State Capacity and Economic Performance in China*

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Abstract

This study attempts a causal examination of the role of state capacity in driving economic performance in a cross-section of China's counties. County governments, among the layers of sub-national governments, are responsible for providing a significant share of the country's public goods and collecting a significant share of its taxes. State capacity at this level is crucial. We use historical variation from wars that spread across ancient counties to identify the impact of state capacity of county governments in modern China. A mediation analysis uncovers specific public investment channels that were impactful. A puzzle we also attempt to resolve is why, despite repressing legal institutions, China has been able to create state capacity. We attempt to view our results through the theoretical lens provided by models developed by Acemoglu (2005) and Besley and Persson (2011), allowing us to both interpret our results and draw their connection to theory.

Keywords: State Capacity; Fiscal Capacity; Economic Outcomes; Public Goods Provision; War

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1. Introduction

We make a first attempt at assessing the role of state capacity in the economic performance of China's sub-national governments who are entrusted with providing public goods and delivering economic output locally. Using a county as the unit of observation, we consider a variety of outcomes to measure impact, including economic output, education, health care and public services. We take the view that state capacity is the pillar supporting these complementary outcomes in China. This idea has theoretical support in Besley and Persson (2011). State capacity in their model is the combination of legal capacity – the means to protect property rights and create a stable environment for contracting – and fiscal capacity – the means to financially empower governments to provide public goods and public investments. In a state that commits to adequately developing both capacities, citizens also commit to investing in a secure state that is itself committed to investing in "cohesive" institutions. The public and private investments this brings about produces clusters of good outcomes. On the contrary, a government insecure about its long-term viability shows its lack of commitment to building cohesive institutions by making little investment. Low fiscal capacity, sub-optimal private investments and clusters of poor outcomes endure.[1]

The paper makes three contributions. The first is to address the puzzle of why China – whose Central government wields firm control over resources, and in this sense is known to be a "strong state" – has outperformed similarly strong states with long-lived authoritarian governments, who have generally failed their citizens. We think the answer to this Chinese exceptionalism is the state capacity that its local governments have built. A core result of the paper shows that local state capacity in China causes local economic performance.

[1]State capacity play a strong role in the series of books by Johnson (1982), Amsden (1989), Wade (1990) and Evans (1995) explaining the economic success of East Asian economies. On the other hand, Herbst (2000) and Centeno (2002) link the economic failure of African or Latin American nations to their limited state capacity. These ideas are supported by cross-country evidence in Gennaioli and Rainer (2007) and within-country evidence in Michalopoulos and Papaioannou (2013) and Bandyopadhyay and Green (2012), who find a positive association between measures of historical political centralization and present-day outcomes. Dincecco and Katz (2014) show that a state's capacity to extract greater tax revenues is an important determinant of long-run economic growth in European countries. Acemoglu et al. (2015) document municipalities with a larger size of bureaucracy have better outcomes in Colombia.

State capacity requires two capabilities: a tax-extracting capacity and the capacity to channel this through public and private investment into output (Besley and Persson, 2011 Ch. 3; Acemoglu, 2005). The tax revenue that ultimately results from these capacities (or their lack) is therefore determined endogenously with output. We seek to establish causality, with state capacity as the driver of outcomes, which requires an instrument. We design an original instrument using historical variation within China. The instrument is based on population losses arising from deaths and migration during three concurrent rebellions lasting from 1851 to 1880: the Taiping Rebellion, the Nian Rebellion and the Dungan Revolt, which resulted in massive loss of life and destruction of property. The measure is tenuously related, if at all, to current outcomes, but it plausibly created institutions upon which the modern state capacity of China's local governments rests. This instrumental variable, whose logic and construction we describe in detail the paper, is the second contribution of the paper.

The third contribution of the paper is to shed light on another puzzle. In the Besley-Persson models, the productivity dimension of state capacity (apart from tax extraction capacity) rests specifically on legal institutions which protect property rights and encourage investment. Legal institutions in China, however, exist on paper but not in fact. What then, fills in for this missing institution and how are China's local governments able to create their state capacities in their absence? We attempt a theory-based explanation that helps to partially answer how, despite the absence of property-rights protecting institutions, state capacity has still developed within China. The theory, drawn from Acemoglu (2005), shows that state capacity is endogenously determined by trade-offs a government faces between increasing its own rents, which disincentivizes firms and citizens from making investments, and incentivizing firms and citizens to make investments, which reduces its own rents. How different governments react to this tradeoff then determines their state capacity. The puzzle about why some governments but not others are able to develop strong state capacity remains, but we open a path forward to more theory and empirical work on this important issue.

Related Literature

Our use of wars-induced variation in local government revenue speaks to the literature on the relationship between wars and state building. This literature takes inspiration from historical works that investigate the relationship between external conflicts and fiscal innovations that enabled states to gather greater wartime funds. Tilly (1990) famously argued that "states made war, and war made states". The models of North and Weingast (1989) and Dincecco et al. (2011) show how armed conflicts provided monarchs with incentives to create effective fiscal infrastructures. Specifically, being presented more opportunities for territorial expansion but also threatened with external attacks and internal rebellion, monarchs required more military expenditures to replenish their injured and dead soldiers. This urgent need for larger tax revenues meant increasing the tax rate or expanding the tax base. Warfare was therefore the reason that drove European states to expand fiscal capacity (Hoffman and Rosenthal, 1997; O'Brien, 2005; Besley and Persson, 2009; Gennaioli and Voth, 2015). The absence of interstate competition in China and the resulting low fiscal demand were the primary reasons for low taxation in Qing China before 1850 (Rosenthal and Wong, 2011). The advent of the large-scale civil wars in 1851-1880 plausibly explains the corresponding rapid increase in tax revenue.

Our study is related to other China-focused state capacity research. A comparison of ancient state capacity in China and Japan by Sng and Moriguchi (2014) finds that, before 1850, China's ruler kept taxes low and government small compared to Japan. Given China's large domain, the ruler's inability to closely monitor bureaucrats created opportunities for bureaucrats to exploit taxpayers, so China's ruler had to keep taxes low and government small to prevent such exploitation. This finding provides a further basis for our instrument, as we describe below. A regression discontinuity is used by Mattingly (2015) to show the relationship between state capacity and long-run growth during Japanese state building in Manchuria after their colonization of the region. By collecting data from the path taken through Sichuan by the Central Red Army during the Long March, Lu et al.'s (2016) in-

strument shows that counties along this path had more future Communist party members than other counties. Using the number of party officials to measure state capacity they find its positive impact on development in the post-Mao era when that capacity was allowed to complement markets. We share in common with these studies the idea that history provides a source of exogenous regional variation in state capacity, that can be exploited to make causal statements about the impact of state capacity. However, our work differs in scope (all of China) and in the outcomes we study (economic output plus a range of public goods).

The paper proceeds as follows. Section 2 indicates the importance of developing state capacity in counties, the unit of observation in our analysis. Section 3 describes the theoretical lens we use to motivate some testable hypotheses about state capacity and economic outcomes. In the empirical section we describe our identification strategy for estimating the causal impact of state capacity on outcomes. The instrument we construct is detailed. Section 4 contains a description of the data and provides statistics. Section 5, the main part of the paper, reports the results. Section 6 interprets these results in light of theoretical models of state capacity due to Acemoglu (2005) and Besley and Persson (2011). Section 7 concludes.

2. Structure of Government: Political and Fiscal Hierarchies

Our unit of analysis is a county government in China. Clearly understanding this choice of unit requires an appreciation of how the single Party governs the country.

Political Hierarchy: Center-Province-Prefecture-County

China's system of governance is hierarchical, with a strong central government as the top layer of a 5-tier government. The next layer of governance are provinces, followed by prefectures, then counties and finally townships. Politically, the hierarchy – necessary to govern from the top – has met the test of time. It has endured over centuries through a solidly established system of incentives – compensation, promotions and the promise of greater prestige and therefore power within the party – that delivers complete political allegiance to the Center. But the Center needs outcomes. Fiscally, therefore, it is not the

case that a lower layer is managed by the upper layer to which it belongs: county-managing-township, prefecture-managing-county and so on. These relations have been substantively altered, since the beginning of Deng's reforms in the 1980s, to deliver economic outcomes. The Center determines fiscal hierarchies to deliver (clusters of) local outcomes.

The population of China lives in three levels of Cities by administrative type (Lu 2014). They are often described sequentially from the largest to the smallest unit, by population. The four industrial giants Shanghai, Tianjin, Beijing and Chongqing comprise Tier 1 cities. The next level, Tier 2 cities, is comprised of over 300 prefectures, comparable to prefectures in Japan. While prefectures administratively report to provincial governments, their functional responsibilities and fiscal authority over constituent counties has seen changes over time.

The third level – at which we conduct out empirical analysis – consist of over 4000 counties, in which reside a billion people. Politically, they are home to county administrative seats, where many notable leaders began their political careers. There is enormous fiscal pressure on county governments for they are tasked with delivering much of the country's education, health care and law and order. By our calculation from the China Statistical Yearbook and National Prefecture and County Finance Statistics Compendium, in 2000 county expenditure as a proportion of combined province+prefecture+county expenditures (i.e. total government outlays excluding Center's outlays) were as follows: 12% on infrastructure, 55% on agriculture, 63% on education and 16% on social welfare. Overall, county governments provided 41% of total local government (not including the Center) public goods and investments, attesting to the heavy responsibility this tier of government bears (Wagstaff and Lindelow, 2008).[2] These national aggregates hide cross-province variation. How county

[2]Health care is a prime example. The central government tightened its fiscal investment in the health sector over the 1990s, and left most responsibilities for health service provision to local governments (Blumenthal and Hsiao, 2005). The major responsibility for providing health care services therefore rests with the county. For example, the central government and provincial governments pay a small fraction of healthcare costs (e.g. planned vaccinations), county governments must pick up the giant's share of cost of public health services. The fiscal capacity and the design of expenditure responsibility at the county government level are crucial for determining local health outcomes in China (Uchimura and Jutting, 2009). In 2003, 43% of total governmental health care expenditures were covered by county (and lower-than-county) governments (Martinez-Vazquez et al., 2008, p. 79). Rural education is another example of a public good almost single-handedly provided by county government. Since 1990s, China's rural education transferred

governments respond to the pressure to deliver on limited resources can determine outcomes at higher levels. Hebei, for example, received 36% of national (excluding the Center) revenues yet provided 39% of national public spending (World Bank 2002, Table 2.8). The province level statistics, in turn, hide within-province cross-county variation. In Gansu province, for example, county governments were responsible for providing 70% of Gansu's education spending, the largest ticket item on the expenditure side of the province's budget. In addition, counties picked up 58% of the province's healthcare spending, 62% of its pensions, and 64% of its administrative management (World Bank 2002, Table 3.4).

Providing public goods require the financial means for doing so. A crucial fact that the literature fails to recognize is that county governments, being the tier closest to the revenue source, bear the burden of collecting the lion's share of the nations taxes. Falling short of their tax targets meant facing threats of penalties from their Tier 2 prefecture government. But gathering revenue requires a tax base. Around 2000, less than 3% of revenue came from individual income taxes and more than 90% was sourced via indirect taxes: the VAT (42% of total revenue), consumption tax and city maintenance taxes (12%), business and enterprise income tax (28%), and stamp tax, agricultural tax, customs duties (11%). This structure is not without reason. Income taxation requires huge and continuing investment in bureaucratic capacity, which other modes of taxation potentially eliminates. Equally, if not more, important is that this structure potentially solves the problem of "monitoring the monitors" were such bureaucratic capacity created (a problem that similarly large countries like India have failed to solve). Bernstein and Lu's (2000) case studies of village and townships describe such agency problems through 1995 – during which local tax collectors usuriously raised revenue from arbitrary fees and penalties. By requiring local authorities to comply with a strict 5% rule, the Center shut this "unruliness". We will return to this point, but it relevant to mention here that it is in this regard that analysis of China's fiscal capacity diverges from studies of countries where bureaucratic capacity is

from a system self-funded by peasants to a system funded primarily by county governments, and aptly titled "County government as the key actor(yixianweizhu)".

a crucial ingredient into creating fiscal capacity (e.g. Acemoglu et al. 2015). In China, the system is geared to collecting VAT and other indirect levies. Local government incentives to do so are kept in line by not only a strict counting system monitored by the Party, but ultimately by rewards based on local outcomes such as income. Lu and Landry (2004) show how promotion-seeking local officials are incentivized to signal loyalty and competence by delivering tangible revenues. It is a wonder that such a system should succeed. Our results indicate it does. Local governments have responded to these incentives to create state capacity.

