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Stationary Bandits, State Capacity, and the Malthusian Transition

The Lasting Impact of the Taiping Rebellion

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Abstract

The Taiping Rebellion (1851–1864) in China was the deadliest civil war in history. This paper provides evidence that this cataclysmic event significantly shaped the Malthusian transition and long-term development that followed, especially in areas where the experiences that stemmed from the rebellion led to better property rights, stronger local fiscal capacity, and rule by leaders with longer-term governance horizons. More than one and a half centuries after the rebellion's end, population increases from pre-war levels remain 38 to 67 percent lower in areas that were affected by the rebellion than in those that were unaffected. Moreover, areas that were affected by the rebellion have, on average, greater fiscal capacity and modern economic sectors to the present day. Two channels for the effects of the rebellion are stationary banditry (manifested by varying property rights and the rebellion area's proximity to the Taiping capital), and the wartime strengthening of fiscal capacity. The analysis shows evidence of complementarity between wartime state capacity and local institutions, and of the long-term benefits of fiscal decentralization in a large country. Furthermore, initial human capital is strongly associated with long-term development.

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Stationary Bandits, State Capacity, and the Malthusian Transition: The Lasting Impact of the Taiping Rebellion *

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I. Introduction

How do civil wars shape a country's development? And what are the underlying mechanisms? The past decades have witnessed a surge of this literature (i.e., Blattman and Miguel 2010; World Bank 2011), most of which deals with the economic legacies of war and conflicts.[1] Still, the long-term impacts of war, as well as the key mechanisms that underlie these impacts, remain poorly understood. As Blattman and Miguel (2010, p. 42) point out, "Unfortunately, we have little systematic quantitative data with which to rigorously judge claims about the evolution of institutions during and after civil wars…the social and institutional legacies of conflict are arguably the most important but least understood of all war impacts."

We add to this literature of civil wars by examining the long-term consequences of the Taiping Rebellion, the deadliest civil war in human history, and a critical juncture for China to turn to modernity (Ho 1959; Fairbank 1992; Pinker 2011). According to Ho (1959, p. 238), "In scope, duration, intensity and barbarity, …. the Taiping Rebellion is deservedly called the largest civil war in world history. In sheer brutality and destruction, it has few peers in the annals of history." Equally important, to fight the rebellion the Qing government decentralized, allowing regional armies and public finance under the control of local leaders; this resulted in fundamental, subsequent changes in China's evolution (Fairbank, 1992). Strong provincial leaders emerged, and warlords began to segment China, and to experiment with various forms of governance in these regions.

Against this backdrop, we investigate the rebellion's long-term impacts and the underlying mechanisms responsible for them. These are interesting for several reasons. First, China is hard to surpass in terms of its variations in local institutions and economic performance both across space and across time. China's inter-city differential in average income is as large as any inter-region differential around the world. Worldwide, the ratio of GDP per capita between the richest and the poorest regions in 2001 was 18 to 1 (Galor 2005, p. 276). This pales in comparison to the ratio that emerges from China: GDP per capita in Dongguan City (of Guangdong Province) is 27 times that of Tianshui City (of Gansu Province) in 2010.[2] China's variation in income across time is equally remarkable. The real income (measured in 1990 international dollars) remained constant at $600 for more than 500 years, from 1300 to 1820 (Maddison 2007; Voigtlander and Voth 2013a); in 2016, it was $14,400. Second, the rebellion led to rich regional

[1] See Collier (1998), Justino (2009), Acemoglu et al. (2011), Michalopoulos and Papaioannou (2011), Nunn and Wantchekon (2011), Nunn and Puga (2012), and Dell (2012).

[2] Here, a city is an administrative unit that covers both urban and rural areas, and it typically includes around ten counties. A typical prefecture-level city has 4 million people and is as populous as Singapore and Croatia.

variations in institutions. Land policies differed across the occupied lands. At various stages, the rulers' time horizons changed, which affected policies. On the Qing side, fiscal power became decentralized, causing large variations in regional fiscal capacity. All these changes could fundamentally determine long-term regional development (Blattman and Miguel 2010). Third, relative to the cross-country studies of the consequence of conflicts, analysis that uses sub-national units in China offers measurement and research-design advantages (Djankov et al. 2003). Cross-country studies of wars suffer from the selectivity of data: war-torn countries have far less and poorer-quality data; thus, the worst-hit countries are less likely to be represented, reducing the evidence of the impact of war in the very areas where conflict has most probably taken the greatest tolls. We have systematic data at the sub-national level, giving insights into the effects on both war-torn prefectures and other prefectures that were unaffected by the rebellion. Moreover, our data span a period of more than one-and-a-half centuries, and they have the additional advantage of holding constant national-level determinants (i.e., institutions and culture).

To proceed, we draw from the institutional background and the literature to derive hypotheses. We focus on several aspects of the rebellion and Qing's responses. First, the land policies in the early and the late stages of the rebellion differed markedly. The protection of land property rights was better in the late stage than in the early one, for example. We hypothesize faster post-war population recovery and better long-term development for the late Taiping areas than the early Taiping areas. Second, since the areas near the rebellion's capital city, Nanjing, were more likely to be viewed as a stationary base for the rebellion, we hypothesize that their governance and policies were likely better than those of other Taiping areas, as Olson's theory of stationary banditry implies (Olson 1993). Third, the rebellion occurred in years of solid technological progress. We examine whether the loss of life associated with the rebellion ultimately led to the subsequent Malthusian transition, characterized by income growth accompanied by lower population growth (Galor and Weil 2000; Galor 2005; Voigtlander and Voth, 2013b). Fourth, we note that the Qing government instituted fiscal decentralization to finance local militias against the rebel army; thus, we examine whether this fiscal decentralization acted as taxation that hindered trade, or state capacity that facilitated development (Besley and Persson 2009).

We analyze a data set of 266 prefectures in China that were and were not affected by the rebellion. Our data cover the years from 1820 to the present day. We focus on population levels and cross-sectional development outcomes between 2000 to 2010. We examine the rebellion impact on population growth because it is a common measure of long-term development in the

literature of economic history (e.g., Acemoglu, Johnson, and Robinson, 2002; Jia, 2014), and because it serves as an indicator of the Malthusian transition. We also examine other complementary aspects of long-term development, such as income levels, fiscal capacity, industrialization, and human capital, which shed light on the mechanisms of the Malthusian transition. When looking at the population impact, we use a difference-in-difference (DID) approach, and we estimate the differences of the population growth rates (from the base period) between the control group (i.e., the prefectures that were unaffected by the rebellion) and the treatment group (i.e., the prefectures in which the rebellion took place). To address potential omitted-variables biases and measurement errors, we use the instrumental variable (IV) approach. Our IV strategy takes advantage of the military routing strategy adopted by the rebellion's top leaders, who aimed to use their superior naval force to take a mid-Yangzi River city first, and then to move east along the river, and to expand to adjacent areas. The longitude thus serves as a valid IV for the influence of the Taiping movement after controlling for proxies of geography. When examining the long-term impact of the rebellion on modern outcomes, we rely on cross-sectional regressions, and, when feasible, we use the IV estimations.

We find that the Taiping Rebellion permanently shifted the rebellion areas' development trajectories. In areas that experienced the rebellion, the post-war population increases (compared to the baseline year 1820) remain 38 percent to 67 percent lower than in areas that were unaffected by the war, even after the passage of one-and-a-half centuries. Moreover, the rebellion's long-term effects on development are similar to those that emerged in Europe following its devastating experience with the Black Death (Voigtlander and Voth 2013a, 2013b). When augmented with favorable changes in institutions and fiscal capacity, the Taiping Rebellion facilitated China's ensuing Malthusian transition. That is, the rebellion was the catalyst for the change from the Malthusian regime of high population growth and no real-income growth to the modern growth regime of sustained income growth with limited population growth (Galor and Weil 2000; Galor 2005). This conclusion is supported by several pieces of evidence. First, the former areas of the rebellion went on to have greater long-run fiscal capacity and faster growth of modern sectors. Second, Taiping-governed areas with both big population losses and good protection of land property rights experienced faster post-war population recovery; they also witness better long-term fiscal capacity, more extensive modern-sector development, and higher income levels. Third, the effects of big population losses in areas close to the rebellion's capital city are similar to those of the rebel areas that featured good land property rights. There is one interesting exception to those observed in the rebel areas with good land property rights: areas near the rebel capital exhibit higher levels of

schooling than elsewhere. We hypothesize that in areas close to Nanjing, capitalist elites likely had more power than landed elites, and that their influence, coupled with rising fiscal capacity, led to increased schooling. Our reasoning is that human capital and physical capital are complements, and that the capitalist elites would have pushed for the provision of public schooling for the capitalist elites' benefit (Galor, Moav and Vollrath 2009). Indeed, we find that areas near Nanjing currently have significantly higher schooling levels than elsewhere. Fourth, fiscal decentralization and the strengthening of fiscal capacity led to a faster Malthusian transition, including lower population levels, and stronger long-term development. Fifth, we find evidence of complementarity between fiscal strengthening and land property rights, consistent with the conjecture of the complementarity between state and institutional capacities (Besley and Persson 2009). Finally, initial human capital (proxied by the density of Palace Scholars in the pre-war era) exerts a positive long-term effect on the Malthusian transition, consistent with the critical role of human capital in long-term development (Glaeser et al. 2004; Galor and Weil 2000; Galor 2005).

