147)	(0.089)
ln (Quota/Pop) * 1902	-0.149	-0.140	-0.091	-0.089
	(0.111)	(0.118)	(0.132)	(0.088)
ln (Quota/Pop) * 1903	0.153	0.167	0.201	0.079
	(0.108)	(0.112)	(0.128)	(0.073)
ln (Quota/Pop) * 1904	-0.149	-0.140	-0.091	-0.089
	(0.111)	(0.118)	(0.132)	(0.088)
ln (Quota/Pop) * 1905	0.224*	0.255**	0.244*	0.202*
	(0.116)	(0.119)	(0.141)	(0.102)
ln (Quota/Pop) * 1906	0.175	0.191	0.262*	0.199**
	(0.128)	(0.134)	(0.146)	(0.099)
Post- vs. Pre-	0.293***	0.305***	0.292***	0.252***
	(0.074)	(0.077)	(0.081)	(0.087)
Year FE	Y	Y	Y	Y
County FE	Y	Y	Y	Y
Prefecture FE * Year FE	Y	Y	Y	Y
ln Pop * Year FE, ln Size * Year FE		Y	Y	Y
Other characteristics * Year FE			Y	Y
Observations	1,196	1,196	1,196	1,196
R-squared	0.328	0.337	0.357	0.335

Notes: This table reports the dynamic effects of quotas per capita using data from 92 counties in Guangdong between 1894 and 1906, using the year of 1900 as the reference. It shows that the quotas only had an effect after the abolition. Column (4) reports the results weighting by population sizes. Standard errors in parenthesis are clustered at the county level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.7: Quotas and Party Identification

	Individual-Level		Prefecture-Level			Prefecture-Level		
	KMT=0/1		KMT (0/1)	Other (0/1)	Diff.	#KMT	#Other	Diff.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln (Quota/Pop)	-0.035	-0.039	0.131**	0.200***	-0.069	0.297	0.333**	-0.037
	(0.048)	(0.048)	(0.052)	(0.053)	(0.072)	(0.183)	(0.130)	(0.232)
Age in 1912		-0.005*						
		(0.003)						
All Controls		Y	Y	Y		Y	Y	
Province FE	Y	Y	Y	Y		Y	Y	
Observations	702	701	262	262		262	262	
R-squared	0.181	0.185	0.425	0.429		0.483	0.480	

Notes: This table shows that quotas per capita 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)-(2). Columns (3)-(8) report the results using prefecture-level data: quotas per capita increase the party member probability for both the *Kungmintang* and the other parties but the impacts of quotas are not significantly different in terms of party identification. Controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.8: Examing the Impact of International Events

	(1)	(2)	(3)	(4)	(5)
ln (Quota/Pop)* Post	0.103**	0.114**	0.111**	0.119***	0.109**
	(0.045)	(0.045)	(0.046)	(0.046)	(0.046)
Newspaper per capita * Post	3.275				0.688
	(14.433)				(14.676)
Newspaper per capita * ln (Quota/Pop)* Post	0.910				3.347
	(13.810)				(16.857)
Newspaper per capita * ln Pop* Post	0.024				4.913
	(16.538)				(17.352)
Enclave * Post		-0.169		0.047	-0.029
		(0.253)		(0.421)	(0.456)
Enclave * ln (Quota/Pop)* Post		0.045		-0.596	-0.584
		(0.307)		(0.669)	(0.716)
Enclave * ln Pop* Post		0.046		-0.401	-0.494
		(0.284)		(0.554)	(0.547)
Enclave * Post			-0.173	-0.294	-0.154
			(0.318)	(0.507)	(0.496)
Japanese Enclave * ln (Quota/Pop) * Post			0.318	0.907	0.665
			(0.338)	(0.722)	(0.730)
Japanese Enclave * ln Pop* Post			0.203	0.620	0.558
			(0.326)	(0.617)	(0.538)
Prefecture FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Province FE*Year FE	Y	Y	Y	Y	Y
Baseline Controls * Post	Y	Y	Y	Y	Y
Observations	1,834	1,834	1,834	1,834	1,834
R-squared	0.462	0.462	0.461	0.464	0.468

Notes: The table shows that foreign penetration could not explain our main findings. The baseline controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.9: Robustness Checks of Using Small Rivers
D.V.: Revolutionary = 0/1

Small Rivers	≤70 KM	≤80 KM	≤90 KM	≤100 KM	≤110 KM	≤120 KM
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Quota/Pop) * Post	0.392**	0.383**	0.376**	0.374**	0.399**	0.394*
	(0.166)	(0.167)	(0.175)	(0.176)	(0.195)	(0.205)
# Rivers (>70 km)/River L * Post	-0.077					
	(0.077)					
# Rivers (>80 km) /River L * Post		-0.034				
		(0.097)				
# Rivers (>90 km) /River L * Post			-0.062			
			(0.122)			
# Rivers (>100 km) /River L * Post				-0.056		
				(0.116)		
# Rivers (>110 km) /River L * Post					0.052	
					(0.137)	
# Rivers (>120 km) /River L * Post						0.031
						(0.157)
Baseline Controls * Post	Y	Y	Y	Y	Y	Y
ln (River Length) * Post	Y	Y	Y	Y	Y	Y
Major river * Post	Y	Y	Y	Y	Y	Y
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
Observations	1,834	1,834	1,834	1,834	1,834	1,834
R-squared	0.431	0.433	0.434	0.434	0.429	0.430

Notes: This table shows that the results using the number of smaller rivers as an instrument are robust to variations in defining smaller rivers. The baseline controls include (i) logged population in 1880 and logged area; (ii) whether a prefecture is located on the coast and whether it is located on a major river; (iii) whether a prefecture has a treaty port; and (iv) whether a prefecture was counted as a big city, a middle-size city or a small city. Standard errors in parenthesis are clustered at the prefecture level: * significant at 10%; ** significant at 5%; *** significant at 1%.