The main results in this paper are founded on exploring state capacity at the level in the hierarchy that (has tax-extraction capacity and) is closest to the people, and that is tasked with providing crucial public goods – the county government. Our econometric strategy is to exploit variation across counties in their tax capacity to explain variation in their per capita output. The absence of a relationship implies *either* that tax capacity is inadequate or that even though the capacity to extract taxes exists, leakages and misappropriations prevent their productive deployment into public investments that would have encouraged private effort and investment by citizens and firms and consequently greater output. The presence of a positive relationship implies that where *both* that the capacity to extract taxes has been developed, and leakages are kept to a minimum so that tax revenue is properly directed to encourage private effort and investment by citizens and firms, output is greater. That is, local governments in China *have* developed state capacity, and the variation in local state capacity is an important determinant of variation in local output. A null result, on the other hand, indicates local governments in China have been unable to develop state capacity, and the variation in local output requires an explanation other than state capacity.[3]

[3]Bai and Jia (2018) point to Chinese exceptionalism to the generally found persistence in the geographic distribution of economic activity, even after a large shock. They study 1000 years of China's history during which empires changed and, with them, the geographic location of economic activity. New dynasties consciously relocated the country's capital city and provincial capitals so as to diminish the economic power and threat of revolt from the status quo networks in densely populated cities. In doing so, Bai and Jia show how economic networks grew around the new capitals which endured as centers of growing activity, diminishing the importance and population of older capitals. One reason why China has defied the history of persistence in other countries is the hierarchical structure of government described above, which has remained constant

3. Econometric Model and Identification

3.1 Econometric Model

We employ a cross-sectional reduced form regression model to estimate the causal impact of tax revenue on output across China's counties around 2000:

$$\ln(\text{OutputPerCapita}_i) = \beta \ln(\text{TaxRevenuePerCapita}_i) + X_i\Phi + \varepsilon_i, \tag{1}$$

where i indexes county. Our working hypothesis is that China's county governments have been able to develop effective state capacity, an essential driver of its phenomenal growth. In our reduced form equation, evidence for state capacity is evidence of a positive causal channel from tax revenue to output, or $\beta > 0$. A wide-ranging set of control variables, described in the data section, are included in X. Data on local tax revenues are not easily manipulable in China, as we argue in the data section, and so measurement error does not significantly affect the estimate of β. The tax revenue data represent what is actually collected by tax authorities, not a de jure rate which the tax authorities are supposed to theoretically collect. We maintain the assumption that the error term ε_i is independently distributed across counties. We seek a causal estimate, and a key contribution of the paper is an original instrumental variable.

3.2 Identification: Population Change from Wars as IV

There are many reasons why tax revenue and output may be jointly determined. Tax revenue yield per capita is clearly limited by the income level, so poorer counties yield lower revenues, imparting an upward bias in the OLS estimate of β. China's fiscal regime,

through centuries. In this system, the Center has the political power to determine the economic geography of its cities. But another crucial reason, without which there would be more geographical persistence, must be the presence of disaggregated *state capacities*. True, the incentives of local government leaders were aligned with the Center through a system of compensation, rewards and promotions, so local governments would follows the Center's dictates. But it must have required state capacity at the *local* government level to produce alternate centers of economic activity in the manner the Center intended. While we use a cross-section from 2000, our methodology is relevant to the persistence debate, and may be used with historic cross-sections to show the role of state capacity underpinning the Bai and Jia's findings.

especially after the 1994 tax reform that reversed the flow of the majority of value-added tax proceeds away from provinces towards the Center, giving the Center enormous discretionary powers over transferring resources geographically. If the Center chose to redistribute fiscal resources through a variety of transfer schemes (e.g. Duan and Zhan 2011, Fig. 3) to cities and counties that were on average more productive, then OLS estimates of β would be upward biased (and further reinforce the tax yield bias above) and if the Center chose to redistribute more to poorer counties then OLS estimates of β would be downward biased (and counteract the tax yield bias above).[4] Models of revenue generation begin with an equation in which revenue is a function of income. In the Besley-Persson model, for example, the income tax rate t multiplied by income y determines income tax revenue. Their (two-period) model determines income endogenously, so that any variation in $t.y$ we observe is strongly correlatred with variation in y. In (1), therefore, it is impossible to identify β since $\text{TaxRevenuePerCapita}_i$ has little exogenous source of variation.

Our identification strategy is to use historical variation in China from the eighteenth and nineteenth centuries when the Qing dynasty (1644-1911) – the last dynasty –ruled the country. Population loss from three concurrent wars during 1851-1880 – the Taiping Rebellion, the Nian Rebellion and the Dungan Revolt – contain plausibly exogenous sources of variation that provides an instrument for current local tax revenue per capita. These wars are a quasi-experiment. They permanently transformed China's tax system by enhancing *local* governments' ability to collect tax in affected areas, but they should have little, if any, direct impact on current economic activity (conditional on covariates). We describe the context of this transformation and in the data section detail the construction of our instrument.

Rebellions and Fiscal Decentralization

Compared with European countries and Japan at that time, Qing China generated lower tax revenue. Land tax was the most important source of government revenue in Qing China before 1850. Every household was obligated to pay a tax determined by the size and quality

[4]There is ample evidence in the 2002 World Bank report (Ch 5, Ch 6) of the wilful use by the Center of its discretionary power to redistribute resources.

of the land the family held (Chu, 1962). According to Sng and Moriguchi (2014), China's annual revenue on the eve of the Opium War (1839-42) was no more than 2% of its national income. In contrast, the comparable number for the Tokugawa shogunate exceeded 15 %, even though the economies and cultures were otherwise similar.

The Qing dynasty was a highly centralized system of administration. A conquering dynasty, it was determined not to repeat the Ming dynasty's mistakes of (i) overtaxing the public and (ii) mistreating its own soldiers. Qing bannermen were entered into the selective bureaucracy and given the same power as the bureaucrats (Dai 2017). The ex-militarymen became civil administrators, gaining experience at collecting revenue through a civil tax system, and even rising to powerful positions of provincial chiefs.

The promise to not over-tax was a challenge. Maintaining an 800,000 strong army as the dynasty took control of China required colossal funds. Even during the 1750s peace-time, army stipends in some provinces exceeded 70% of provincial expenditures. A system, painstakingly administered by the bureaucrats, was created to transfer funds from surplus provinces to ones needing funding. Thus began a decentralized *fiscal* system, where a province deducted from what it owed the center the amount it transferred to another province. Lateral transfers often nullified payments to the center. Doing this properly, to keep the army well maintained, became a basis for promotions within the bureaucracy (Dai 2017).[5]

The Taiping Rebellion (1851-1872) was the largest war in China since the Qing conquest in 1644, and perhaps the largest civil war in world history (Ho, 1959). The estimates of war deaths range from 20 to 70 million, with millions more displaced. The major affected areas were the populous and developed provinces in the southern part of the country – Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei and Hunan (indicated in the southeastern part of Figure 1). The Nian Rebellion, an armed uprising influenced by the Taiping Rebellion, took place in northern China from 1851 to 1868 causing 100,000 deaths. The Qing government collectively termed them "Fa (Taiping) and Nian". The Dungan Revolt (1862-1877) was an uprising of

[5]Though the administrative system of province-city-county was set up centuries earlier, it was this Qing system laid the ground for the future institutionalization fiscal decentralization.

members of the Muslim Hui and other Muslim ethnic groups in China's Shaanxi, Gansu and Yunnan provinces, as well as in Xinjiang. They realized this opportunity with the Qing government's attention diverted by the Taiping rebels. More than 20 million people died due to massacres and battle deaths indicated in the northwestern and southwestern parts of Figure 1. The total deaths from the three wars stood close to 100 million, three times the deaths caused by the Sino-Japanese War (1937-1945) as part of World War II.

Figure 1 here

The account of Luo (2013) and Jiang (2012) of the most influential and earliest rebellion, the Taiping Rebellion, helps establish the plausible exogeneity of population loss from the war. The rebellion was initiated by Xiuquan Hong, born in Guangdong province in 1814. After a naval battle defeat of Qing by the British, Hong Kong became a colony of the British. Christianity took root and its influence spread to neighboring Guangdong province. In 1847 Hong studied with the American Southern Baptist missionary Reverend Issachar Jacox Roberts for two months in Guangzhou, during which time he gained knowledge of Christianity (De Bary and Lufrano, 2000). He established a distorted version of Christianity, and by 1850 commanded between 10,000 and 30,000 followers in the neighboring Guangxi province. Most of his followers were Hakka, a branch of ethnic Han that reached southern China relatively late and were less integrated. The separation between them and earlier arriving groups was a driver of the uprising because local governments in Guangxi province stood with the earlier arriving groups perhaps because local governments were themselves comprised of the older arrivals, but these group conflicts do not seem to be important beyond the origin of the uprising. In January 1851, Hong declared the founding of the "Heavenly Kingdom of Transcendent Peace (Taiping Tianguo)" and initiated the rebellion in Guangxi. In March 1853, Hong's forces took Nanjing, the most strategically important city in the southern China, and made it the capital of their movement until 1864. During this period,

his forces reached as north as Hebei province, close to Beijing, and as far west as Tibet.

In fighting rebellions, ad hoc centers were created in jurisdictions of war, whose governors were ordered by the throne to command war operations or manage logistical services. The logistical centers set up during the Taiping rebellion acquired the gravity of fiscal and military activity. These logistical bureaus staffed with prefects and magistrates managed war funds, hired workers and supported local military officials operations. Decentralized tax capacity came to exist as a system, no longer directed by the center but by generals leading the campaigns accompanied by a bureaucratic system capable of funding the campaigns. To repress the Taiping rebels the generals had to coopt the gentry class to organize into an army and collect a form of transit/commercial tax, Lijin, to finance their battles. In locations with more battles and therefore more deaths, generals needed greater tax capacity to replenish their armies. More Lijin was therefore collected in these areas. Because of Hong's anti-Confucian ideology and practice, Qing resistance against Hong's crusade received support from the gentry class. In 1864, Nanjing was captured by local forces comprised of the gentry, and ceased to be Hong's capital. In 1872, the last Taiping rebels were eliminated.

The large, and random, within- and inter-province variation in the scale of these wars is notable. Though the Taiping Rebellion was widespread, it never captured a whole province. For example, the Qing government controlled the side of the Yangtze River close to Nanjing throughout the rebellion. Unlike the U.S. Civil War and the two World Wars, of the rebellion's many battles it is hard to point out two or three conclusive battles. The rebels' strategy was to attack an area weakly protected by the Qing army. But once the Qing army reinforced in that area, the rebels retreated. This feature randomizes affected areas. Importantly, the three rebellions were repressed by local rather than national armed forces. Funds for military expenditures were collected locally, inducing great variation in new-found fiscal capacity across the country. In contrast, the Sino-Japanese War (1937-45) and Civil War between the Nationalist Party and Communist Party (1946-50), also large-scale wars, did not cause comparable change in local variation in fiscal capacity because central, rather

than local, forces mobilized across the country, often funded by international aid.

Rise of Lijin (and Decline of Land Tax)

For two thousand years preceding these wars, China's government encouraged agriculture and discouraged commercial and industrial activities. Lijin marked an important transformation in China's tax system. Beginning in Yangzhou prefecture of Jiangsu province in 1853, Lijin was adopted by local governments in most provinces (Luo, 1936; Luo, 2013). Nationwide, the Lijin revenue was 11% of total government revenue in 1903 (1170 silver taels), increasing to 14% by 1911 (4318 silver taels). Since Lijin accrued to local governments, its share in local government revenue was even higher. Lijin was canceled in 1931, but the Nationalist government, and later the Communist government in 1950, introduced new commercial taxes to make up the revenue loss. The persistence and scale of Lijin across different governments was due to two reasons. First, since these governments claimed to be liberators, it became unwise to cut public services, whose maintenance required tax revenue. Second, these non-democratic regimes had few checks on the power of governments to expand, and an already existing tax collection capacity enabled this expansion. Over time, commercial taxes grew in importance, making the land tax, the major source of revenue in ancient China, trivial.

The decline of the land tax began in the Qing era (Mizoguchi p 59). Early in the Qing period, every household was assessed the same land tax, reflecting the equality of people in the mind of the emperor. The dynasty was challenged when its private interest due to its monopoly over land superseded public interests. This violated the understanding that the king's land, being given to the king by Heaven, was the people's land. A compromise was the emergence of a clan system in which commercial (not ownership) rights to land were granted to the clan to take care of itself. This began system of local self-governance of "village spaces" or communes comprised of clans, and also hastened the decline of land as the source of revenue. Bernhardt (1987) describes how, during the Taiping rebellion, Qing allowed leaseholders to reduce rents they paid to landlords in return for paying taxes. This

began the decline of the landholding class and gentry. The Taiping war separated ancient China, in which the government did not directly tax farmers/merchants and relied instead on the gentry and landlord classes to gather taxes, from post-rebellion China in which these classes declined sharply as both the Taiping rebels and the Qing government sought to reach farmers and merchants (a process extending well into Mao's land reform and Great Leap).