Our paper is related to several strands of literature. The first concerns the long-run impact of wars (see Blatterman and Miguel 2010 for a survey and the references therein), to which we add novel twists. We uniquely show that war facilitated the Malthusian transition and long-term development partly via the mechanisms of fiscal decentralization and fiscal capacity. This is especially evident in areas where, as the rebellion played out, spacing and timing aided property rights protections and lengthened the ruler's time horizon. Moreover, understanding the long-term impact of the largest civil war in human history is important in and of itself.[3]

Our paper is also related to the literature of the determinants of long-term development. There are various schools of thought on this topic. The institutional theory emphasizes the incentive effects of institutions and property rights protection for long-term development (North 1981; Mokyr 1990; De Long et al. 1993;Glaeser and Shleifer 2002; Acemoglu, Johnson and Robinson 2001, 2002). The geography theory emphasizes the role of geographical conditions (which could have time-varying effects) (Jones 1981; Diamond 1997; Gallup, Sachs and Mellinger 1999). The human capital school highlights the critical role of human capital (Galor and Weil 2000, Galor and Moav 2002; Doepke 2004; Glaeser et al. 2004). The

[3] There has been little examination of the Taiping Rebellion's long-term economic impacts. The existing literature is mostly descriptive. Luo (1959) and Michael (1966) document the evolution of the rebellion from the outset in 1850 to its downfall in 1864. Cao (2001) estimated the subsequent population losses. Li (2016) examines the impact on subsequent imperial exam quotas. Li and Ma (2016) estimate the short-term (i.e, half a century) impact of the rebellion (i.e., up to 1910) on population and the mechanisms of industrialization. None empirically deals with the long-term impact through contemporary times, and none considers the underlying mechanisms we study here: property rights, stationary banditry, and state capacity.

Malthusian transition view (Galor and Weil 2000, Galor and Moav 2002; Galor, Moav and Vollrath 2009; Voigtlander and Voth 2013a, 2013b) emphasizes the importance of sudden and large population losses during an era of sufficient technological changes to trigger and lock in the advantage of lower population in facilitating industrialization, human capital investments, and demographic transitions. These factors can be intertwined. Initial geographical conditions could change institutions and then affect long-term development (Engerman and Sokoloff 2000). And the importance of these factors could depend on timing: geography is important in determining productivity in early stages of development, while human capital dominates in mature stages of development (Galor, Moav and Vollrath 2009). In our paper we show how a large civil war interacted with geography to shape institutions (i.e., land property rights), state capacity, the rulers' time horizons, and human capital, and offer evidence that some of these channels such as institutions and state capacity are complementary. Our findings are mostly consistent with the Malthusian transition view. In fact, our work enriches the Malthusian view by adding insights into the ways in which property rights, state capacity, and a ruler's time horizon all matter in the Malthusian transition after a civil war.[4] Our paper also speaks to the literature of recovery after big historical shocks.[5] We show that a large war can fundamentally change property rights and local fiscal capacity, and, therefore, can also change the path of a Malthusian transition.

Finally, our paper is related to the literature of state capacity and development. The recent theoretical work on state capacity underscores the need to model state capacity as an endogenous investment, the importance of executive constraints in facilitating state capacity, the key role of wars in facilitating state capacity, and the complementarity between fiscal and institutional capacities (Acemoglu 2005; Besley and Persson 2009, 2010, 2013).[6] There is also a large literature on state building in European countries.[7] A rise in state capacity associated with wars in Western (and a few African) countries tends to be associated with positive long-term development such as increased income levels and greater economic growth (Gennaioli and Rainer 2007; Dincecco and Prado 2012; Michalopoulos and Papaioannou 2013; Dincecco and Katz 2016). Typically, the strengthening of state capacity was accompanied by increasing

[4] Related, Chen and Kung (2016) show the importance of the Malthusian regime by arguing that it could explain much of the Qing population changes. Li and Ma (2016) show that the rebellion was associated with population losses and faster industrialization over half a century.
[5] See Cerra and Saxena (2008), Davis and Weinstein (2002), Brakman, Garretsen, and Schramm (2004), Miguel and Roland (2011), Organski and Kugler (1977), Azariadis and Drazen (1990), and Besley and Reynal-Querol (2014).
[6] See Johnson and Koyama (2017) for a survey of this literature.
[7] See North and Weingast (1989), North et al. (2009), Dincecco (2009), Karaman and Pamuk (2013), Dincecco and Katz (2014), and Koyama and Johnson (2017).

executive constraints, which facilitate compliance of tax collection; fiscal revenues were also used more for "the common good." But, at the same time, "comparative research on state-building in other parts of the world such as Asia and Latin America is in its infancy" (Johnson and Koyama 2017, p. 15).[8] In our paper, we find that the Taiping Rebellion facilitated state capacity, but via fiscal *decentralization* rather than the fiscal *centralization,* as typically has been found (Dincecco 2015, Hoffman 2015). We find that the fiscal strengthening was not accompanied by simultaneous increases in executive constraints, as has been typically found in European countries. To the best of our knowledge, our study is the first long-term historical study of the effects of fiscal decentralization broadly, and, more specifically, on demographic transitions.[9] Interestingly, we find that the civil-war-induced fiscal decentralization in China facilitated long-term development. This finding suggests that the conclusion that tax centralization has long-term positive effects may not be applied universally, and that fiscal decentralization could work better in large countries. We also find that a high level of local tax during and immediately after the Taiping Rebellion likely facilitated the Malthusian transition. Moreover, the empirical confirmation of the complementarity of fiscal capacity and property rights (Besley and Persson 2009) is also novel.

The rest of the paper is organized as follows. Section II provides the institutional background and draws from the literature to derive the hypotheses. Section III describes the data. Sections IV and V provide the empirical results on the Rebellion's impact on the population and the underlying mechanisms. Section VI offers evidence of the Malthusian transition by linking modern development outcomes and the war experience. Section VII concludes.

II. Institutional Background and Hypotheses

Here we describe the institutional background and derive our hypotheses. We hypothesize that stationary banditry and state capacity were channels for the Taiping Rebellion's effects on the Malthusian transition that followed.

The Taiping Rebellion unfolded in the mid-nineteenth century amid what Galor (2005) calls the Malthusian regime, in the wake of a number of economic and demographic changes confronting China. In the 110 years prior to the rebellion, the cultivated land area of the Qing

[8] The exceptions include studies in Latin America (Arias 2013), and in East Asia (Haggard et al. 1997; Paik and Vechbanyongratana, 2017). The literature on wars and state building shows that wars allowed the strengthening of state capacity in early modern Europe and in contemporary East Africa and Southeast Asia. See Johnson and Koyama (2017) and Hoffman (2015).

[9] For theory, survey, and contemporary studies of fiscal decentralization, see Davoodi and Zou (1998), Zhang and Zou (1998), Oates (1999), Bardhan (2002), and Jin, Qian and Weingast (2005).

Empire stagnated while the population tripled (Wu 1950). Moreover, in the middle nineteenth century, China's temperature reached a 300-year nadir, leading to severe natural disasters. Furthermore, the Nanjing Treaty after the loss of the Opium War to Britain in 1842 made Shanghai a major port for foreign trade, taking away a large share of port businesses and customs income from foreign trade from Guangzhou (in Guangdong). Located farthest from the capital of the central government, Guangdong and Guangxi were, as a result, subject to the lowest levels of central control (Huang et al. 2017). Ethnic diversity there was significantly greater than elsewhere. These factors all contributed to the start of the rebellion starting there (Miguel, Styanath and Sergenti 2004; Blatterman and Miguel 2010).

The Taiping Rebellion, from 1851 to 1864, was a millenarian movement led by Hong Xiuquan, a school teacher who failed the Qing Scholar examinations and then became a Christian.[10] He established the Taiping Heavenly Kingdom (TPHK hereafter) with its capital at Nanjing. During its reign, TPHK controlled much of southern China, including Jiangsu, Anhui, Hubei, Jiangxi, and Zhejiang provinces. Its control over these areas was not complete; some were jointly controlled by both Qing and TPHK, or their control changed hands frequently. The rebellion had devastating consequences on population levels. The war affected 18 provinces. Ho (1959, pp. 246-247) states that the casualties amounted to between 20 million to 30 million, and recent estimate from Cao (2001, pp. 553) suggests that the lower bound is 70 million.

Changing expectation of ruling horizon

We argue that in the time window when the rebellion's land policy was adopted around 1860 in the new acquired territory, TPHK had shifted from a "roving bandits" to a "stationary bandits" mentality. These two types of mentalities were proposed by Olson (1993) to show how the ruling horizon of a leader affects policy choices: "In a world of roving banditry there is little or no incentive to produce or accumulate anything that may be stolen and, thus, little for bandits to steal. Bandit rationality, accordingly, induces the bandit leader to seize a given domain… and to provide a peaceful order … thereby obtaining more in tax theft than he could in migratory plunder" (p. 568).[11]

The Taiping Army (TPA) had strong momentum in its war against the various Qing forces up to 1860. Before the founding of TPHK, the Taiping leaders had grassroot experience in mobilizing the support of peasants and (some) rich landlords. Bandit heads had joined the

[10] He claimed to be the second son of God and the younger brother of Jesus Christ (Spence 1996).
[11] Similarly, Acemoglu et al. (2001) show that the time horizon of colonists has long-term impact on development in American states.

cause. Some large landlords had financed their cause. The army had repeatedly skirmished with the Qing army in the remote areas of Guangxi (Spence 1996). The movement had established a solid core of leadership and enforced strong and brutal discipline as was typical around that time (Pinker 2011). The rebels had an experienced bandit leader, Luo Dagang, who was skilled in navigating rivers, and, as a result, the rebellion started with a strong navy. In 1850, before the establishment of the TPHK, the movement already had 10,000-20,000 soldiers.

In the first few years, the Taiping Army (TPA) rose in military strength, steadily defeating official Qing armies. The Qing army was inefficient partly because of the large size of China's territory. For instance, in 1853, when the rebels captured Wuchang, one of the most important cities in Southern China 1,200 km from Beijing, the news took eight days to reach the capital (Sng 2014). In 1853, rebel army took Nanjing and used it as its capital and viewed it as the New Jerusalem (for their Christian followers) and its long-term base (Spence 1996).

Fatally threatened, the Qing government encouraged local gentry and officials to raise local militia to contain the rebellion. Zeng Guofan, a former top Qing official then idle in Hunan, along with many other gentries, took up the challenge and raised the lean and mean Hunan Army employing several organizational innovations: It offered much higher wages than other armies (i.e., efficiency wages), threatened strong punishment for deserters, established loyalty-based hierarchy, and officially allowed looting after conquering.[12] Between 1854 and 1858, the Taiping Army often defeated the Hunan Army, which sometimes had the upper hand as well. The Arrow War between Britain and the Qing from 1856 to 1860 greatly weakened the Qing. In 1858, the Taiping Army achieved a major victory again, the Hunan Army at Three River, Anhui. In May 1860, the Taiping Army routed imperial siege troops at Nanjing, and in June 1860, it occupied Suzhou (the key city of Jiangsu province). The period between 1859 and 1860 represented the peak of the Taiping Army's military power.

The leadership evolution exerted important impact on TPHK's governance capacity. The years up to 1858 in TPHK were fraught with infighting among the leaders. Incidents included the coup by the East King Yang Xiuqing in 1856 and the departure of the Wing King Shi Dakai. The unstable top leadership weakened TPHK's ability to govern and to have stable policies.

The leadership was strengthened afterwards (Platt 2013). In 1859, Hong Rengan, Hong Xiuquan's cousin, one of the rebellion's earliest activists and one of the best-educated in terms

[12] Each official recruited his subordinates personally from his hometown. A subordinate only reported to his immediate commander to ensure loyalty. Desertion, a key challenge, was contained by the officials' familiarity with his network of acquaintances in the hometown along with credible threat of brutal punishment.

of knowledge of the West, arrived in Nanjing, and became the *de facto* prime minister of TPHK.[13] He advocated industrialization by adoption of Western technology, and supported private businesses and foreign trade. He tried to win support from the West using his connections established in Hong Kong. Perhaps more importantly, the military leader in the new territory of Zhejiang and Jiangsu areas was Li Xiucheng, an outstanding general who was pragmatic and considered the most "pro-citizen" among all Taiping Army generals. He made a policy of reducing land taxes and offered famine relief, for which local residents felt so grateful that they erected his statue before his area fell to the Qing (Tao, 2016, p. 69-70).[14] Thus, around the time that the Taiping Army established its Jiangsu and Zhejiang bases in 1860, the expectation for its future was brighter, the leadership was more stable and "pro-citizen," and the TPHK, in setting up its land policy, behaved more like stationary bandits. Indeed, Li Xiucheng built one of China's most beautiful palaces in Suzhou, signaling his intention of ruling for the long run. In contrast, the TPHK had weaker control and governance over the regions that it had occupied before 1860 (perhaps excluding the areas near Nanjing). The army relied to a larger extent on looting and contributions for war financing. Control over previously conquered regions was also fragile: Wuhu prefecture in Anhui, for instance, changed hands between the Taiping Army and the Hunan Army eight times between 1853 and 1855 alone (Spence 1996, p. 218). Thus, TPHK should have behaved more like "roving bandits" for these areas where it had established early rule.

Stationary Bandits and Land Property Rights

We now consider how stationary banditry affects land property rights. The revenue of the Qing Empire came mainly from land taxes, which were collected from landowners. They in turn collected rents from tenant farmers where applicable. The empire protected the ownership rights of land owners to ensure that tenant farmers paid their rents (Guo 1991, p. 238). Indeed, the Qing government maintained careful written records of land transactions (Brandt et al. 2014).

The rebellion dramatically changed *de facto* (and sometimes *de jure*) land ownership. TPHK proposed the egalitarian redistribution of land based on its Land System of Heavenly Dynasty, its initial land policy announcement. But this policy was never implemented due to

[13] He had a solid classical education and was assistant to top missionaries in Hong Kong SAR, China, after he fled there from organizing the rebellion in Guangxi. Fluent in English, he helped translate Chinese classics with a missionary who later became the first professor on China in Oxford.

[14] After the famous Anhui militia general Li Hongzhang, future *de facto* prime minister of the Qing, re-conquered Suzhou, he asked local residents why they had erected the status of Li Xiucheng. Local residents responded by praising Li Xiucheng's benign economic policies (Tao, 2016).

the lack of capacity and the need to collect sufficient tax for war financing (Bernhardt 1987).[15]

Nevertheless, the rebellion drastically disrupted the status quo of land ownership. Absentee landlords were commonplace, particularly for large properties. To gain peasant support, the Taiping Army often executed landlords with large holdings who were connected to the Qing government in their occupied territories, or the army confiscated these landlords' properties.[16] As a result, a large share of landlords fled, and atrocities against landowners were reported inside all Taiping Army-controlled provinces (Guo 1991, p.188-201, 210). Emboldened by the army's repression of the landlords, the anti-rent movement of tenant farmers spread in the areas it controlled (Luo 1955, p 210). The burning of all Qing government buildings led to the loss of most land title deeds and the public title deed records in these regions (Wang and Wang 1902, Vol. 27, Part II, p. 4), leading to ambiguity of land titles after the war.

Over time, the Taiping Army changed methods of collecting land taxes and financing the war. *In the early stage* from 1853 to 1859, the army expanded mainly in Jiangxi, Hubei and Anhui provinces. Partly because army officials did not have the administrative capacity to collect land taxes or to reconstruct land property rights, looting, confiscation, and contribution from residents in conquered land and members of the army were more important than land taxes in its war financing (Wu 1950). In the case of Anhui, for instance, farmers largely did not pay land taxes, but they instead paid all types of "contributions" to bandits, including both the Taiping and the Qing armies (Gu 2006). Farmers in these areas could thus be characterized as facing completely arbitrary taxation under "roving bandits." With multiple parties who could use violence, expropriation's costs are shared by these parties, and expropriation is too cheap and over-provided (Besley and Ghatak 2005). Starting in 1854, the Taiping Army's land policy was to continue the land system used in the Qing Empire, and *to collect the land tax from the landlord as usual* (Bernhardt 1987, p 394; Wang et al. 1952, Vol. 3, p. 203). Despite the intention, the old land system was destroyed due to the repression of the landlords and the massive loss of land title deeds. Moreover, the widespread anti-rent movement made landlords unable to collect sufficient rents to cover taxes. In other words, because Taiping Army officials did not punish those who did not comply with its land policy, no quasi-voluntary compliance with tax payment took place (Levi 1988), and landlords deliberately avoided registering their land with the Taiping Army. This caused ambiguous land property rights under the early

[15] A more cynical view would argue that the TPHK merely tried to use it as a slogan to attract recruits.
[16] The Taiping Army did not appear to be against all landlords. Indeed, some of the initial supporters and even some of its top generals such as Shi Dakai were sizable landholders. However, large landlords holding Qing government positions were treated brutally as enemies (Spence, 1996).

Taiping Army land policy.

Such ambiguity of land ownership would make tenant farmers vulnerable to expropriation risks and would discourage investments in land improvement or wasteland reclamation. Instead farmers would focus on maximizing their short-term profits by over-farming, thereby eventually producing more wasteland. Lack of property rights also limits the extent to which land can act as collateral for external finance, and the extent to which the land can be used in market transactions to obtain the highest market value and to attract efficient producers (Besley and Ghatak 2010).

To consider the *long-term* impact of this early land policy, we should consider whether the Taiping Army policy and its effects persisted when the Qing Army came back to power. After the Rebellion's failure, a large share of landlords and land ownership deeds disappeared. If cultivating tenants did not have a clear sense of ownership due to the lack of "tax paying experience" as was the case in the post-1860 period in the late Taiping territories, the ambiguity of property rights likely persisted. The adverse effects of ambiguous property rights should thus persist.

We now turn to *the Late Taiping land policy* (i.e., 1860 and later). Beginning in 1860, the Taiping Army conducted the Eastern Campaign and expanded mainly in Jiangsu and Zhejiang provinces. At this relatively mature stage, they needed war financing more than ever in light of stronger counterattacks from the Hunan Army and the rising costs of purchasing ever more sophisticated modern weapons. Moreover, with a stronger control over its new territories and with the intention of establishing the base of its long-term occupation in the areas near the capital ("the New Jerusalem," Spence 1996), the Taiping Army leaders had a longer-term ruling horizon for this area at that time. Thus, they should behave more like stationary bandits in setting their new land policies (Olson 1993).