We close the section by providing circumstantial evidence of the relationship between population loss and Lijin collection. Although data on nationwide Lijin collected across ancient prefectures are unavailable, we obtain the ancient prefecture-level Lijin collected in Zhejiang province in the Late Qing period from Luo (1936). Zhejiang, one of the most developed provinces in China, suffered heavy damage in its northern and western parts during the wars, but the rest remained intact. Normalizing Lijin revenue by the 1880 population and taking logs, we regress it on the population change from the wars. We find that an additional percentage point change in population is associated with per capita Lijin revenue increase of 3 percent. This estimate is statistically significant at 1%, and the regression R^2 is above 0.4 (appendix Figure A1). The system of financing of these wars by Lijin, as we have described, laid a basis for tax collection capacity in the modern era. As we will show, population loss had no direct impact on economic activity at that time, and is therefore properly excluded from the regressions explaining current economic activity. Population loss from the wars potentially serves as an instrument for our causal examination of the state capacity within China. It is plausibly exogenous, and measures a permanent change in decentralized tax capacity through the mechanism we have detailed. We now proceed with our investigation.

4. Data

This paper contributes significantly on the data dimension. Our analysis uses the cross section of over 2000 counties in China, around the year 2000. China's county GDP measures are probably subject to manipulation, according to many observers. In a hierarchical structure in which lower-level government officials are appointed by upper-level government

officials, local government officials have a strong incentive to inflate GDP reports so as to increase their chance for promotion (Li and Zhou, 2005; Jia et al., 2015). We sidestep the GDP issue,[6] and instead measure output using high-resolution data on light density measured by satellites at night and processed by the National Oceanic and Atmospheric Administration.[7] Each satellite-year dataset is a grid reporting the intensity of lights, for every 30 arc-second output pixel (approximately 0.86 square kilometers at the equator). The digital number measuring the intensity of lights is an integer between 0 (no light) and 63. We aggregate the digital number for a county using the Arc-GIS software, normalize by the population (in 10,000 people) and then take logarithm. Because the light measures are not strictly comparable across year (Henderson et al., 2012), we use the light data in 2000 in the main analysis, though the 2001 light data provide the same results. Bleakley and Lin (2012), Michalopoulos and Papaioannou (2013), and others have shown this measure to adequately serve as a proxy for local economic activity, and Henderson et al. (2012) find that it correlate strongly with other welfare proxies. In our county data, night lights are strongly correlated with GDP. Finally, we also measure a large number of public goods due to county governments.

Data on local government revenue, our main explanatory variable, are obtained from the National Prefecture and County Finance Statistics Compendium, published by China's Ministry of Finance. It includes two major categories: budgetary revenues and government-fund revenues. Budgetary revenues include a value-added tax, business tax, personal-income tax, corporate-income tax, urban maintenance tax and agricultural tax accruing to county governments. The period of our sample, around 2000, is chosen so that local tax revenue is accurately measured and is the relevant source of revenue for county governments. Although the yearbooks began in 1993, most provinces reported data for non-district counties but not for county-level districts.[8] The 1999 yearbook was the first issue to report full fiscal

[6]The results with per capita GDP are generally similar to the main results, though nosier as GDP data contain more measurement errors.

[7]The raster files are at: http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html.

[8]There are two types of counties in China: non-district counties and county-level districts. The former have a long history and are more distant from the prefecture government seat, while most county-level

statistics for both types of counties. Variable definitions changed radically in the yearbooks after 2006, and hence most researchers use the 1999 to 2006 yearbooks (e.g. Lu and Landry, 2014). Because we also use outcomes in the 2000 population census, we use the average of local government revenue collected in 1999 and 2000 (and use CPI deflators provided by the National Bureau of Statistics to express data in 2000 prices) divided by average population in the two years. As we have mentioned, the tax revenue data are not easily manipulable because the Center has strong incentives to maintain tight control over tax collection and the data.[9] The central and local governments share tax revenues from value-added taxes, stock exchange transaction taxes and natural resources taxes. Shared taxes are directly collected by national tax bureaus because part of the revenues must be remitted to upper-level governments.[10]. Bureau chiefs are therefore relatively immune to pressure from local governments to artificially inflate reported taxes (Lu and Landry 2014). Also, the "vertical administration" of tax bureaus implies that county governments cannot easily intervene in the operation of local tax offices through personnel changes. Notably, government-fund revenues in the form of land use fees became an important source of local government revenue after 2000, but were less significant during our sample period. We exclude transfers from upper-level governments, which reflect fiscal capacity of upper-level governments. Finally, since local governments were not allowed to issue bonds during the sample period a non-borrowing constraint is implied.

The instrumental variable (IV) is operationalized as the population change from wars over the period 1851-1880 at the level of ancient prefectures in the Qing dynasty (1644-1911). The source is population data from China Population History edited by Ge (2005), a

districts were established after 1930.

[9]Since the 1994 tax-sharing reform, the central government retains 100% of the tax revenue from sources such as tariffs, consumption tax, and taxes and revenues from state-owned enterprises controlled by the central government. Local governments retain 100% of revenue from business taxes, personal income taxes, agricultural taxes, and taxes and revenues from state-owned enterprises controlled by local governments.

[10]75 and 25 percents of value-added tax accrue to the central government and prefecture/county governments, respectively, while 60, 15, 25 percents of corporate and personal income tax accrue to the central government, provincial governments and prefecture/county governments, respectively.

book widely cited in Chinese economic history literature. Conceptually we wish to measure, for each ancient prefecture i, the rate

$$\Delta POP_i = \frac{POP_{i,1880} - (POP_{i,1880} \mid \text{No War})}{Pop_{i,1851}}$$

where $(POP_{i,1880} \mid \text{No War})$ is the counterfactual population in 1880 in ancient prefecture i. To estimate this term, we assume prefecture i's population growth the 30 years prior to 1951 is the same as in the 30 years following it. The stability of population growth in the pre-industrial era, provides a basis for this assumption. We estimate this (constant) potential population growth rate without wars as $\frac{Pop_{i,1851}}{Pop_{i,1820}}$. Applying this, we obtain our population loss data as

$$\Delta POP_i = \frac{POP_{i,1880} - \left(POP_{i,1851} * \frac{POP_{i,1851}}{POP_{i,1820}}\right)}{POP_{i,1851}}. \tag{2}$$

The deviation of the actual 1880 population from the hypothetical population is attributed to the wars. Chen and Zhou (2007) measure severity of the 1959-61 famine similarly using the excess mortality rate in famine years over normal years. To mitigate the impacts of outliers, population change at the largest and smallest 1 percentiles are winsorized. These data are used to plot Figure 1. Simple population growth between 1851 and 1880 as a measure of the scale of the wars also produce similar results. Notably, more than 95 percent of the counties have population change less than zero, indicating the variation in population change is due to casualties rather than out-migration.

The first set of covariates, "Covariate set 1", are measured at the current county level – log county area, whether the county is in a coastal prefecture, whether the county is in a provincial capital, latitude, longitude, and province dummies. Geography explains, in part, why counties in coastal areas and provincial capitals are generally more developed. Latitude and longitude capture spatial aspects that remain unaccounted for by province-fixed effects. Latitude affects crop adoption due to its association with climate and longitude serves to control for China's northeast Asian monsoon patterns (Zhang and Lin, 1992). The second

set of covariates, "Covariate set 2", are measured at the ancient-prefecture level in which (current) county i is located (Bai and Jia, 2016). They include main river indicator, log river length, incidence of drought/flood during 1800-1899, average transportation condition, log 1820 population, three types of crop suitability (foxmillet, rice and sweet potato) (Jia, 2014a), language fragmentation indices, number of presented scholars (*Jinshi*) and indicator for treaty ports. These covariates can directly affect outcomes separately from the county level covariates. While fragmentation captures racial and ethnic differences (Alesina and Ferrara, 2005), China proper is populated mostly by ethnic Han. Therefore language fragmentation aptly captures subtle within-Han cultural differences (Tabellini, 2010; Chen, Kung and Ma, 2016). The number of presented scholars proxies another aspect of culture as well (Bai and Jia, 2016, Chen, Kung and Ma, 2016). Being in a prefecture with an ancient treaty ports can promote long-run economic development (Jia, 2014b). For reasons related to the IV's validity, as we explain below, we also include the pre-war 1851 population, pre-war population change over 1820-51 and indicators for ancient city size. Finally, province dummies capture differences in tax bases and sharing rules determined by the Center. They also account for province-specific unobservables in the vast country. Because most counties are located in the same ancient prefecture as the current prefecture, and our IVs and many covariates capture that variation, we cannot control for prefecture-fixed effects. However, we cluster errors at the prefecture level. The expansive set of covariates attempts to leave little to missing variables, therefore minimizing the effect of unobservables.

Descriptive Statistics

All variables are measured at current (around 2000) counties in the 23 provinces including the four province-level municipalities of Beijing, Tianjin, Shanghai and Chongqing (China proper). Our sample consists of 2104 non-district counties and county-level districts.[11]

Table 1 reports the descriptive statistics of main variables for the full sample of 2104

[11]Counties in Ganzi and Aba, two Tibetan prefectures in Sichuan province are dropped, as are counties in Chengde prefecture of Hebei province. Historical data are absent for these far-flung border regions since the ancient government did not establish effective jurisdictions there. About 100 counties are thus dropped.

counties. The mean government revenue per capita is 261 yuan, or 4 percent of mean GDP per capita. The reasons for the low ratio are the 1994 tax-sharing reform that we have mentioned, when the Center took back a large share of revenue originally accruing to local governments during Deng's reform years, and land use fees had yet to become a significant source of local government revenue.[12] Mean population loss during the 1851-1880 wars was 25 percent of the 1851 county population, a devastating loss of approximately 100 million nationwide. The distribution of population loss was skewed – the median county experienced a population loss of 3%. The counter-factual population change without wars would be zero.

Table 1 here

Non-district counties sub-sample

There are two types of counties in China: non-district counties and county-level districts. The former have a long history and are more distant from the prefecture government seat, while most county-level districts were established after 1930. For the non-district counties sample of 1568 counties – nearly 75% of counties in the full sample – we can construct a number of additional outcomes measures than the full sample allows. From China County Socioeconomic Statistical Yearbooks and Annual Surveys of Industrial Firms we construct: output of medium and large manufacturing firms, telecommunication, attendance in primary and middle school, and number of hospital beds. The latter four outcomes we consider to be public investments. The lower panel of Table 1 shows descriptive statistics for this sample. Appendix Tables A1 and A2 contains statistics for other covariates for the two samples.

5. Results

Table 2 presents 2SLS estimates of the impact of government revenue per capital on

[12]The tax-sharing reform enables the Center to capture a larger share of the incremental tax revenues from local governments. Therefore, the variation in tax revenue remained similar to the pre-1994 years.

economic activity measured by night lights per capita. In column 2, the model with current county level covariates, a 100 percent increase in per capita government revenue causes night lights scaled by population to be 114.6 percent higher. A clearer statement of the result is that counties with per capita government revenue at the 75 percentile have 100 percent more night lights than counties at the 25 percentile.

Table 2 here

Population loss from the ancient wars proves to be a capable instrument for government revenue. The bottom part of Table 2 shows that a greater rate of population loss from the old wars is strongly associated with higher current tax revenue collections per capita, supporting the idea (below) that the need to replenish forces and supplies were most severe in intensely contested zones with high casualties, which created the urgent need for tax capacity in those zones. In column 2, an additional percentage point per (1851) capita population loss from the old wars is associated with an increase in current government revenue per capita of 0.493 percent. Or, a one standard deviation increase (of 0.37) in per 1851 capita population loss is associated with an increase in current government revenue per capita by 18.2 percent.

The estimates are consistent with the idea, due to North and Weingast (1989), that armed conflicts provided monarchs the incentive to create an effective fiscal infrastructure. In battlefields across China, especially in locations with higher casualty rates, generals needed resources to urgently replenish their forces. This need induced greater tax collection by fiat, mostly by expanding the tax base. This laid the basis for decentralized fiscal institutions (of varying capacities) across China. As we noted, the transformation from land tax to commercial/industrial taxes was permanent. The mechanism associating higher death rates in large-scale wars with greater tax capacity is strongly empirically supported by the first stage results. The Cragg-Donald F-statistic of 64.10 indicates that the maximal IV size is 10 %, that is, the 2SLS bias is at most 5% of the OLS bias (Stock and Yogo, 2005). The

Kleibergen-Paap test statistics (robust to non-iid errors) also attest to no weak instrument problem. The weak-IV-robust Anderson-Rubin Wald test of the coefficient estimate in the main equation affirms a significantly positive impact of per capita government revenue.