In 1860, consistent with being stationary bandits, the Taiping Army commanders in the newly occupied counties experimented with policies to collect land taxes. They began with "landlord registration and payment" as before, but quickly discovered the inadequacy of this method in collecting taxes: The widespread anti-rent movement meant that landlords could not collect sufficient rents to cover land taxes. Facing expropriation risks, landlords tended not to register their land with the Taiping Army, which was then unable to obtain adequate land taxes. The leaders immediately experimented with a system based on direct tenant payment (i.e., directly collecting taxes based on cultivation, or zhuodian jiaoliang), which quickly proved to be successful, and, as a result, was widely adopted in the new territory (Bernhardt 1987; Guo 1991, p. 258-272). Here *cultivators* were urged to register their land. They complied readily

because the implied payment was lower under this Taiping Army rule than it had been under the Qing (Luo 1955, p. 208; Guo 1991, p. 203-232, 252-266). Furthermore, in the Late Taiping era, grassroots governance was much stronger than it had been in the earlier era: the Xiangguan (village Taiping officials) system was widely established, and land registration became mandatory, significantly improving the enforcement of tax collection (Bernhardt 1987). Tenants viewed their payment of taxes as *implying their ownership of the land* (Luo 1961, Vol. 1, p. 279). Furthermore, from 1861 on, Taiping leaders started issuing new land title deeds in Jiangsu and Zhejiang. As a result, a large number of tenant farmers were granted land ownership, which made them both *de facto* and *de jure* land owners (e.g., Luo 1955, p.209; Zhang 1967, Vol.1, 119-125). Thus, these available historical materials suggest that the Late Taiping land taxation system was more coherent, and that tenant farmers became *de facto* (and sometimes *de jure*) owners of their land, which encouraged voluntary compliance of tax collection.

Being *de facto* (and sometimes *de jure*) land owners, tenant farmers in the Late Taiping region would treat their land as their own, and invest more in land improvement, including reclaiming wasteland caused by the war. Moreover, the redistribution of *de facto* ownership from landlords to tenant farmers might have incentive effects. Previously, the Qing tax system had relied on local gentry to enforce tax collection, and, as a result, the effective land tax rates had been significantly higher for smallholders than for petty gentry and especially for big gentry, who then accumulated larger landholdings; thus, more smallholders, being unable to afford to land taxes, became tenants (Wu 1950). The presence of frictions prevents the efficient allocation of property rights (e.g., when landed elites collude with local officials for lower taxes, and to maintain and expand their land ownership). To the extent that labor efforts are the critical inputs for land output (Grossman and Hart 1986), then transferring property rights to tenants, as occurred during the Late Taiping governance era, would have increased efficiency due to stronger incentives of cultivators (Besley and Ghatak 2010).

The positive effects of the Late Taiping land policy likely persist. After the Taiping Rebellion, peasants gained experience in overcoming the collective action problem, and they thus posed a greater threat to the government and the landed class (Acemoglu et al. 2005). The rising "voice" threat would then become more credible and would limit the scope of expropriation (Besley and Ghatak 2005). The increasing scarcity of labor also increased farmers' bargaining power. With an especially large number of casualties associated with the war in the Late Taiping-controlled areas, idle land was abundant following the rebellion. Not surprisingly then, the Viceroy governing the provinces of Jiangxi and Jiangsu in 1869 granted

farmers cultivating idle lands a three-year tax holiday. Facing the new reality of labor shortages, and as a typical response to rising threat of revolts (Acemoglu et al. 2005), the government made considerable concessions to buy off farmers. The post-rebellion concession policy was available for most Taiping-controlled areas, but the policy was more favorable in the Late Taiping areas in which the army had a stronger hold (Zheng 2008). In 1865, grain taxes in Jiangsu were reduced by 27 percent. In 1868, the Jiangsu governor standardized grain tax payments (to reduce expropriation). In 1863-65, the Zhejiang governor reduced all informal levies; similarly, grain taxes were reduced by one-third.

There is evidence that the cultivators' land rights gained during the Taiping Army rule were recognized and respected after its fall **(**Zhang 1996; Zheng 2008). Under the post-war policy, when the land was idle, original owners could claim the land. However, after non-owner farmers had cultivated the idle land, if the original owners came to reclaim the land, property rights were still given to the cultivator. Moreover, both indigenous farmers and migrants could cultivate idle land, and a large amount of land was sold to cultivators.[17] These changes granted a large share of pre-war landless farmers land property rights after the war.[18] Another advance for peasants was that forever-tenancy (*yong dian zhi*) became the norm after the Taiping Rebellion. This eliminated the discretion of landlords to alter the term and duration of a tenancy. This again strengthens tenant incentives. Thus, the positive effects of clearer definition of land property rights in Late Taiping-controlled areas did not end with the Taiping Army's fall. This initial positive advantage after the war could have long-term path-dependent effects: an initial advantage confers future advantage over every stage of development (Krugman 1991). We thus expect better long-term development for the Late Taiping-controlled regions.

*The stationary bandit property rights hypothesis***.** Relative to the Early-Taiping areas, the Late-Taiping areas feature clearer definition of land property rights, and should have a lower share of wasteland, faster post-war population recovery, and better long-term development.

Nanjing as the New Jerusalem

Areas close to Nanjing ("Capital-Close") were likely under the rule of stationary bandits. Since its beginning the rebellion's leaders had told their followers that they would seek an earthly heaven (*xiao tiantang*) for its followers. Once the Taiping Army leaders settled in Nanjing as

[17] In Guangde of Jiangsu, two-thirds of the land was sold to cultivators (of idle land).

[18] In 1873 in TongXiang County of Zhejiang province, farmers with less than 10 mu land accounted for 87 percent of all land; those with more than 19 mu, 13 percent of all land. (One mu is 0.067 hectare.) Similarly, in Jiangsu province, the number of farmers with land ownership increased dramatically. According to a British diplomat, in Zhenjiang of Jiangsu Province, 90 percent of lands were owned by idle-land cultivators, with proper land deeds issued by the government. In Jiangsu province, the government also helped in lending draft animals and seeds to farmers.

its capital, it was treated as its stationary base ("the New Jerusalem") (Spence, 1996). Nanjing had several advantages for the Taiping Army: the capital of many dynasties, its wall was thick and long, making it ideal to defend. The Yangzi River flows along the city, and the Taiping military made use of this with its strong navy; moreover, the river provided easy access for transportation of army provisions. Indeed, given its intention to use Nanjing as the base, the Taiping Army offered stronger military protection and control in nearby areas (Platt, 2013, p118). Moreover, capital-close areas likely had stronger state capacity, similar to the situation that led to higher rates of tax per capita collection in the prefectures near Beijing (Koyama et al. 2017). Institutions matter more in locations closer to the capital because state capacity there is stronger (Michalopoulos and Papaioannou 2013). As discussed, the favorable policies near Nanjing should persist after the Taiping Army's fall due to the tendency to maintain the status quo even after the Qing came back to power. Thus, we would expect "Capital-Close" prefectures to have stronger state capacity, to adopt stationary bandit-like policies, to have faster population recovery, and to have better long-term development.

The distance-based stationary bandit hypothesis. Capital-Close Taiping-controlled prefectures were governed by leaders with longer time horizon, and these prefectures should have a faster population recovery, and better long-term development.

The Malthusian Transition Hypothesis

There are two views of the long-term impacts of a large war. The neoclassical view is that a one-time shock has *no effect* on equilibrium income or growth. With unchanged technology, a shock-affected area would temporarily increase its capital accumulation and return to its steady-state, despite the initial destruction of its capital (Miguel and Roland 2011). Moreover, with perfect factor mobility, capital and labor would move to the war-affected areas, and the national government could reallocate resources across regions, all aiding recovery (Barro and Sala-i-Martin, 2003). This view is supported by postwar evolution of physical capital, which experienced quick convergence in a few decades (Organski and Kugler 1977; Davis and Weinstein 2002; Brakman et al. 2004; Miguel and Roland 2011). In contrast, the view of poverty trap and endogenous growth (Azariadis and Drazen 1990, Barro and Sala-i-Martin 2003) implies permanent impacts of shocks. Similarly, wars could have long-term effects by strengthening state capacity as in Europe (Tilly 1975, 1992; Acemoglu and Robinson 2006), or by destroying rent-seeking coalitions (Olson 1982; Murphy, Shleifer and Vishny 1993).

An intriguing possibility for shocks' long-term impacts is via the Malthusian transition, as emphasized in the influential studies of the Black Death in Europe and the unified growth theory (Galor and Weil 2000; Galor 2005; Voigtlander and Voth 2009, 2013a, 2013b). The logic

is as follows. A large population loss in a location increases land per capita, temporarily and sharply raising income per capita. If the local economy is at or near the post-Malthusian regime (i.e., with sufficient technological progress so that income growth is accompanied by growth in both population and income per capita, see Galor and Weil 2000), advances in manufacturing would occur due to the rising demand for luxury goods that come with higher income. The development of manufacturing facilitates trade. Faster technological changes in manufacturing also raise the returns to human capital, facilitating stronger demand for child quality at the expense of child quantity, raising demand for female labor, facilitating reduction in fertility, and further raising income per capita. In the case of the European countries, rising income associated with the Black Death was also used to finance the luxury goods of wars (Hoffman 2015). Wars, in addition, facilitate urbanization due to the safe harbor effects of cities (Glaeser and Shapiro 2002). Wars, trade, and urbanization all raise mortality, locking in the gains in income per capita. This process could have reinforcing mechanisms such as the decline in child labor, the rise in life expectancy, changes in marriage institutions, and natural selection and the evolution of preferences for offsprings' quality (Galor 2005; Galor and Moav 2002).

The Malthusian-transition view implies that, the higher the number of war casualties, the more likely the region is to experience better long-term development. The theory does not have a prediction on whether high war-casualty areas would experience faster postwar population recovery: in the Post-Malthusian regime, part of the faster income growth would translate into higher population growth, but subsequent technological changes and patterns of fertility changes also reduce population growth. However, it is likely that in the long run, the high war-casualty areas should have contained their population more than areas that did not experience such high levels of casualties.

The era of the rebellion likely occurred on the doorstep of the post-Malthusian regime, which requires reasonable technological progress (Galor and Weil 2000). First, the Malthusian force was strong. Real wages in China were lower at the end of the eighteenth century than at the beginning of the first century (Galor 2005), and there is evidence that Malthusian forces were important in Qing China (Chen and Kung 2016). Second, technological changes during the Late Qing period appeared to be fast, as demonstrated by the tripling of the Qing population between 1741 and 1851 (Wu 1950).[19] While it is unclear when China moved from the Malthusian to the Post-Malthusian regime, it is clear that the regions in China differ in their

[19] To put it in perspective, the Western European population roughly doubled from 25 million to 57 million from year 1000 to 1500 (Galor 2005).

transition paths. It is also clear that the whole China has entered the Modern Growth regime. There are indications that the Taiping areas entered the Post-Malthusian regime around the turn of the twentieth century: Li and Ma (2016) find that the duration of the Taiping Army's occupation of a prefecture is negatively associated with population growth, and positively associated with urbanization and industrialization in the early twentieth century.[20]

There are reasons to expect that some opportune Taiping-controlled areas would have experienced a stronger Malthusian transition. As discussed earlier, stronger protection of property rights in the Late Taiping and Capital-Close areas should cause higher agricultural income there. Because agriculture remains dominantly important after the Taiping Rebellion, the higher agricultural income should result in rising demand for luxury manufacturing goods (Voiglander and Voth 2009), which would pave the way for a growth take-off (Murphy et al. 1989). We thus expect that the Late-Taiping and Capital-Close areas have faster developmentof non-agriculture and manufacturing and have higher incomes and other development outcomes in the long run.[21]

The Malthusian transition hypothesis. Relative to other areas, the high war-casualty areas (i.e., the Late Taiping and Capital-Close areas) should have contained their population to a greater extent, and, thus, long-term development or Malthusian transition should have been stronger.

War financing and state capacity

We now discuss the evolution and the impact of taxation before, during, and after the rebellion. Before the rebellion, land taxes were the main sources of tax revenues, and their collection was managed by provincial and county governments. Tax expenditure management was *centralized*. For local government, tax quotas were given, and local tax collectors became residual claimants for local tax revenues. Because county magistrates, the officials in charge of local tax collection, were not allowed to come from where they presided (to prevent corruption), they relied on the local gentry to collect taxes. To obtain support, local officials set up higher land tax rates for peasants, petty gentry, and big gentry, in this order. The tax rate for big gentry could be as low as a quarter of that of peasants (Wu 1950, p. 268).

Before the rebellion, the Qing's fiscal capacity had declined over time, and it remained

[20] They try to address the endogeneity of the Taiping Army occupation by using an IV, but their IV (i.e., the distance to Nanjing) is found to be a key channel for the effects on various outcomes, as shown in this paper.
[21] A caveat may limit the extent that the Malthusian transition story can be applied in the context of the Taiping Rebellion. In the European countries after the Black Death, limited inter-country mobility aided in locking in the effects of technological changes. But in the Chinese context, there had been migration (except in the period between 1949 and 1980 when migration was restricted), which would have reduced the extent of any rise in land per capita.

weak when the rebellion broke out (Rosenthal and Wong 2011; Johnson and Koyama 2017). Severe weather conditions and the indemnity paid to Britain played a role, but other factors contributed to the Qing's fall (Sng 2014). To ensure that no rebellions surfaced, the government wanted to limit the effective tax burden on peasants. But with the huge territory, the central government could not effectively monitor its lands, especially in distant locations. Because of monitoring difficulties and low official rates of pay to local officials, these officials tended to take heavy bribes.[22] The central government could only set a low tax rate, and, thus, reap limited fiscal revenue to ensure a reasonable effective burden for the subjects.

Partly due to its weak fiscal capacity, the Qing Army proved unable to rise to the task of containing the Taiping Army, and a new militia system emerged (Wu 1950). With rising military expenditures and limited land taxes, the Qing government initially resorted to the sale of aristocratic titles and offices, but the funds raised proved to be limited. With the Qing army unable to effectively fight the Taiping Army, and with the safety, property, and the prevailing social order of the gentry class endangered, the gentry class rose to resist, with the government's assent. A new militia system emerged, and expanded quickly, under the leadership of gentry-generals such as Zeng Guofan.

To go with the decentralization of violence control, a new financing system emerged. In 1853, a local official and military leader named Lai I-hsien introduced *Likin*, a tax levied on an ad valorem basis with rates ranging from 2 percent to 10 percent at each internal tariff check point on goods in transit. This was among the most far-reaching policies in China. While sanctioned by the central government, the tax was collected and used by local authorities for local military forces. This tax system was welcomed by the gentry class and peasants because it shifted part of the tax burden from land to industry and commerce, and because it allowed support of the local militia that provided protection for the gentry class. After the Taiping Army's fall in 1864, *Likin* became one of the regular taxes of the Qing Empire and of the early Republic era. After the war, both the Qing Empire and the Nationalist government made attempts to abolish *Likin*. Only in 1931, however, was *Likin* finally abolished. Thus, the *Likin* system lasted almost a century. The adoption of Likin resulted in "a new balance between the central and provincial governments that was to shift steadily in favor of the latter" (Fairbank 1992, p238). This fiscal decentralization reversed the long tradition of centralization since the Qin Dynasty (from 221 BC), and resulted in a new regionalism that changed the course of

[22] This tendency to take bribes was partly because of low official wages (so that bribes were expected), and partly because of a short tenure of merely three years.

Chinese history.

The *Likin* system should have raised local fiscal capacity. Facing the brutalities of the war, safety would have become especially valuable for the gentry class in the Taiping Army-controlled areas, and local gentry and merchants would have been more likely to help with collecting and complying with higher *Likin* taxes. Moreover, once the tax apparatus is established, future marginal costs of tax collection are lowered. Then local officials and warlords have had a strong vested interest in defending *Likin* collection. Thus, higher Likin revenues in Taiping Army-controlled areas would have persisted.

The War-Induced State-Capacity Hypothesis. The level of Likin is persistently higher in the Taiping Army-controlled areas than elsewhere.

What are the long-term effects of *Likin*? If acting only as taxation**,** it should have negative long-term effects. Heavy transit taxes, such as *Likin*, hinder inter-regional trade, encourage autarky, and impose large burdens on producers and traders.[23] Moreover, *Likin* could increase rent-seeking resource misallocation (Acemoglu 2010). Strengthening local fiscal capacity entails temptations regarding the wielding of power and struggles to obtain power, which may result in further distortion in resource allocation, as the period of warlords in early twentieth century testifies.

The Likin-as-taxation hypothesis. Due to the incentive effects of *Likin*, post-war population growth should be lower in the areas with higher *Likin* burdens. Moreover, the long-term development there should also be worse.

The perspective of *Likin as state capacity*, by contrast, implies positive long-term effects. State capacity refers to the government's ability to implement a range of policies, including raising revenues (Tilly 1985; Brewer 1989; Levi 1988), and supporting market development (Besley and Persson 2010). Recent literature has emphasized the critical role of state capacity for long-term development. Fiscal capacity is presumed to be a key prerequisite for development, expanding the extent of the market, enabling the development of modern infrastructure and other market-supporting institutions, and increasing the state's incentives to develop the economy due to a higher stake (Besley and Persson 2013). State capacity is viewed as a key ingredient of the "East Asian Miracle" (Johnson 1982; Amsden 1989; Wade 1990), and the lack of it is viewed as contributing to economic failures of some African and Latin American countries (Herbst 2000, Centeno 2002). The case of state capacity's importance is

[23] According to the Second Historical Archives of China (1996, Vol. 1, p. 83), "in 1900s a cargo shipped from Zhenjiang to Shanghai with a distance of about 240 km in between would have to go through seven Likin stations and at each checkpoint pay the Likin tax rate of about 5%, implying a total transit tax rate of 35%."

bolstered by cross-country evidence (Gennaioli and Rainer 2007; Dincecco and Prado 2012; Dincecco and Katz 2016), and within-country studies (Michalopoulos and Papaioannou 2013; Bandyopadhyay and Green 2016).

This literature suggests that state capacity is often strengthened in fighting external wars, as in Europe and North America,[24] Latin America (Arias 2013), and East Asia (Paik and Vechbanyongratana, 2017). Moreover, the rise in state capacity associated with war, at least in European countries, tends to be associated with positive long-term development. Would *Likin*, developed in the process of *civil* war (rather than external war) and implemented in decentralized ways (as opposed to fiscal centralization as in the case of most studies of fiscal capacity), also have positive effects for long-term development?

Likin-financed gentry resistance reduced war violence, which should have contributed to positive long-term effects. Even in Taiping Army-held areas during the rebellion, the Taiping Army only had control over some cities, and a large share of rural areas were still controlled by local gentry-elites (Fairbank, 1992). The ability to raise *Likin* allowed the gentry-elite to maintain stronger control in the local areas, to reduce property and life damages, and should have resulted in weaker long-term adverse Taiping-related effects. Furthermore, when the local gentry-elite was strengthened, they should have stronger capacity to offer protection for property rights, to improve local infrastructure, among others, all of which could have positive long-term effects.