Column 3 of Table 2 adds three covariates from the pre-war era (measured at the ancient prefecture level): pre-war city size during the war era, population change in three decades preceding the wars, and population size. The motivation for doing so is to dispel three potential issues. The first pertains to non-randomness of population loss during the wars, specifically whether urban areas experienced disproportionately greater loss. If they did, controlling for (ancient) city size should greatly affect our result about state capacity. We draw on Rozman's (1974) four-part classification of Chinese urbanization levels in the Qing dynasty: largest (population above 300,000), mid-level (70,000 to 300,000), small (30,000 to 70,000), and smallest (population below 30,000) (e.g. Bai and Jia 2016). Including the city indicators does not significantly change the result.

The second ascertains whether it is the 1820-51 pop growth, used as the counterfactual in (2), rather than population loss during the wars that drives the result. Clearly not, meaning loss during the wars is the driver. The third is that population size may be an important missing variable that is both correlated with population loss in the wars years 1851-80 and night lights per capita in modern China. The results do not indicate population size is an omitted variable of importance (current population is an outcome of state capacity and hence endogenous, but even if it were included, the results are not affected – Appendix Table A5).

In the last column we add a number of weather-related, crop-related, transport-related, and cultural covariates. Historic incidence of drought or flood is associated with 14.3% fewer night lights per capita; and counties where ancient transportation conditions were good are associated with 25.7% more night lights per capita. The association of other covariates with economic activity is weak or imprecisely measured. Even with this large set of controls, our main finding remains intact.

Table 3 reports the impact of local government revenue on night lights and public goods

for the sample of non-district counties. Public goods include the ratio of households having treated water, average educational attainment, per capita number of telephones as a measure of public investment in telecommunication infrastructure, the share of middle school students in population aged 10 to 19, the share of primary school students in population aged 5 to 14, and per capita hospital beds. All variables are in logs except the ratio of households having treated water, average educational attainment and shares of middle and primary school students. We find significant positive impacts of per capita government revenue on night lights and all public goods measures except the share of primary school students.[13]

Table 3 here

The difference in impacts across the interquartile range of counties imply significant variation in state capacity development across county governments. Counties at the 75th percentile in per capita government revenue have 79 percent more night lights per capita, 55 percent more telephones per capita and 54 more hospital beds per capita than counties at the 25th percentile. Further, the same differences in the proportion of households with treated water, the average educational attainment and share of middle school students, respectively, are 17 percentage points, 0.65 years, and 5.3 percentage points. In addition to these public investment and public goods outcomes, appendix Table A3 reports similarly significant findings for *private* outcomes, including the per capita number and the value of production of manufacturing firms with annual sales larger than 5 million yuan, per capita residents' deposits and per capita loaned funds. They affirm the logic of Barro's (1990) model in which high quality public investment attracts matching private investment in the context of China's sub-governments.

[13]The share of primary school students was already uniformly high across counties by 2001, and further increases were harder to achieve. Local government revenues were effectively used to increase secondary enrollment: A one standard deviation increase in local revenue per capita improved secondary enrollment by over four percentage points. In most developing countries this impact would be viewed with envy, and evidence of a system in which government revenue is effectively used.

The results suggest that many county governments have not only developed extractive fiscal capacity, but (rather than make transfers or divert resources to private rents) they have effectively deployed tax revenue towards providing treated water, telecommunication infrastructure, secondary education and healthcare as measured by the supply of hospital beds per capita. The same specification shows the causal impact of government revenue on a variety of outcomes, consistent with the Besley-Persson logic of a common underlying factor producing a cluster of (good and bad) outcomes. The latent dimension causing these cluster of outcomes is (strong or weak) state capacity in China's counties.

Evidence of waste, government corruption and informal taxation by local officials is plentiful (Olken and Singhal, 2011). However, our estimates about formal tax revenue show that counties with the capacity to obtain higher formal tax revenues per capita also convert these into more public goods per capita. Moreover, in our sample period formal tax revenue is more important than the later years, because both land revenue and funds from local government financing vehicles were trivial in local governments' revenues at that time. Therefore, our estimates suggest efficient public goods provision relies on effectively monitored taxation. A school of thought is that competition between the central government and the local government for official revenue – a dollar that accrues to the local government is one less dollar that can accrue to the central government – incentivizes the Center to tightly monitor the utilization of tax revenue (Che, Chung and Lu, 2017). Promotions and soft-powered incentives for local government officials as they rise within the Party, are based on the delivery of public goods as well as the production of private goods in their jurisdictions. Tsai (2007) shows how informal accountability in China leads to more than the minimum level of public goods needed to maintain social stability. Finally, we note the stronger first-stage results. Non-district counties, unlike counties carved out of prefectures and districts more recently (after 1931), have a long history. Therefore, variation in local government revenue has a stronger association with population loss from the wars in this sub-sample.

Devarajan, Xie and Zou (1998) caution that if taxation is so costly that the value of public

goods is unable to offset the cost of collecting taxes, the impact of government revenue can actually be negative. Our high positive estimates imply the opposite has been true about China's local governments. Interpreted as returns-to-scale in the production of public goods, the estimates in Table 3 show the varying degree of efficiency with which county governments transform tax revenue into public goods by China's county governments.

Consider phones per capita in 2000. In that era, preceding the advent of cellular technology, landline telephones were the predominant mode of distance communication in China, and were largely publicly provided. Phones per capita is a plausible measure of telecommunications infrastructure investments in switchboard capacity, long distance lines and phone terminals. These investments were undertaken largely by local governments,[14] paving wires and cables and constructing base stations, which determined prices set by local telephone companies as well as the number of phones supplied.[15] The return-to-scale estimate in Table 3 of 0.709 indicates efficient provision of telecommunication infrastructure investment with tax money. Efficient provision of an important public investment good induces citizens to also increase their investment and therefore output. Although telecommunication is one of many public investment local governments undertake, the mediation analysis attests to its overall importance.

Mediation Analysis

We decompose the total effect of local government revenue on night lights into an "indirect" or "mediated" effect that works through public goods provision and a residual "direct" effect. This allows us to measure the contribution of each type of public goods to prosperity. We lean on the method, due to Dippel et al. (2017), which identifies the mechanism by which log government revenue per capita causes log night lights per capita outcome. Government

[14]Lu (2000) notes that during 1991-95, China installed more than 73 million phone lines, more than all the rest of the developing world combined. The penetration rate (measured by number of telephone terminals per 100 persons) rose sharply from 0.6 to 4.66 in a decade. Many coastal cities raised their telephone penetration from 2 to 3 percent to above 30 percent by 1995, in less than a decade's time.

[15]An article in the Chinese journal, *Information China*, v.3, 2010, by Jianjun Qiu, a government official in Chongyi county government, provides first-hand account of role of local governments in this regard.

revenue is the source of funds for making public investments into capacity for producing public goods. These public goods induce private investment which combines with the public goods to produce output. Dippel et al.'s method identifies the contribution made by each type of public investment (good) to the total impact of government revenue on output measured by night lights. It is attractive because no further instrumental variables are needed: the same IV used in the 2SLS estimation is sufficient to causally estimated the mediated effects. To estimate the effect of local government revenue on night lights through educational attainment, for example, the method is as follows. First estimate (1) with educational attainment as the outcome to obtain the IV estimate $\hat{\beta}_{Educ}$ (= 0.838 in Table 3) of the impact of local government revenue on educational attainment. Next, estimate the model:

$$\ln(\text{Night Lights pc}_i) = \alpha_1 \text{EducationAttainment}_i + \alpha_2 \ln(\text{TaxRevenuePC}_i) + X_i\Phi + \varepsilon_i, \quad (3)$$

The mediated effect of local government revenue on night lights through educational attainment is given by $\hat{\alpha}_1 * \hat{\beta}_{Educ}$. We note that this estimate of the mediated effect may pick up the impact of other public goods that are strongly correlated with educational attainment, and may not be uniquely attributed to educational attainment. This is not a serious concern since we use available measures to proxy public goods provision. If educational attainment proxies broad schooling resources provided by the government, our estimate suggests the mediated effect of such educational resource provision on economic performance.

Table 4 here

Table 4 reports estimates of these mediated effects for the public goods in Table 3. Outcomes are in logs for ease of comparison. The total effect of local government revenue on night lights is from Table 3. Telecommunication infrastructure has the largest mediated effect on night lights. The mediation effect through educational attainment is also substan-

tive. Other public goods have mild effects. A plausible explanation is that since returns to telecommunication infrastructure and educational attainment accrues to the local area, and local government has stronger incentive to make these investments.[16]

Robustness

Population Change from Wars and Pre-War Development

We have addressed exclusion restrictions in our discussion of the results in the above section, by showing population change from the old wars are not related to economic development before the wars. Furthermore, our regressions control for 1851 population size which could possibly be related with economic development in the pre-war periods. Here we advance the instrument's validity using a placebo. We construct pre-war population growth over 1820-1851 using ancient prefecture population data (ratio of 1851 population to 1820 population minus 1). If population growth over 1851-1880 – our IV sans the counterfactual adjustment – measured economic development before the wars, rendering the IV's exclusion invalid, then it is reasonable that the 1820-1851 population growth similarly does and we should therefore see the same strong first-stage effects. We do not find this to be the case. Appendix Table A4 (second column) shows that the first-stage regression coefficient on 1820-1851 population growth ($=-0.229$) is statistically no different from zero (p-value=0.24). In contrast, the first column shows the coefficient on the population growth over the duration of the devastating wars of 1851-1880 ($=-0.497$) is a precisely estimated.[17]

Non-Random Population Loss

Arguably, greater population losses may have occurred in places with already large populations that were centers of industry. Davis and Weinstein (2002) show that even though U.S. bombing of Japan in World War II targeted and annihilated regions where production

[16]The difference between the sum of mediated effects and the total effect is the "direct effect" of government revenue only if the full set of public goods through which the total effect is mediated is included, and if the full set are pairwise (conditionally) uncorrelated. These conditions are not fulfilled here.

[17]As an informal check we regress outcomes in Tables 2 and 3 on log per capita government revenue, population growth during the wars period, plus covariates. The coefficient of population change from wars is not statistically significant at 5% in most regressions. The impact of log government revenue per capita, on the other hand, is always statistically significant at 1% (except for primary education).

and populations were concentrated, it is in the same locations that the strongest production networks later emerged. If such persistence occurred after the China wars, population loss is incorrectly excluded from the regression The Japanese pattern of destruction occurred because aircraft sorties could fly to core areas of the enemy with command of the air. However, population loss from the old wars in China followed no that pattern. There were no targeted annihilations by central forces because the wars were under the decentralized control of local forces; the Center had no role in specifying targets.

Furthermore, the rebellion spread organically with no neat geographic logic to it. It is hard to identify two or three decisive battles. The rebel strategy was to attack areas weakly protected by the Qing army, and withdraw once the army reinforced those areas. The fighting spread randomly. A revolt starting in a county quickly spread beyond the county further into the province. Indeed, the Taiping rebellion started in Guangxi province but the large majority of Taiping rebels deployed beyond Guangxi soon after. The Muslim rebellion also experienced a similar expansion. The ancient urbanization results above support such a geographically random population loss. Bai and Jia (2018) document centuries of delocating and relocating centers of economic activity as new empires sought to break up hostile prevailing coalitions from mounting threats. They too find no evidence of path dependence in China's regional development. As further evidence, we drop provinces with even the hint of non-random population loss. As Appendix Table A5 indicates, this makes the impact of state capacity even stronger. The IV therefore appears to adequately serve the purpose of randomizing counties into those with (continuously measured) high versus low tax capacity, allowing us to interpret our results as treatment effects.

Finally, we find no association between *land* tax revenue per capita and current government revenue per capita in a regression including covariates. We infer that the land tax declined in importance (as we described earlier, its decline began in the Qing era, and became permanent during the rebellions as Lijin came to be the tax of choice), leaving little impact on current government revenue. The new tax institutions, being organically formed,

bore no systematic geographical relationship to older structures like the land tax.

6. Mechanisms

State capacity requires both the capability to extract tax and the capability to optimally channel resources into public investment to encourage private investment. Though implicit, the mechanics are muted in our reduced form. In this section, we delve into two models whose mechanics shed light our findings.

6.1 Acemoglu (2005) model

In Acemoglu's (2005) model state capacity is determined as the solution to trade-offs faced by the government and citizens. Both private and public incentives are key to efficient tax collection, making the model apt to China's sub-governments. A message is that governments with too much power – strong states – have an incentive to over-extract, but citizens can then choose to not invest effort, that is, to exit. Governments with too little power – weak states – under-extract and are unable to provide public goods sufficiently to incentivize citizens to invest. How governments resolve this tradeoff determines their state capacity.