More importantly, *Likin* changes the tax structure drastically to the benefit of long-term development. Prior to *Likin*, land taxes were the main source of government revenue. With the arrival of *Likin*, which was levied on manufacturing goods in transit and commerce, the local officials had strong incentives to foster commerce and the manufacturing sectors. These local officials would then have offered support and special incentives to foster the modern sectors, much as what happened to local officials in recent decades in modern China (Cull et al. 2017). Capitalists would also have had stronger political voices in the local political processes, and this would have facilitated institutions such as public schools to complement their technologies (Galor, Moav and Vollarath 2009). This should have facilitated industrialization, raised income, and aided technological changes, which would have raised the return to human capital, reduced fertility, increased schooling, facilitated the Malthusian transition, further raised resources per

[24] For a survey on recent advances of research on state capacity, see Johnson and Koyama (2017). For further references, see North and Weingast (1989), Brewer (1989), Tilly (1992), Acemoglu and Robinson (2006), North et al. (2009), Dincecco (2009), Besley and Persson (2011, 2013), Dincecco and Prado (2012), Dincecco and Katz (2016), Karaman and Pamuk (2013), Gennaioli and Voth (2015), and Hoffman (2015).

capita and income levels, and increased technological changes (Galor and Weil 2000). Note that the positive effects of Likin on Malthusian transition also manifest into *a negative effect of Likin on population*, as predicted by the *Likin*-as-taxation hypothesis.

The positive effects of *Likin* could have been tempered. First, the strengthening of state capacity is often accompanied by stronger executive constraints in the European context, and it is presumed that the executive constraints are necessary for the positive effects of state capacity (North 1981, Levi 1988, Dincecco 2009; Besley and Persson 2009). Second, investment in state capacity was mostly attributable to external wars (Besley and Persson 2009), which foster common interests and allow investment in state capacity. The Taiping rebellion was a catastrophic civil war, and it could have had adverse effects on trust and human capital. Thus, the state capacity effects of the *Likin* represent the lower bound of typical state capacity effects (on long-term development).

The Likin-as-fiscal-capacity hypothesis. The establishment of the *Likin* system ushers in stronger fiscal capacity, which leads to stronger long-term development.

The Likin-helping-Malthusian-transition hypothesis. Higher initial *Likin* leads to stronger Malthusian transition and a lower population level in the long run.

An intriguing hypothesis on state capacity is the complementarity between state capacity and institutional quality, as suggested by Besley and Persson (2009), who propose a dynamic model of investment in fiscal and institutional capacities. They show theoretically and empirically that investments in fiscal and institutional capacities are complements. With the right circumstances, each capacity makes the other more productive and induces investment in the other capacity.

Because property rights protection is stronger in the Late-Taiping and Capital-Close areas, the complementarity between fiscal and institutional capacities implies that these stationary bandit-led regions should have stronger fiscal capacity around and immediately after the Taiping Rebellion. Thus, the circumstance of being governed by stationary bandits should have led to both better property rights and stronger fiscal capacity, and the complementarity hypothesis implies that the effect of local fiscal capacity for long-term development should be more pronounced in Taiping-controlled areas with better institutions.

The fiscal-and-institutional-capacity complementarity hypothesis. Fiscal capacity and institutional quality are complements in facilitating long-term development. Taiping Army-controlled areas with better institutions should have higher *Likin* revenues, and the positive effects of fiscal capacity should be greater.

In Capital-Close areas, when more *Likin* is collected, the local government would have

had stronger incentives to develop manufacturing and commerce (i.e., the new tax base). This would have raised *de facto* power to the capitalists there (Acemoglu et al. 2005). Moreover, because the Capital-Close areas had higher urbanization rates after the war (Li and Ma 2016), the capitalists there would have been more closely congregated. They would have been more politically powerful as a group and should have found it easier to overcome the collective action problem and to organize to advocate for favorable policies for themselves. Due to the complementarity between technology (or physical capital) and human capital, the capitalists would then have demanded more public schooling (Galor et al. 2009), and they were likely to have succeeded due to their expected relative ease in overcoming the collective action problem. The rise in initial fiscal capacity thus would have made more post-war school financing feasible. Thus, more schools would have been built in Capital-Close areas, and schooling attainment should have been higher.

The institution-induced skill-demand hypothesis. The increase in initial *Likin* revenue would raise schooling in Capital-Close regions to a larger extent than elsewhere.

III. Data and Measurement

Our main data consist of 266 of the 317 prefectures in the Qing Dynasty in 1820 in China.[25] Of the sample, 147 prefectures had never been occupied by the Taiping Army, 55 prefectures had been under the Taiping jurisdiction, and 64 prefectures had been occupied by the Taiping Army but were not in the Taiping rulers' jurisdiction ("Occupied") (see Appendix B). Inside the Taiping jurisdiction group, 37 prefectures had ambiguous land property rights policies associated with the early Taiping controlled areas (Early Taiping hereafter), and 18 prefectures adopted the stronger land property rights policies in the late TP areas (Late Taiping hereafter).[26]

*Economic Development***.** Our first measure of development is population density,[27] and we choose it for three reasons. First, the population data are the only well-recorded data for measuring long-term prosperity coving the sample period for China. Other proxies, such as historical urbanization are either unavailable or have significant measurement issues, which render them poor candidates for our analysis.[28] Second, studies of the consequences of

[25] Since the literature suggests that shared state antiquity strongly affects long-term development (Bockstette et al. 2002), we exclude prefectures with significantly lower shares of state antiquity, which include those in minority areas of China that were underdeveloped and less populated before 1953: Xinjiang, Tibet, Qinghai, and the north of the Great Wall (Inner Mongolia, Outer Mongolia); we similarly exclude three provinces in Northeast China (Fengtian, Jilin, and Heilongjiang).

[26] Where it is obvious, we sometimes shorten them to be Early and Late.

[27] In the regression, we use total population in the prefecture, but we control for the prefecture fixed effects. So, in essence, we are using the population density as the dependent variable.

[28] Urbanization measurements have only been recorded since the late nineteenth century. Skinner (1977) estimates the population in the core area of cities or towns of China in 1893; similar estimates in the 1920s can be found in

historical events commonly rely on population as a proxy for prosperity.[29] Third, as argued by Bairoch (1988), population density is closely related to urbanization, and it has been used as a proxy of urbanization in many studies of history (e.g., Acemoglu et al. 2002; Chen and Kung 2016; Jia 2014).[30] Finally, by Malthus's argument, only areas with high productivity can afford a high population density (Malthus 1798). We recognize that after the Malthusian regime (Galor and Weil 2000), a better measure of development is income per capita, and that slower population growth, in fact, could be a key sign of high-quality development.

We use two data sets for population. One is from the commonly used Cao (2001), covering 266 of all 317 prefectures in China (Chen and Kung 2016; Jia 2014). It records population once about every three decades between 1820 and 1953. The other source is the national censuses for 1953, 1982, and 2000. Using the historical GIS maps of China, we merge the contemporary census data set with the historical population data sets, after considering different administrative boundary changes.[31] In the end, we rely on seven snapshots across two centuries (i.e., years 1820, 1851, 1880, 1910, 1953, 1982, and 2000) for population evolution.

To see the long-term development impact, we also consider modern outcomes. Income is captured by GDP per capita in 2010.[32] Fiscal capacity is measured by fiscal revenue per capita in 2010,[33] industrialization by the shares of manufacturing and of non-agricultural employment in 2000, and human capital by the average years of schooling and the mortality rate.

*The Taiping Rebellion***.** Based on Guo (1989) and Hua (1991) (see Appendix B), we construct two Taiping treatments. The first concerns all the areas in the Taiping jurisdiction ("Taiping"). The second concerns all those that were occupied by the Taiping Army but not officially under Taiping control ("Occupied").[34] We use the Qing boundary in 1820 to define Early and Late and require Early and Late prefectures to be under Taiping control during that

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Stauffer (1922). Ullman (1961) offers a more comprehensive population estimation of cities in China in 1938, 1953, and 1957. Perkins (1969) tallies the population of cities in China in 1910 and 1920. Historical measures of urbanization have serious measurement issues. For example, in the Yangzi River area, where clustered market towns were close to each other, the distinction between rural and urban areas is blurred (Brandt et al. 2014).

[29] See Acemoglu (2002), Davis and Weinstein (2002), Brakman et al. (2004), Jia (2014), Chen and Kung (2016).

[30] However, no similar cross-sectional relationship can be found using recent data, likely because the demographic relationship between income and the number of children has changed (Livi Bacci, 1992).

[31] Using the administrative boundary in 1820 as the benchmark for the prefectures, we calculated the population in the same prefecture for different periods from 1953 to 2000 using the area as the weight, assuming that the population distributes evenly inside the prefecture.

[32] Because the data come from various sources, the modern variables center around years 2000 to 2010, but are not of the same year. See Appendix B for data sources.

[33] For most variables, the jurisdiction is based on the Qing Dynasty.

[34] In defining Taiping prefectures, our main source of data is "太平天国地理志-华强" (Taiping Kingdom Maps-Huang Qiang). To implement, we first coded Taiping-influenced area at the county level using the Qing 1893 administration boundaries, then converted it in to Qing 1820 administration boundaries (between 1820 and 1893). In our research we thus use the administration boundary of prefectures and provinces in the year 1820.

era—resulting in five prefectures in the Taiping provinces being classified in the control group. We have tried a robustness check in which being occupied largely before or after 1860 is the criterion for the classification of the Early or the Late Taiping areas.[35]

*Wasteland***.** Wasteland between the Taiping Rebellion era and 1915 is measured by the share of wasteland in total arable land in 1915 from the Ministry of Commerce and Agriculture (1915), which provides county-level data for the Taiping provinces. Ideally, we need wasteland both before and after the rebellion to apply the DID approach. However, because the national agricultural survey in China started at the beginning of the 1910s, only cross-sectional regressions are feasible.

*Likin***.** Provincial-level annual *Likin* revenues from 1861 to 1925 are available from two sources: those for 1861 to 1908 are from Luo (1936); those for 1920-1922 and 1925 are from The Second Historical Archives of China (1996)**.** Since *Likin* was about spatial transportation costs, we normalize *Likin* by the area of the region: *Likin* per 1,000 square km.

Control Variables. We include key controls of prefecture characteristics that have implications for long-term development, such as geography, natural resources, and political importance. Proxies of geography include the distance to the Yangzi River, to the coastline, and to the Grand Canal (i.e., a major canal linking the north and the south), and the number of neighboring provinces of the prefecture. Such indicators of geography are important to control for because we need to filter out favorable geographical conditions under Taiping areas, and because we later rely on the longitude as the instrumental variable for Taiping areas based on the war-routing strategy of the Taiping Army. The number of neighboring provinces is controlled for because prefectures near multiple provincial borders were less tightly controlled by the provincial government; they were also more prone to rebellions, due to free-riding and monitoring difficulties stemming from a greater distance to the provincial government. All geographical variables are from China Historical GIS Data (Bol 2002). Since the treaty ports system has had strong impacts on population growth and income (Jia 2014), we control for the duration (in years) of being treaty ports before 1949 (Yan et al. 1955), and the duration of being concessions and leased territories (Fei 1991).

[35] The year 1860 was the year after which the vast majority of Jiangsu and Zhejiang provinces were occupied by the Taiping Army. This definition largely coincides with our definition except for Jiangning and Zhenjiang prefectures (under the Qing definition), which were occupied before 1860. When using the alternative definition of the Late Taiping period based on whether a prefecture was occupied largely before or after 1860, if a prefecture was occupied longer after 1860 than before 1860, we define this prefecture as a Late Taiping area. For example, if prefecture *A* is occupied by the Taiping Army for 11 months before 1860, and for 20 months after 1860, then we define *A* as a Late Taiping area. In this case, Jiangning and Zhengjiang prefectures (of Jiangsu) are included in the Early Taiping areas. The qualitative results (available upon request) remain the same.

We control for basic economic and political characteristics. We measure the level of land taxes by average farm land tax per mu in 1820 (Liang 1980), the level of human capital by the number of palace graduates per million people from 1793 to 1820 (Jiang, 2007),[36] and the pattern of agricultural production by the dummy variables of producing silk and tea before the Taiping Rebellion (Zhu, 1992; Wu, 1990). To measure political importance, we create four dummy variables based on the Qing classification in 1820 of a prefecture into four designations: Chong (important in transportation), Fan (important for business), Pi (difficult to gather taxes), and Nan (high in crimes). Since other wars could affect the outcomes, we control for the frequency of wars since 1776 (Chinese Military History Editorial Committee 2003).

Descriptive statistics. Table 1 compares the differences in population growth from the pre-Taiping Rebellion year of 1820 for the control group (i.e., the non-Taiping prefectures) and for the various treated groups for the years from 1851. Before the rebellion (i.e. year 1851), the difference in population growth between the control and the Taiping groups is insignificant. After the war, in sharp contrast, the population disadvantage of the Taiping areas (relative to the non-Taiping areas, both in comparison to the pre-war level) remains large and even expands over time, from 47 log points in 1880 to 57 log points in 2000 (see also Figure 1).

Columns (5) and (7) present the differences in population growth (relative to year 1820) between the control group and the Early and Late Taiping groups, respectively. The *initial* drop in population in the Late Taiping areas, relative to the control, was more pronounced than in the Early Taiping areas: The lower population growth in Early (Late) Taiping regions relative to the control group was 41 (60) log points in 1880. The larger relative initial drop in Late Taiping regions reflected greater casualties that occurred in the Late Taiping areas. Between 1880 and 1953, relative to the control group, population in the Early Taiping regions declined by 11 more log points, but remained largely unchanged for the Late Taiping region. This is consistent with the stationary bandit property rights hypothesis that, relative to Early Taiping areas, Late Taiping areas had better property rights protection up to the Communist Revolution (in 1949), and, therefore, the area had less wasteland, and could support higher population growth.[37]

[36] The palace graduates (*Jin Shi*) are successful candidates in the highest imperial civil service examination.
[37] Interestingly, the population change after the Communist Revolution through the Household Responsibility System Reform (around 1980) reverses the pattern: relatively the Early Taiping areas' population growth stayed the same as the control group, but the Late Taiping region's relative population growth dropped by 11 log points. This is again consistent with the land property rights story: relative property rights change for the Late Taiping areas with good property-rights protection was worse. (Communist China no longer had private property rights over land in this period.) Thus, their population dropped more. Between 1982 and 2000, China adopted the Rural Household Responsibility System, and farmers again gained *de facto* property rights over

IV. Impact of the Taiping Rebellion on Population Levels

We now examine the relationship between the Taiping Rebellion and the prefecture population levels. We use the panel data for the 266 prefectures and the seven specific snapshots across two centuries (i.e., 1820, 1851, 1880, 1910, 1953, 1982, and 2000). The pre-treatment years are 1820 (the default year) and 1851; the post-treatment years are the rest. The baseline regression is as follows:

$$\ln pop_{it} = d_t + \eta_i + X'_{i,t}\beta + \sum_t \beta_t D_t Z_i + + \sum_t \alpha_{1t} D_t TP_i + \sum_t \alpha_{2t} D_t TP\_Oc_i + e_{i,t} \quad (1)$$

Here d_t and η_i are the year and the prefecture fixed effects. The prefecture fixed effects capture all time-invariant factors such as geography and culture. $X_{i,t}$ is a vector of time-varying controls including the duration of treaty ports, concessions, and leased territories, and war frequency, which has been shown to matter for China's development (Bai and Kung, 2015; Jia 2014). Z_i is a vector of time-invariant controls including geographical and historical variables (i.e., the distance to Yangzi River, to the coastline, and to the Grand Canal; the number of neighboring provinces; the pre-war level of land taxes per mu; the total number of palace graduates per million people from 1793 to 1820; the silk and tea prefectures dummies; the four post designations of the Qing government in 1820), which are allowed to have period-specific effects so that the local endowment could have a different effect over time. $e_{i,t}$ is the error term.

The OLS Results. Column (1) in Table 2 presents the regression results using the two Taiping treatments. To allow for potential selection bias, we allow the period immediately before the Taiping Rebellion to have distinct effect for the Taiping areas — as a test of selection bias. The estimate of the Taiping coefficient before the rebellion (1851) is small (at about one log point lower than for the control group) and statistically insignificant, suggesting a lack of selection bias by the Taiping areas after proper controls are employed. After the war, the Taiping coefficients increase dramatically in magnitude (in absolute value). There is no sign of convergence in population growth relative to the control group after the war from 1880 to 2000. In 1880, the Taiping coefficient is -0.47, which implies that the population growth of Taiping areas from the pre-rebellion years to 1880 is 37 percent lower than that of the control group.[38] In 2000, the Taiping coefficient is -0.48, indicating that the pre-rebeellion-to-year-2000 population growth of the Taiping areas remains 38 percent lower than that in the control group even after one-and-a-half centuries, and that the Taiping Rebellion has had a long-lasting impact on population growth. The initial drop in population for the Taiping areas of 37 percent

land. In addition, there was family planning in effect. Population growth thus differed little for the two regions from 1982 to 2000.

[38] That is, $e^{-0.469} - 1$= -37%.

is comparable to the population fall in the wake of the Black Death in Europe from 1347 to 1351, i.e., 30 percent to 60 percent of Europe's total population died.[39] The effects of Taiping occupation, in contrast, are statistically insignificant. Since Taiping-occupied areas behave similarly to the control group, from now on we will absorb these areas into the control group and focus on the Taiping areas.[40]

The long-term impact on population by the Taiping Rebellion is also illustrated clearly in Figure 2, which depicts the evolution over time of the total population and the share of the Taiping areas in the total population of the sample prefectures. The Taiping prefectures' population share has dropped from 34.2 percent in 1820 to 22.7 percent in 2000.

We conduct several robustness checks. First, to ensure that our results are not driven by the prefectures that fought the heaviest rebellion battles, we exclude six such prefectures (i.e., Wuchang, Songjiang, Anqing, Jiangning, Suzhou, and Hangzhou) (Platt 2013) from the sample. The results (column (3)) are similar. Second, the literature suggests that the Taiping Rebellion affects the subsequent imperial exam quotas (Li 2014). To ensure that our results are not driven by its omission, we include in column (4) the number of newly selected Palace Scholars ("*jinshi*") since the end of the last period.[41] Its coefficient is not significant; and the Taiping coefficients remain similar. Third, in columns (5) and (6), we replace the Taiping dummy with the Taiping interaction with the log of the number of battles during the rebellion, and with the log of duration of the Taiping occupation (in months). Here, we allow the effects to differ by Taiping "dose." The qualitative results remain similar: the Taiping effects remain stable, and no recovery in population had taken place relative to the comparison group.