Since China raises its taxes indirectly, the tax in the model refers to a value-added tax. Consider the problem of county government g in China. Output y_{igt} of firm i located in county g in year t is produced using the Cobb-Douglas technology

$$y_{igt} = \frac{1}{(1-\alpha)} A_{gt}^{\alpha} (e_{igt})^{(1-\alpha)}, \tag{4}$$

where A_{gt} is the quantity of public investment goods – infrastructure, education, healthcare – provided by county g in year t (which fully depreciate every period), and e_{igt} firm i's private investment. Public investment goods therefore enhance the productivity of private investment. Government expenditure G_{gt} is used to produce public investment goods, with a lag:

$$A_{g,t+1} = G_{gt}^{1/\phi}, \tag{5}$$

where $\phi > 1$ indicates decreasing returns in producing public investment goods.

Citizens and the government are both self-interested actors. On the one hand, citizens seek to evade taxes and can hide their income from being taxed. On the other hand, government g seeks to maximize its private rents by diverting tax resources to personal use. Controlling the extent to which citizens hide or under-report their income determines the government's extractive fiscal capacity. The government would like to eliminate this possibility, but if it is overbearing in this pursuit, citizens may exit – they stop investing or move to a county with more favorable terms.

Suppose the county government applies a value-added tax at the rate τ_t and firm i decides to under-report a fraction z_{it} of its income. The "strength" of county government g is its ability to detect a fraction δ_g of this hidden income and seize it. Suppose the county can choose this strength. To keep the model simple, we assume what the government seizes is lost to society. Firm i's maximum output net of taxes (its consumption) in year t is

$$C_{igt} \leq (1 - \tau_{gt} + \tau_{gt} z_{igt})\, y_{igt} - \delta_g(z_{igt} y_{igt}), \tag{6}$$

where $(\tau_{gt} - \tau_{gt} z_{igt})$ is the effective tax rate and $\delta_g(z_{igt} y_{igt})$ is lost to society. Of the total taxes T_{gt} it collects government g pockets rents R_{gt},[18]

$$R_{gt} = T_{gt} - G_{gt}. \tag{7}$$

The sequence of actions proceeds as follows. The county inherits A_{gt} from government's spending at time $t-1$. The county's citizens choose to make investments $\{e_{igt}\}$. Government g decides how much G_{gt} to expend, and sets the tax rate τ_{gt}. Firms decide how much of their output to hide to evade taxes $\{z_{igt}\}$.

What tax rate does the government choose and how much do firms hide? How do firms decide what portion of their post-tax (disclosed) output to consume and how much to invest? The solution is derived in Acemoglu, our purpose here being the description of the process

[18]From (3), $T_{gt} = \sum_c (\tau_{gt} - \tau_{gt} z_{igt}) y_{igt}$

by which government g determines its state capacity and interpreting our empirical results in that light. In a Markov Perfect Equilibrium (MPE), where decision rules of the government and citizens depend on current values of the state variables, not on their histories, the following decisions are taken (the time subscript is dropped; all variables except A pertain to the current period; $\hat{A}$ denotes public investment goods available in the next period.):

- Government g chooses a tax rate equal to its detection rate, $\tau_g = \delta_g$: Rewrite (6) as $C_{ig} \leq (1-\tau_g)\, y_{ig} + (\tau_g - \delta_g) z_{ig} y_{ig}$, where the second term on the right-hand side is net (of detection) tax revenue lost due to hidden income. If $\tau_g > \delta_g$ firms hide all their income ($z_{ig} = 1$) to maximize C_{ig} at $(1 - \delta_g) y_i$. County g earns no tax revenue. If $\tau_g < \delta_g$, citizens hide no income. This is sub-optimal because by infinitesmally increasing τ_g government g earns more revenue. It sets $\tau_g = \delta_g$, at which rate no income is hidden.

- Firm i's investment e_i: i maximizes net income $[(1 - \delta_g) y_i - e_i]$ subject to output $y_i = A_g^{\alpha} e_i^{1-\alpha} . [1/(1-\alpha)]$. The solution as a function of public investment is $e_i(A_g) = (1 - \delta_g)^{1/\alpha} A_g$. Firm i's investment is decreasing in the tax rate and increasing in A_g. Since A_g is pre-determined (by the previous period's G_g), e_i is now determined.

- County output and Tax revenue T_g: A_g and e_i together determine y_i for each firm. Aggregating over firms yields county output y_g, and $T_g = \delta_g y_g$. Using the result about e_i above, the county's tax revenue can be expressed as $T_g(A_g) = (1 - \delta_g)^{(1-\alpha)/\alpha} \delta A_g$, showing its dependence on its own public goods provision.

- Choice of public spending G_g: Government g maximizes rents $T_g - G_g$. The solution is by dynamic optimization because the value function of government g involves a future realization of public investment $\hat{A}_g$ for spending G_g today. The key feature of the solution to G_g – and therefore $\hat{A}_g$ – is that it is a function of only δ_g and the model parameters (Acemoglu 2005, eq. (14)).

  State capacity therefore boils down to the choice of the detection rate δ_g (which solves A_g in the following period, and other decisions above). Let the socially optimal choice

of δ_g that maximizes total output y_g be δ^*. A core result about state capacity is:[19]

"Strong State" does not imply Strong State Capacity

If the cost of hiding one yuan from the tax authorities, δ_g, is higher than δ^* then government g is too strong and, since government's tax rate is δ_g, it over-taxes firms. In the opposite case, where government is weak, δ_g is lower than δ^* and it under-taxes firms. A too-strong government forces firms to exit, resulting in sub-optimal private investment and lower output; a too-weak government cannot prevent firms from hiding output, resulting in low tax collection, low public investment and, consequently, low private investment by firms and low county output.[20]

Although δ^* is society's ideal, it is neither the government's ideal nor the citizen's ideal: Citizens prefer a weak government where δ_g is lower than δ^*, while government like to be a "strong state" with δ_g higher than δ^*. Suppose county government g is endowed with high extraction capacity δ_g.[21] Being a strong state, however, does not deliver strong state *capacity*, which requires not just capacity to extract taxes but to use it to produce the optimal amount public investment goods that incentivizes firms to match the government's optimal provision

[19]The solution, in Acemoglu (2005, eq. 17) is the following $\delta^* = \frac{\alpha}{\phi(1-\alpha)+\alpha}$.

[20]We empirically explore this idea that weak states, by under-taxing and strong states, by over-taxing, both weaken private incentives to make productive investment and therefore produce lower output than states that are just secure enough to provide the right incentives. Seniority in China's government connotes experience, which can strengthen tax extraction capacity and risk-taking ability. Further, this experience has implications for governors' behavior based on promotion prospects. Data on the leader's age are available at the prefecture level but not for counties, so the results come from prefecture data. Following studies of seniority in China prefecture governors are classified into three three age groups: below 45, 45 to 55, and over 55. We find that the youngest governors tax least and have the worst economic outcomes. However, although the oldest governors tax less than the median age group, they have the best economic outcomes as shown in Columns 2-3 of Table 5.

Table 5 here

The lower seniority of the youngest governors limits their extractive powers, and their greater risk-aversion makes them content to keep taxes low. According to Lu and Landry (2014) the ability to tax is viewed as being a more important quality than even the ability to produce growth. Younger governors are still developing their networks and developing this capacity. The oldest governors can tax but avoid taxing too much. In China, vice provincial governors or lower must retire at 60, and hence they have reached the apex of their careers, and knowing they cannot be promoted further are secure enough to do more for their citizens by using tax revenue for public investment. The governors that are neither too young nor too old want to be promoted, and demonstrate their extractive ability; they tax the most, but this hurts their citizens' willingness to make private investment.

[21]Investing resources in its ability to detect, making δ endogenous, does not change the broader conclusions.

with optimal private investment of their own. But this begins with a tax rate τ_g lower than δ_g, allowing firms rents. It also requires government to sacrifice its rents R_g. Its endowment of political power must not translate to economic power. Economic power must be granted to firms to balance the state's political power. Since firms can economically exit if political power is repressive, government must behave "consensually" and strike the proper balance if it is to obtain good outcomes.

Interpretation

The first point to observe, going back to the logic of our instrumental variable, the old wars endowed some local governments but not others with extractive fiscal capacity. That capacity, in the present day, can combine with the great political power and machinery delegated to them from the Center to extract. Acemoglu's model shows how taxes net of rents, $T_g - R_g$ (the main regressor in our model) cause output, and how over-extraction can lead to sub-optimal outcomes. We therefore interpret our finding as follows: County governments endowed historically with extractive capacity, and who eschew rents and seek balance between their political power and the economic strength of private actors, are able to produce more public investment goods – with their higher net taxes – than are governments who excessively wield political power to extract and earn rents. More public investment goods elicit more investment from firms, and cause higher county output Y_g.

To check the complementarity between public and private investment exists in the data, we add prefecture level data on investment flows, measured as spending on both fixed assets and residential construction to model (1). The results reported in Table 6 show evidence of such complementarity between private and public investment. Since investment spending and government revenue are strongly correlated, both in theory and data, the regression is informative about their joint effect, which is statistically and economically significant.

Table 6 here

Notably, the MPE solution concept justifies our empirical design of a cross-section. In theory, the result should hold in other cross-sections, so long as the state variables (e.g. δ_g) are not subject to shocks. The idea that greater net taxes cause greater output is a cross-sectional hypothesis from this model. Since the mechanics clearly imply that $(T_g - R_g)$ and y_g are endogenously determined, to draw this causal inference we have devoted serious effort to constructing a plausibly exogenous source of variation from historical war data.

6.2 Besley-Persson (2011) model

How can tax capacity produce outcomes without the stability and guarantees that legal institutions provide for private contracting? Interpreted as above, our results imply considerable state capacity imbedded in China, even though its legal institutions exist only paper, not in fact. Can the Besley-Persson model provide insights into the missing link?

In Besley and Persson (2011), *fiscal* capacity is endogenously determined in a 2-period, 2-party model featuring four key parameters: probability of ruling party turning over in the following period (γ); whether public goods are valued highly, α^H, or have low valuation, α^L, where $1 < \alpha^L < 2 < \alpha^H$; the proportion of tax revenue that is devoted to public investment goods versus transfers (interpretable as political rents, r); and the ratio of the rents that go to the ruling party versus opposition ($\theta \in [0, 1/2]$, with $\theta = 0$ indicating ruling party transfers to its own group only, and $\theta = 1$ indicating equal transfers to society, as in the Pigouvian case). The timing is as follows: Period 1 starts with an initial stock of capacity to tax (fiscal capacity τ_0), an incumbent group I in power, and nature determining α. I chooses the period 1 policy vector $\{\tau, g, r^I, r^O\}$ where r^I are transfers to the incumbent group, r^O to the opposition group, and g is government spending on public goods.[22]

In period 2 the period-1 incumbent remains in power with probability $(1 - \gamma)$ and the period-2 incumbent chooses the policy vector in period 2. Their basic model shows how countries are clustered, based on their parameters, by three types of fiscal capacities: common-interest, redistributive and weak (Beseley and Persson 2011, Fig. 2.4). Common interest

[22]Another element in the policy vector is investment into fiscal capacity to achieve a period-2 tax capacity goal, which is dropped to keep the description simple.

states have cohesive institutions and expend much of their revenue providing public goods (plus preserving and improving fiscal capacity), redistributive states decide to divert significant revenues to transfers while also providing some public goods but make little investment in future fiscal capacity, and weak states transfer as much revenue as they can to themselves.

The key determinant of whether a country will be a common interest state is whether the benefit to the (future) ruling party from devoting an additional dollar of tax revenue to public investment, when it is *not* valued highly, still exceeds the benefit from devoting the additional dollar of tax revenue to transfers to self. This condition is summarized as: $\alpha^L > 2(1-\theta)$, which is most likely to be satisfied when $\theta = 1/2$. That is, when transfers – if any – are made equally to all groups regardless of their political preference, institutions are cohesive in the sense that regardless of which party rules in the second period, it will devote all of the tax revenue to public investment. This assurance provides the incentives for the current government to do similarly. Political turnover is of no consequence. The ruling party in the first period acts as if it is institutionally bound to both, provide the maximum output of public goods and invest to maintain fiscal capacity for second-period spending.[23]

Are China's local governments common interest states? Clearly, the single party government is long-lived, but that does not mean the Besley-Persson model with two parties is inapplicable. At the core of the model are two decisions: (i) the proportion of tax revenue to invest in fiscal capacity and producing public goods (ii) how much of the remainder to transfer to self versus the opposition. In China's local governments this calculus is ever-present, for officials have out-sized power and opportunity to capture transfers. Some reasons for local governments to become, instead, redistributive states are the following:

[23]Besley and Persson's model clarifies how wars incentivize investment into fiscal capacity. During times of war, demand for defense is both strongly valued at α^H as a public good and its demand is high (a large measure of the population values it highly). If $\alpha^L > 2(1-\theta)$ is satisfied, meaning institutionally the country is a common interest state, then $\alpha^H > 2(1-\theta)$ is also satisfied. The optimal investment into fiscal capacity is higher, meaning more taxes need to be extracted from a willing population, and so investment is made by the government into greater tax extraction capacity which goes into the building of defense. This is not unlike what Chinese historians indicate occurred during the three wars, albeit in a decentralized manner. The valuation of defense was increased and in order to provide it, local tax extraction capacity was increased and indeed provided the revenue to provide defense that protected trade. The tax was a indirect tax on trade, for that lowered the time and investment required to build an income tax system replete with bureaucracy.

- Exit options lower θ: Analogous to political turnover, officials can leave office and join business where they can cash in on their political connections. The revolving door creates adverse incentives. Knowing they are in office only temporarily, officials gear the system to doing favors for those who will take the reins of power and reciprocate them. Current transfers to buy future political favors lowers θ and violates the condition $\alpha^L > 2(1-\theta)$ for being a common interest state.

- Public goods with low valuation: Related to the above, a local government can expend resources on public goods whose valuation is low – for example, white elephant infrastructure projects – but which serves to distribute rents (transfers) to groups related to officials in power. The violation of the condition implies a redistributive or weak state.

Interpretation

Counties in China cluster into these three states, and our regression results are borne out of the inter-cluster variation in outcomes.[24] Our estimates suggest that county governments who effectively self-police, ensuring $\alpha^L > 2(1-\theta)$, achieve common interest statehood. The suggestion from the Besley-Persson model that county governments most committed to investing in fiscal capacity – by foregoing transfers – are precisely the governments that are able to collect the highest revenues is significant for our regression model. It is similar to the suggestion in Acemoglu's model, except that here the mechanism highlights the value and demand for public goods by society, whereas in Acemoglu's model detection of hidden income determines fiscal capacity. In either case, higher tax collection incontrovertibly implies greater fiscal capacity. The results from our regression are therefore a statement about *fiscal capacity* causing output in China's local governments.

[24]Within the group of redistributive states, the model's comparative statics make predictions about how public investment and spending varies with the parameters. In the model, the valuation of public goods is random over $\{\alpha^L, \alpha^H\}$, with probabilities $\{1-\phi, \phi\}$, respectively, measuring demand for the public good. Some predictions are (Besley and Persson, 2011, Proposition 2.3) that investment in fiscal capacity (i) increases with demand ϕ for the public good, (ii) increases increases with longevity (decreases with probability of turnover γ), (iii) increases with cohesiveness of institutions θ *if* there is political stability (probability of turnover $\gamma < 0.5$. These are as yet an untested, and of consequence for a more nuanced understanding of state capacity building within China.

But, as we have seen in Acemoglu's model, for fiscal capacity to cause *output* requires incentives for citizens to accumulate to make make private investments. The Besley-Persson answer is that government investment in *legal capacity* create those incentives. The timing of the model, with legal capacity, is as follows: Period 1 starts with an initial stock of fiscal capacity τ_0 and legal capacity π_0, an incumbent group I in power, and nature determining α. The incumbent chooses the period 1 policy vector $\{\tau, g, r^I, r^O, \pi\}$ where r^I, r^O and g are as before, and π is legal capacity - the judicial infrastructure and bureaucracy to make judgments and the law enforcement system to carry them out. In period 2 the period-1 incumbent remains in power with probability $(1-\gamma)$ and the period-2 incumbent chooses the policy vector in period 2.

Legal capacity is introduced into the model by making income a function of π, and so income is endogenous. The concept of legal capacity is institutional capacity that reduces *misallocation* of resources. For example, in a credit constrained economy without legal institutions, lending by creditors would only be collateral-based. But in poor countries, those with little wealth – a large proportion of the population – would be excluded from credit markets and prevented from joining the entrepreneurial class. Legal capacity would, by lowering the probability of default and therefore relaxing this constraint, enable creditors to extend loans to a larger proportion of the poor.

Reconciling the Besley-Persson model with Acemoglu's model results in an interesting interpretation of our regression results. Rewrite (4) as (Besley and Persson 2011, p. 129):

$$y_{igt} = \frac{1}{(1-\alpha)}(\pi_{gt})^{\alpha}(e_{igt})^{(1-\alpha)}, \tag{8}$$

with legal capacity π_{gt} created in county g in year t in place of of A_{gt}, the quantity of public infrastructure in Acemolgu's model. Treating legal capacity as infrastructure brings home the idea that legal capacity can be an institutional source of productivity improvements by reducing misallocation by firm i of their private capital e_{igt}. By improving incentives for the

private sector, legal institutions can have the same effect as public investments do.

Seen in this light, it is possible to answer the question we pose above: In the absence of legal capacity, in the sense of a judiciary independent of government, how is it possible for China's sub-governments to provide incentives for private investors? By using public investment decisions to provide the same signals as legal capacity as institutions provide, they can incentivize private investment in the same manner as legal capacity does. Public investment goods like infrastructure serve the purpose of reducing misallocation that legal institutions do in the model. Just as legal capacity augments total factor productivity in the economy, so can public investment, as the similarity between (4) and (8) indicates.[25]

In sum, many of China's local governments are able to elicit a desirable accumulation response by firms and citizens sans the institutions to protect private property rights. By providing high levels of public goods – schools, hospitals, pensions – and infrastructure, they are able to demonstrate commitment to their citizen's welfare. The Besley-Persson model's value in the China context lies in clarifying that demonstrating such commitment – which legal institutions would do in their model – solves the misallocation problem.[26]

[25]In Besley and Persson, productivity response to legal capacity is not like TFP growth in the Solow model where resources are always assumed to be efficiently allocated, but rather more like misallocation and underutilization of resources in Lewis' model of duality.

[26]An independent literature has addressed such commitment as a hold-up problem: whether a government can credibly commit to a tax policy to induce private investment when, once the investment is made, government has all the incentive to tax the firm's output at 100%. Weingast (1995) suggests China's central government did so by giving up economic and political power to its local governments. Deng's reform began a process of politically decentralizing government into hierarchical structures with clearly defined scope of authority. The Center, for example, provided public goods for the nation, such as defense, while local governments collected taxes (providing a fixed share to the Center) and provided local public goods for citizens. The autonomy of local governments was challenged by the Center after the Tianamen incident in 1989, but the effort to recentralize failed. The durability of decentralization was thus established, and, in this sense, institutionalized. Two other conditions necessary for a market-preserving federalism came to be satisfied in the 1990s. First, China's regional economies which had been autarkic (Young 2000), became more integrated as geography broke down and a common market emerged. Second, lower governments came to face hard budget constraints, having neither the ability to print money nor access international markets for credit, yet were charged with delivering public goods and growth. One way to think of this is to understand that without market-preserving federalism the applicability of the Acemoglu and Besely and Persson models to China's local governments is questionable. If the Center "overawed" local governments, the mechanics of those models may be inapplicable. Without regional competition, and therefore no exit option for firms, Acemoglu's model breaks down, with perpetually low investment and of weak state outcomes.

Our results affirm that China's commitment to tax policy is in fact credible. By ceding authority over tax collection to an autonomous layer of lower government – laying down policy against usurious extraction and incentivizing local officials to perform – the Center has sent a costly signal that neither it has any interest

7. Conclusion

If citizens value a marginal dollar of government spending on public goods more than the government values transferring a marginal dollar of tax revenue to its political supporters, the potential exists for government to build a "common interest" state. If citizens value a marginal dollar of government spending less than the government values a marginal dollar of transfers, the only outcomes are a redistributive state in which transfers exceed public goods or a weak state in which the government purely extracts (Besley and Persson 2009, 2011). Strong fiscal capacity is most likely in "common interest" states. Because the ability to extract taxes requires its citizens' consent (else they can exit), how much of its revenue a government expends on transfers versus public goods matters. More of the latter engenders the consent of citizens to extract more.

The more than 2000 county governments in China, charged with the dual responsibility of collecting a significant share of the country's value-added and providing crucial public goods such as healthcare, education and infrastructure, face the opportunity and challenge to build fiscally strong common interest states, or become redistributive states, or worse, fiscally weak states. Our instrumental variable – population loss from the old wars – is highly correlated with current tax revenue, that is, current fiscal capacity, suggesting the wars endowed some counties more than others with tax extraction capacity. Earning this capacity at the time of the wars is consistent with the idea, well-established in the literature, that providing defense and security was a highly valued public good which county residents readily consented to finance with the Lijin tax. Indeed the generals, who served as the de facto government of counties, efficiently converted the tax into the desired public good, security. One interpretation of our historical source of variation is therefore that it separates common-interest states, whose creation dates back to these times even though that capacity remained

in grabbing investors' revenue. Li, Li and Zhang (2000) argue that this autonomy to local governments has translated to a property rights system in which residual claims is ceded to managers of firms, with the result that managers with rights have responded to competition with greater effort to cut costs just as in a Western system. Without credible property rights, managers would not make such effort.

latent through China's tumultuous path till Deng's reforms when this capacity resurfaced. Possibly, the historic experience with creating fiscal capacity in a common interest state made it less costly to recreate (fiscal capacity did not depreciate), relative to counties that had never experienced being in the position of a common interest state.

To progress from a state with strong fiscal capacity to one with strong *state* capacity requires citizens not just to (agree to) be taxed in return for the supply of public goods by the state, but also requires citizen and firms to make costly accumulation and investment decisions. But the commitment to not expropriate these investment once they are made is not credible. Legal institutions in the Besley-Persson model solve this commitment problem by protecting property rights of investors. This poses a challenge in China, for it has no independent judiciary. Yet, our results find that counties, especially those that were historically endowed with fiscal capacity, translated their strong fiscal capacity into strong state capacity to deliver greater economic prosperity for their citizens. Our preferred explanation is that public investment, especially into (irreversible) infrastructure, played the role of legal institutions, helping to solve the commitment problem and therefore eliciting private investment. Government investment in infrastructure signal credible commitment to economic growth, and because of its complementarity with private investment, such public investment incentivize investment by firms (Acemoglu; Besley and Persson). We find that local government have been successful in incentivizing firms and citizens to invest.

More work is needed to understand why this has been the case in China and not in so many other countries with similar institutional weaknesses and voids. While political strength endows the state with the ability to control leakage and corruption, a strong state must control its own corrupt impulses. Our results indicate the potential demonstrated by China's local governments to become common interest states and further, develop state capacity by ceding economic power to its citizens. Why a politically strong state voluntary cedes economic power to its citizens, as they seem to have done, awaits a more complete answer.

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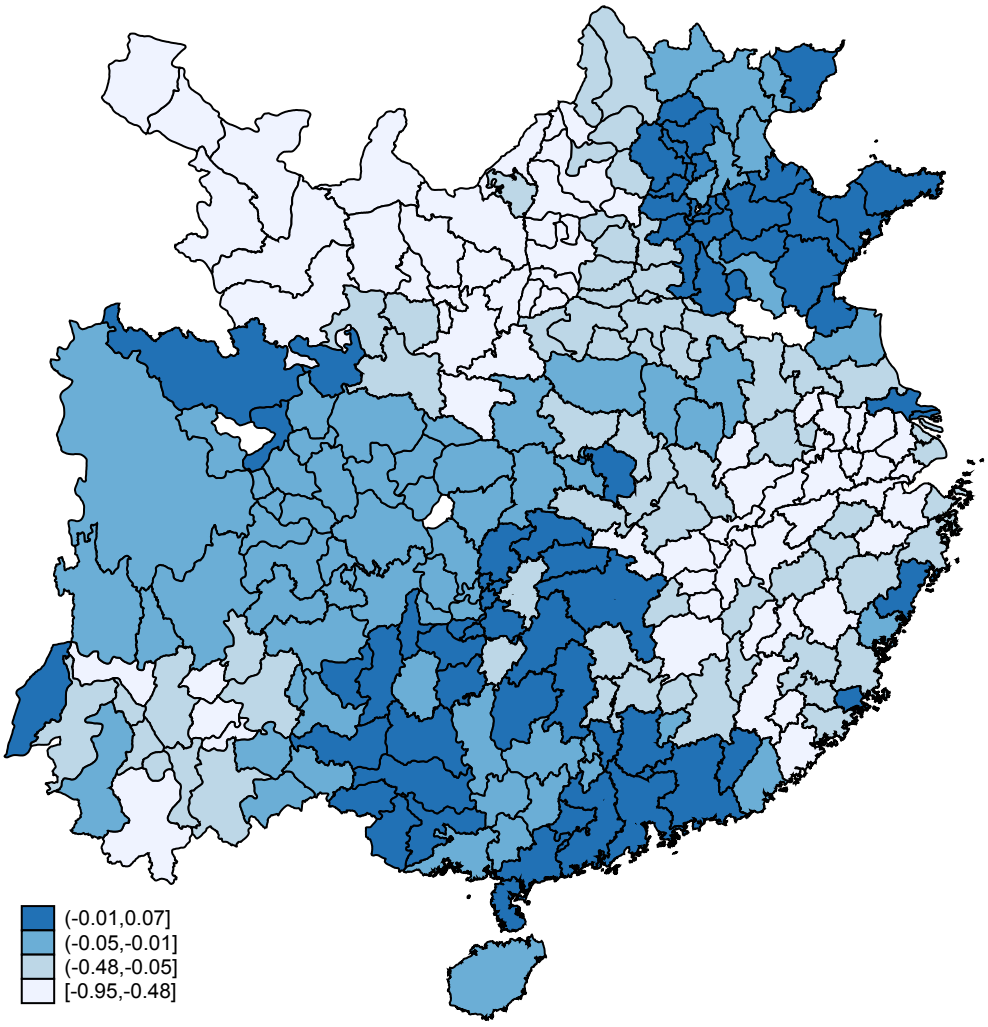
Figure 1: Population loss from the 1851-1880 Wars



Note: The figure shows the population change resulting from the three wars in 1851-1880 at the ancient prefecture level as calculated using (2). The lighter the color, the greater is population loss. The Taiping rebellion had the largest impact on the southeastern part, the most populous and developed provinces in this country. The Dungan Revolt had the largest impact on the northwestern and southwestern parts.

Table 1: Descriptive statistics

Variable Description	Variable Name	N	Mean	sd	Median
Explanatory Variables and IVs:					
Per capita government revenue (1999-00)		2104	261.1	292.9	181.6
Log per capita government revenue (1999-00)	ln(Gov Revenue pc)	2104	5.26	0.71	5.20
(IV) %Population change from wars	%War Pop Change	2104	−0.25	0.30	−0.03
Outcomes (incl. Public Goods):					
Full sample					
Per capita GDP (2000-01)	GDP pc	2063	6216	6452	4409
Night lights per 10,000 persons (2000)		2100	103.3	96.84	83.83
Log night lights per 10,000	ln(Night Lights pc)	2100	4.23	0.99	4.44
Non-District Counties sample					
No. of firms per 10,000 persons (2000-01)	ln(Firm pc)	1568	2.08	3.26	1.32
Per capita firm production (2000-01)	ln(Output pc)	1568	6290	11820	2561
Have treated water (2000)	TreatedWater	1567	0.36	0.26	0.27
Average educational attainment (2000)	EduYears	1569	7.01	0.82	7.16
Per capita telephones (2000-01)	ln(Phones pc)	1559	0.18	0.11	0.15
Secondary education ratio (2000)	Secondary Educ	1569	0.32	0.08	0.33
Primary education ratio (2000)	Primary Educ	1569	0.61	0.08	0.61
Per capita hospital beds (2000-01)	ln(HospitalBeds pc)	1569	0.004	0.002	0.003

Note:
1. **Full sample** includes both county-level districts and non-district counties. Population change from wars over the period 1851-1880 and Counties per 10,000 persons vary across ancient prefectures. "Ancient prefectures"mean prefectures in the Qing dynasty (1644-1911). The outcomes vary across current counties."Current counties" means counties in 1999-2001. We mark the corresponding year(s) for the variables: two years, for example, 1999-00, means the average (adjusted by CPI) of the two years divided by average population during the two years.

Source: China Population History edited by Ge (2005); Comprehensive History of Administrative Divisions in China edited by Zhou (2013); Bai and Jia (2016); CHGIS, Version 4; National Prefecture and County Finance Statistics Compendium; 2000 Population Census.

2. **Non-District Counties Sample**: No. of firms per 10 thousand people and Per capita firm production include manufacturing firms with annual sales revenue larger than 5 million yuan. Secondary education ratio is the number of secondary school students scaled by the number of people aged 10 to 19; Primary education ratio is the number of primary school students scaled by the number of people aged 5 to 14.

Source: China Population History edited by Ge (2005); Comprehensive History of Administrative Divisions in China edited by Zhou (2013); Bai and Jia (2016); CHGIS, Version 4; National Prefecture and County Finance Statistics Compendium; 2000 Population Census; China County Socioeconomic Statistical Yearbooks; Annual Surveys of Industrial Firms.

Table 2: 2SLS, full sample: State Capacity and Economic Performance

Dep. Var.: **ln(Night Lights pc)**	Baseline (1)	Cov Set1 (2)	Cov Set1 + Pop+City (3)	Cov Set1 + Cov Set2 (4)
2SLS:				
ln(Gov Revenue pc)	1.370**	1.146***	1.075***	1.174***
	(0.583)	(0.272)	(0.246)	(0.262)
Log county area		0.012	0.005	0.020
		(0.058)	(0.046)	(0.045)
Longitude		−0.016	−0.022	−0.006
		(0.023)	(0.022)	(0.025)
Latitude		0.056**	0.055**	0.044
		(0.024)	(0.023)	(0.024)
Coastal		−0.105	−0.073	−0.006
		(0.149)	(0.141)	(0.128)
Provincial capital		−0.152	−0.113	−0.166
		(0.167)	(0.145)	(0.137)
Log 1851 population			−0.025	−0.067
			(0.037)	(0.051)
Population change 1820-1851			0.340	0.277
			(0.389)	(0.393)
Large ancient city			−0.047	−0.098
			(0.139)	(0.126)
Median ancient city			0.127*	0.059
			(0.069)	(0.071)
Small ancient city			−0.035	−0.098
			(0.061)	(0.064)
Main river				0.059
				(0.076)
Log river length				0.068
				(0.063)
Incidence of drought/flood				−0.143***
				(0.044)
Transportation condition				0.257**
				(0.121)
Crop suitability: rice				0.044
				(0.053)
Crop suitability: sweet potato				−0.025
				(0.041)
Crop suitability: foxmillet				−0.030
				(0.042)
Language fragmentation index				−0.104
				(0.207)
Number of presented scholars (*Jinshi*, in 1,000)				−0.368
				(0.293)
Treaty ports				−0.074
				(0.093)
Province dummies		Y	Y	Y
N	2100	2100	2100	2100

Table 2 (...Continued): 2SLS, full sample: State Capacity and Economic Performance

First-stage Dep. Var.: **ln(Gov Revenue pc)**

%War Pop Change	−0.290**	−0.493***	−0.480***	−0.513***
	(0.129)	(0.096)	(0.103)	(0.103)
Cragg-Donald F	31.41	64.10	56.77	56.54
Kleibergen-Paap F	5.04	26.65	22.90	22.87
Anderson-Rubin $p-$val	0.02	0.00	0.00	0.00
R^2	0.015	0.457	0.464	0.494

Notes:
(1) ln(Night Lights pc) are log night light digits in 2000 (reported by satellites and processed by NOAA per sq. km.) aggregated across county area and divided by county population (in 10,000).
(2) ln(Gov Revenue pc) is log of (official) local government revenue per capita in 1999-2000 (1999 revenue translated to 2000 yuan).
(3) The dummy variable for the smallest ancient cities is dropped.
(4) %War Pop Change measures the scale of the Wars in 1851-1880 as measured in equation (2).
(5) Standard errors are clustered at prefecture, * p<0.10, ** p<0.05, *** p<0.01.

Table 3: 2SLS, Non-district counties: State Capacity and Outcomes: (1) Night Lights pc, (2) Treated Water (3) Educational Attainment, (4) Telephones pc, (5) Secondary Enrollment, (6) Primary Enrollment, (7) # Hospital Beds pc.

Dependent Var.:	ln(Night Light pc) (1)	Treated Water (2)	Education Years (3)	ln(Phones pc) (4)	Secondary Educ. (5)	Primary Educ. (6)	ln(Hospital Beds pc) (7)
2SLS:							
ln(Gov Rev pc)	1.017***	0.223***	0.838***	0.709***	0.068***	0.010	0.702***
	(0.156)	(0.057)	(0.159)	(0.104)	(0.020)	(0.016)	(0.107)
Covariates	Y	Y	Y	Y	Y	Y	Y
N	1567	1567	1569	1559	1569	1569	1569
First-stage: Dep Var							
ln(Gov Rev pc)							
%War Pop Change	−0.699***	−0.699***	−0.695***	−0.687***	−0.695***	−0.695***	−0.695***
	(0.102)	(0.102)	(0.102)	(0.101)	(0.102)	(0.102)	(0.102)
Cragg-Donald F	90.72	90.72	90.12	87.65	90.12	90.12	90.12
Kleibergen-Paap F	47.03	47.03	46.92	46.19	46.92	46.92	46.92
Anderson-Rubin p-val	0.00	0.00	0.00	0.00	0.00	0.53	0.00
R^2	0.400	0.400	0.400	0.396	0.400	0.400	0.400

Notes:
(1) These outcomes available only for Non-district counties.
(2) Dependent variables are in logs (after scaling by population), except the ratio of households having treated water, average educational attainment, the shares of secondary school and primary school students.
(3) ln(Gov Rev pc) is log of (official) local government revenue per capita in 1999-2000 (1999 revenue translated to 2000 yuan). %War Pop Change measures the scale of the Wars in 1851-1880 and is defined in Equation (2).
(4) All covariates in Table 2 are included here as well. These comprise two sets: Covariate set 1 are measures at the current county level: logged county area, latitude, longitude, indicator for locating in coastal prefectures, indicator for locating in provincial capitals, and province dummies. Covariate set 2 are measures at the ancient prefecture (in which the current county is located) level: Log 1851 population, population change 1820-1851, large ancient city, median ancient city, small ancient city, whether there is a main river, logged river length, incidence of drought or flood during 1800-1899, transportation condition, crop suitability for three crops (rice, sweet potato and foxmillet), language fragmentation index, number of presented scholars (*Jinshi*), and treaty ports.
(5) Standard errors are clustered at prefecture, * p<0.10, ** p<0.05, *** p<0.01.

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Table 4: Mediated Impact of State Capacity through Public Investments. Non-district counties

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	Total Effect	Via Treated Water	Via Phones	Via Edu Attainment	Via Secondary Education	Via Primary Education	Via Hospital Beds
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Magnitude	1.017	0.039	0.374	0.127	0.018	0.002	0.035
Percent in total effect	100%	3.8%	36.8%	12.4%	1.7%	0.2%	3.4%

(1) These outcomes available only for Non-district counties.

Table 5: Output response to Strong and Weak States

Dependent Var.:	ln(Night Lights pc)	ln(Gov Rev pc)	ln(Night Lights pc)
	(1)	(2)	(3)
Secure states	0.436***		
	(0.105)		
Strong states	0.251		
	(0.165)		
45≤Prefecture governor age≤55		0.117*	0.077
		(0.068)	(0.083)
Prefecture governor age>55		0.050	0.233**
		(0.101)	(0.107)
Covariates	Y	Y	Y
R^2	0.542	0.419	0.565
N	2100	1,610	1610

Notes:
(1) The first regression does not include the constant term. In the second and third regressions, the omitted category is the prefecture governors aged less than 45.
(2) We predict log per capita government revenue from the first stage, and use this to rank counties. Three dummies are then created, corresponding to counties in the top 10% (strong states), the middle 80% (secure states) and the bottom 10% (weak states) of the ranking. The omitted category is the weak states.
(3) Both sets of Covariates are included – See notes to Table 2.
(4) Standard errors are clustered at prefecture, * p<0.10, ** p<0.05, *** p<0.01.

Table 6: Economic performance of public goods investment and private investment

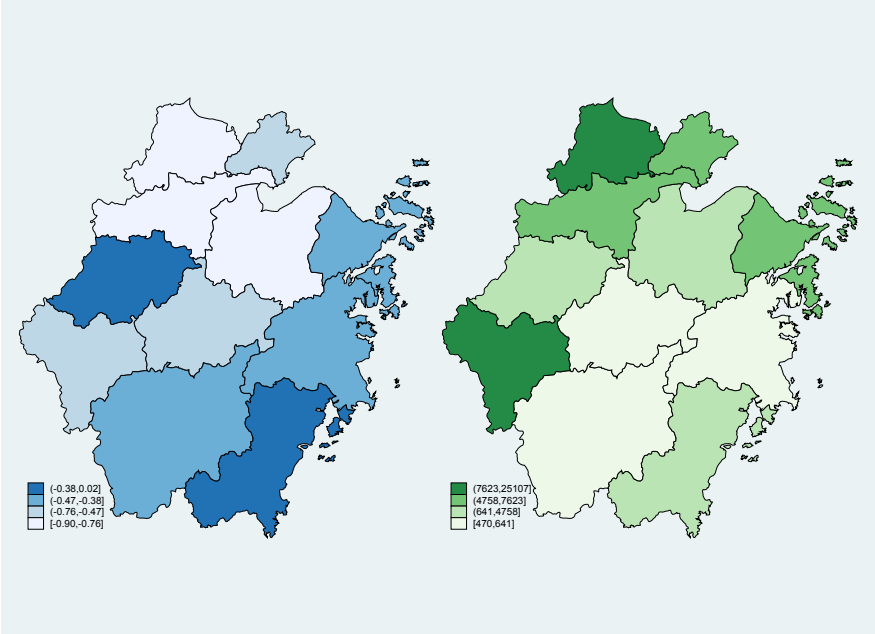
Dep. var: Ln(Night lights pc)	(1)	(2)	(3)	(4)	(5)
Ln(Gov revenue pc)	0.470***				
	(0.046)				
Ln(Treat water ratio)		0.298***			
		(0.038)			
Ln(Edu Attainment)			1.501***		
			(0.225)		
Ln(Phones pc)				0.737***	
				(0.060)	
Ln(Hospital beds pc)					0.423***
					(0.053)
Ln(Private inv pc)	0.065***	0.087***	0.086***	0.068***	0.117***
	(0.010)	(0.011)	(0.011)	(0.011)	(0.010)
Covariates & Province FE	Y	Y	Y	Y	Y
N	1946	1946	1946	1431	1440
R-squared	0.631	0.612	0.601	0.711	0.667

Notes:
(1) Private investment is defined as the sum of spendings on fixed assets and residential construction.
(2) The numbers of observations in Column 4 and 5 are smaller because the two variables are available only for non-district counties.
(3) Both sets of Covariates are included – See notes to Table 2.
(4) Standard errors are clustered at prefecture, * p<0.10, ** p<0.05, *** p<0.01.

Population Change from Wars and Lijin per capita in Zhejiang province

We plot the population change from wars and per capita Lijin for Zhejiang province in Figure A1. The left graph is the population change from the 1851-1880 Wars. The dark color stands for low population loss, while the light color stands for more population loss. The right graph is Lijin per capita. The dark color stands for more Lijin per capita. Its northern and western parts were influenced by the wars heavily, while the rest were intact. At the same time, we see more Lijin per capita in its northern and western parts.

Figure 1: Population loss from the 1851-1880 Wars and Lijin per capita in Zhejiang province



Note: These graphs show the population change resulting from the three wars in 1851-1880 Lijin per capita in Zhejiang province at the ancient prefecture level. The left graph is the population change. The dark color stands for low population loss, while the light color stands for more population loss. The right graph is Lijin per capita. The dark color stands for more Lijin per capita.

Sample: China Proper

Similar to most of the papers on China's economic history such as Sng and Moriguchi (2014) and Bai and Jia (2016), the geographic boundary of our study comprises ancient prefectures in China Proper shown in Figure A2, the most populous part of China, where the ethnic Han group dominated in ancient times as they do now. It consists of 23 current provinces, including the four province-level municipalities of Beijing, Tianjin, Shanghai and Chongqing.

Figure 2: Sample: China Proper

Notes: Historical variation is available for China Proper (in green) but not the Border Regions (yellow).
Source: CHGIS, Version 4, Cambridge: Harvard Yenching Institute, January 2007.

A1: Descriptive statistics for other covariates: Full sample

Variable Description	N	Mean	sd	Median
Covariate set 1:				
Current county area	2104	1718	2135	1424
Log current county area	2104	6.96	1.19	7.26
Longitude	2104	112.32	5.60	113.18
Latitude	2104	30.98	5.08	30.88
Located in coastal prefectures	2104	0.19	0.39	0
Located in provincial capitals	2104	0.14	0.34	0
Covariate set 2:				
Log 1851 population	2104	5.15	0.80	5.27
Population change 1820-1851	2104	0.14	0.07	0.13
Large ancient city	2104	0.09	0.29	0
Median ancient city	2104	0.19	0.39	0
Small ancient city	2104	0.24	0.43	0
There is a main river	2104	0.68	0.47	1
Log river length	2104	7.11	0.63	7.16
Incidence of drought or flood	2104	-0.53	0.78	-0.49
Transportation condition	2104	0.41	0.26	0.44
Crop suitability: rice	2104	2.04	1.02	2.17
Crop suitability: sweet potato	2104	2.55	0.96	2.53
Crop suitability: foxmillet	2104	2.98	1.34	2.82
Language fragmentation index	2104	0.09	0.16	0
Number of presented scholars	2104	146.22	190.35	71.5
Treaty ports	2104	0.17	0.37	0

Note: Covariate set 1 are covariates measured at the current county level: logged county area, latitude, longitude, indicator for locating in coastal prefectures, indicator for locating in provincial capitals, and province dummies. Covariate set 2 are covariates measured at the ancient prefecture (in which the current county is located) level: Log 1851 population, population change 1820-1851, large ancient city, median ancient city, small ancient city, whether there is a main river, logged river length, incidence of drought or flood during 1800-1899, transportation condition, crop suitability for three crops (rice, sweet potato and foxmillet), language fragmentation index, number of presented scholars (Jinshi), and treaty ports.

Source: Comprehensive History of Administrative Divisions in China edited by Zhou (2013); Bai and Jia (2016); CHGIS, Version 4; National Prefecture and County Finance Statistics Compendium; 2000 Population Census.

A2: Descriptive statistics for other covariates: Non-district counties

Variable Description	N	Mean	sd	Median
Covariate set 1:				
Current county area (squared km)	1569	2113	2306	1752
Log current county area	1569	7.43	0.66	7.47
Longitude	1569	111.76	5.67	112.46
Latitude	1569	30.87	5.15	30.62
Located in coastal prefectures	1569	0.15	0.36	0
Located in provincial capitals	1569	0.08	0.28	0
Covariate set 2:				
Log 1851 population	1569	5.03	0.81	5.08
Population change 1820-1851	1569	0.14	0.07	0.13
Large ancient city	1569	0.06	0.24	0
Median ancient city	1569	0.17	0.37	0
Small ancient city	1569	0.23	0.42	0
There is a main river	1569	0.67	0.47	1
Log river length	1569	7.09	0.60	7.14
Incidence of drought or flood	1569	-0.52	0.78	-0.50
Transportation condition	1569	0.40	0.27	0.43
Crop suitability: rice	1569	1.98	1.04	2.09
Crop suitability: sweet potato	1569	2.59	1	2.57
Crop suitability: foxmillet	1569	2.97	1.34	2.80
Language fragmentation index	1569	0.09	0.16	0
Number of presented scholars	1569	122.33	167.79	61
Treaty ports	1569	0.13	0.34	0

Note: the same to those in Table A1.

A3: 2SLS Estimates: Impact of log Government Revenue pc on outcomes in Non-District County Sample: (1) # Firms, (2) Firm Output pc, (3) Bank Deposits pc, (4) Bank Loans pc.

Dependent Var.:	ln(Firms pc) (1)	ln(Output pc) (2)	ln(Deposits pc) (3)	ln(Loans pc) (4)
2SLS:				
ln(Gov Rev pc)	0.932***	1.347***	0.783***	0.809***
	(0.165)	(0.198)	(0.129)	(0.103)
Covariates	Y	Y	Y	Y
N	1568	1568	1557	1560
First-stage: Dep Var				
ln(Gov Rev pc)				
War Pop Change	−0.693***	−0.693***	−0.688***	−0.692***
	(0.101)	(0.101)	(0.102)	(0.102)
Cragg-Donald F	90.09	90.09	87.48	88.31
Kleibergen-Paap F	46.98	46.98	45.70	46.08
Anderson-Rubin p-val	0.00	0.00	0.00	0.00
R^2	0.400	0.400	0.399	0.400

Notes:
(1) These outcomes available only for Non-district counties.
(2) Dependent variables are in logs (after scaling by population), except the shares of secondary school and primary school students.
(3) Both sets of Covariates are included – See notes to Table A1.
(4) Standard errors are clustered at prefecture, * p<0.10, ** p<0.05, *** p<0.01.

A4: 2SLS Estimates: Using the Raw Population Growth during 1851-1880 or 1820-1851 (placebo) as the IV

Dep. Var.: **ln(Night Lights pc)**	(1)	(2)
2SLS:		
ln(Gov Rev pc)	1.181***	−0.038
	(0.250)	(1.957)
Covariates	Y	Y
N	2100	2100
First-stage: Dep Var **ln(Gov Rev pc)**		
Pop Change 1851-1880	−0.497***	
	(0.101)	
Pop Change 1820-1851		−0.229
		(0.327)
Cragg-Donald F	57.81	0.99
Kleibergen-Paap F	24.26	0.49
Anderson-Rubin p-val	0.00	0.98
R^2	0.494	0.480

Notes:
(1) ln(Night Lights pc) are log night light digits in 2000 aggregated across county area and divided by county population (in 10,000); ln(Gov Rev pc) is log local government revenue per capita in 1999-2000. War Pop Change measures the scale of the Wars in 1851-1880 (eq. 2).
(2) Both sets of Covariates are included – See notes to Table A1.
(3) Standard errors are clustered at prefecture, * p<0.10, ** p<0.05, *** p<0.01.

Robustness: Random assignment via IV

In order to fully exploit the idea that our IV randomly assigns counties (continuous) high and low state capacities, we restrict the sample to provinces where population loss from the wars may have been non-random. For example the presence of large local armies in locations may have been correlated with the development of the region or for some other reason. For example, Shanxi had a large population outflow to Inner Mogolia during the second half of 19th century, called"Zou Xikou". Now about half of the population in Inner Mongolia have ancestors in Shanxi. Shandong is close to Beijing and was protected by the Qing army; The Nian rebellion affected Henan, northern Anhui and Jiangsu disproportionately. Hunan was protected by the Xiang Army (the main local armed force at that time) whose hometown is Hunan. We find that excluding these provinces makes the first-stage results stronger (Table A5). Excluding Anqing, Nanjing, Suzhou, and Hangzhou for similar reasons makes both the first- and second-stage results stronger. Therefore, the results we report are an understatement of the impact of state capacity on growth within China. Besides these major strategic cities, randomness of attacks holds for the Taiping rebellion very well. One piece of evidence for this is the frequent and radical change of territory between the Taiping and Qing armies over time, even in neighboring areas around Nanjing. Hubei, Jiangxi, Zhejiang, Fujian, northern Jiangsu, and northern Anhui. We want to capture the average effects across a large range of areas, rather than a small number of strategic cities.

A5: 2SLS: Random assignment via IV (dropping potentially non-random counties)

	No Hunan, Shanxi, Shandong	No Anqing, Jiujiang, Nanjing, Suzhou
Dep. Var.: **ln(Night Lights pc)**	(1)	(2)
2SLS:		
ln(Gov Rev pc)	0.914***	1.320***
	(0.196)	(0.274)
Covariates	Y	Y
N	1721	2060
First-stage: Dep Var		
ln(Gov Rev pc)		
War Pop Change	−0.616***	−0.536***
	(0.115)	(0.110)
Cragg-Donald *F*	66.87	58.24
Kleibergen-Paap *F*	28.77	23.73
Anderson-Rubin *p*-val	0.00	0.00
R^2	0.528	0.488

Notes:
(1) ln(Night Lights pc) are log night light digits in 2000 aggregated across county area and divided by county population (in 10,000); ln(Gov Rev pc) is log local government revenue per capita in 1999-2000. War Pop Change measures the scale of the Wars in 1851-1880 (eq. 2).
(2) Both sets of Covariates are included – See notes to Table A1.
(3) Standard errors are clustered at prefecture, * p<0.10, ** p<0.05, *** p<0.01.

Robustness: Current population

Controlling for either average population in 1999-2000 or its log, actually results in larger coefficient estimates of state capacity, suggesting our main results are not likely to be driven by current population size. Current population size is very likely endogenous, and exaggerates our main result. We do not use it in the reported results.

A6: 2SLS: Controlling Current Population Size

Dep. Var.: **ln(Night Lights pc)**	(1)	(2)
2SLS:		
ln(Gov Rev pc)	1.264***	1.371***
	(0.333)	(0.355)
Population 1999-2000	0.002	
	(0.002)	
Log population 1999-2000		0.169**
		(0.085)
Covariates	Y	Y
N	2100	2100
First-stage: Dep Var		
ln(Gov Rev pc)		
War Pop Change	−0.425***	−0.425***
	(0.106)	(0.106)
Cragg-Donald F	37.87	58.24
Kleibergen-Paap F	15.95	23.73
Anderson-Rubin p-val	0.00	0.00
R^2	0.503	0.503

Notes:
(1) ln(Night Lights pc) are log night light digits in 2000 aggregated across county area and divided by county population (in 10,000); ln(Gov Rev pc) is log local government revenue per capita in 1999-2000. War Pop Change measures the scale of the Wars in 1851-1880 (eq. 2).
(2) Both sets of Covariates are included – See notes to Table A1.
(3) Standard errors are clustered at prefecture, * p<0.10, ** p<0.05, *** p<0.01.