Instrument Variable Estimates. The estimate of the rebellion's effect would suffer from the omitted variable bias if the Taiping areas differ systematically from the other areas conditional on our controls. To tackle this, we pursue an IV approach: historical documents show that the rebellion's top leaders pursued a military strategy that resulted in a spatial pattern of Taiping Army occupation that is related to the longitude, and we thus use the longitude of the prefectural seat as the IV for the Taiping analysis, holding key geographical features constant.

Firstly, the longitude satisfies the relevance condition as the instrument of the Taiping Rebellion. The rebellion officially started in the remote Guangxi Province in early 1851. A key

[39] See https://en.wikipedia.org/wiki/Black_Death.
[40] Indeed, when we repeat the analysis in column (1) but include the TP-Occupied prefectures in the control group in column (2), the results are almost identical.
[41] The data set of Palace Scholar covers the period 1793-1911. For the base year 1820, Jinshi measures the newly selected Palace Scholar in the period between 1793 and 1820. This variable is automatically zero after year 1911 (since this exam was no longer held after the fall of Qing).

element of the strategy of the rebellion's leaders stemmed from the fact that at the beginning, the rebellion attracted bandit leader Luo Dagang, who had led more than a thousand river bandits to join the rebellion (Spence 1996). After that point in time, the effective use of the Taiping Navy had been a key in the military strategy of the rebellion's leaders. In July 1852, the Taiping leaders adopted a basic military strategy for the revolution (Wang et al. 1952, Vol. 3, p. 291): the Taiping Army decided that it should first march to *the east* along the Yangzi River, conquer and occupy Jiangning prefecture (currently Nanjing), located on the grand, eastward-flowing Yangzi River, and then use Nanjing as the base to expand.[42] To carry out these plans, the Taiping Army attacked and seized Yuezhou Prefecture near the midstream of the Yangzi River in late 1852. Following the strategic plan and relying on its then dominant navy,[43] the Taiping Army conquered most of the key cities from midstream to downstream of the Yangzi River and many nearby cities. Few prefectures in the west of China or along the upstream of the Yangzi River were under the control of the Taiping officials. This explains why the area located in eastern China was more likely to be under Taiping rule, which implies that the longitude likely satisfies the relevance condition as an IV for Taiping control. Indeed, this is confirmed in Table 1: the Taiping prefectures have higher average longitude.

Secondly, the longitude likely satisfies the exclusion restriction. A concern is that the longitude may affect population through other non-Taiping-related channels. For example, population growth in the east could be higher due to favorable geographical characteristics, such as arable land availability and irrigation potential, and lower transportation costs. To allow for this, we control for the prefecture fixed effect, and therefore for the influence of all time-invariant characteristics. Furthermore, we control for the interaction terms of time dummies with key indicators of favorable geographical conditions (i.e., the distances from the prefecture seat to the coastline, to the Grand Canal, and to Yangzi River). After these geographical controls, the longitude should be excludable in the population growth equation.

To further test the excludability of the longitude, we examine whether it is correlated with other key pre-Taiping explanatory variables. The idea is that if the IV is strongly correlated with the observables, it is also likely correlated with the unobservable (Altonji, Elder and Taber 2005). In panel C of Table 3, we regress the key explanatory variables on longitude, while

[42] Yang Xiuqing, the top Taiping Army general (and some view him as the *de facto* top leader), proposed that, "Today the best choice is to give up Guangdong Province and continue marching to the east along the Yangzi River, conquer and occupy Jiangning prefecture as the base, then attack the cities on the north and south of Jiangning. Even if we cannot overthrow the Qing Empire in the future, we can still occupy the south of the Yellow River." This proposal was endorsed by all the top leaders and became the strategic war plan.
[43] The Taiping Navy was dominant on the river until the 1854 rise of the navy of the Hunan Army led by Zeng Guofan (Wang et al. 1952, Vol. 3, p. 276, p. 142).

controlling for the remaining explanatory variables. In general, the correlation is insignificant, indicating likely no correlation or weak correlation between the IV and the unobservable.

Since the literature emphasizes the importance of having non-weak IV, and the existing testing framework focuses on a single endogenous variable, we conduct our two-stage-least-squares estimation using all pre-Taiping periods and one single post-Taiping period at a time, so that in total we conduct five 2SLS estimations (i.e., for the years 1880, 1910, 1953, 1982, and 2000), one endogenous variable at a time. When pooling all periods, the results are similar except that we do not have guidance on how to interpret test statistics. The results are in Table 4.

The IV results reinforce our conclusions. The IV satisfies the relevancy condition. All the F statistics for the five post-Taiping years are above 20, suggesting a non-weak IV (Staiger and Stock 1997; Baum et al. 2007). Moreover, the magnitudes become more pronounced. The population growth of the treatment group in 1880 (compared to 1820) is 52 percent lower than in the control group. And the population growth of the treatment group in 2000 (compared to 1820) is 67 percent lower than that in the control group. The population growth gap between the Taiping and control prefectures becomes stable around 1953.

V. Property Rights, Distance to Nanjing, Fiscal Capacity, and Population Evolution

We now investigate the channels through which the Taiping Rebellion affects population growth: property rights, distance-based stationary banditry, and local state capacity.

Property Rights

We examine whether relative to the Early Taiping areas (i.e., featuring the lack of clearly-defined land ownership), the Late Taiping areas (i.e., featuring clearer land ownership) has less wasteland and faster post-war population recovery. The data on wasteland cover 332 counties on their share of wasteland in the Taiping provinces in 1915. We have data on 151 Early Taiping counties, 95 Late Taiping counties, and 86 control counties (see Panel A, Table 4).

The cross-sectional regression results of the determinants of the percentage of wasteland in 1915 are in panel B of Table 4. The control variables include the distance to the Yangzi River, to the coastline, the dummy for being the prefecture capital seat, the dummy for being the most important county in 1820 ("*Zuiyao*"), and the dummy for being a trade center in 1915.[44] We also control for provincial fixed effects to hold constant province-specific features. The results show that the wasteland ratio in the Early Taiping areas is 3.6 percentage points higher than that in the non-Taiping counties, while the wasteland ratio in the Late Taiping areas is slightly

[44] We do not control for the distance to the Grand Canal because it did not pass our sample counties here.

higher but not statistically different from the non-Taiping counties. The lack of significant difference between the non-Taiping and the Late Taiping counties in wasteland is suggestive: the reallocation of property rights between former landowners and farmer tenants did not reduce long-term land maintenance or investment. This pattern supports the stationary bandit property rights hypothesis: the degree of protection of land property is better in the Late TP counties, and indeed, they had less wasteland. The distance to Nanjing and the Likin intensity immediately after the Taiping Army's fall do not explain the wasteland ratio.

Do land policies affect the long-term population level? Using the same samples and controls, we estimate the following panel data equation (Table 5, columns (1) and (2)):

$$\ln(pop_{i,t}) = d_t + \eta_i + \sum_t \alpha_{1t} D_t * Early\ TP_i + \sum_t \alpha_{2t} D_t * Late\ TP_i + X_{i,t}^{'}\beta + \sum_t \beta_t D_t Z_i + e_{i,t} \quad (2)$$

Compared to the control group, the Early Taiping areas experienced an immediate drop in population of 36 percent after the war, and a further drop of 11 log points until the Communist takeover in the mid-twentieth century. They recovered slightly in the second half of the last century. This is consistent with the finding that poor land property rights in the Early Taiping areas led to more wasteland and slower population recovery. In the half century after the Communist takeover, the population in the Early Taiping prefectures recovered 10 log points relative to the control group, perhaps because there was more wasteland to begin with, which allowed more land reclamation.

The Late Taiping areas experienced faster population recovery than the Early Taiping areas, but one-and-a-half centuries later, the initial (relative) population losses were locked in, and the recovery was far from complete (see column (1)).[45] After the war, and compared to the control group, the Late Taiping areas experienced a large drop in population growth by 39.6 percent (or 50.4 log points) in 1880. Between 1880 and 1953, its relative population growth was *greater* than the control group by 19 log points. This partial recovery in population could be explained by two forces: first, convergence toward the mean when factors such as labor flowed to the region with a higher land/labor ratio; second, good land property rights in the Late Taiping areas led to faster re-utilization of wasteland, which facilitated population growth.[46]

Distance-based stationary bandit hypothesis

This hypothesis says that the Taiping rulers in Capital-Close regions act more like stationary

[45] The qualitative results are similar using the sample that excludes the high war-casualty Taiping prefectures.
[46] In the half century after the Communist takeover, population growth in Late Taiping areas was similar to that of the control group, perhaps because both control and Late Taiping prefectures had good land property rights to begin with, and they thus experienced similar changes in land property rights after the Communist takeover.

bandits, and that these regions should experience faster population recovery. To test the hypothesis, in Table 6, in addition to the conventional average Taiping effects at various years, we add two terms that allow the Taiping effects, depending on the distance to Nanjing, to have a level shift in log population, and to have a shift in the population growth rate per decade in the postwar decades. To aid interpretation, the distance to Nanjing is standardized (i.e., with a mean of zero and a standard deviation of one for the Taiping sample). For the conventional average Taiping effects, we have either the year-specific post-Taiping effects (column (1)), or the level- and growth-rate shifts specification (columns (2) and (3)). In column (3) we exclude the heavy war-casualty cities to test the sensitivity to casualty outliers. Compared with a Taiping prefecture that is one standard deviation above the mean in the distance to Nanjing, a Taiping prefecture one standard deviation below the mean would have *an initial population drop of an extra 34 percentage points* (i.e., $e^{-0.42}$-1), and a faster population growth rate per decade of 1.6 percentage points. The qualitative results are robust with all three specifications, with population recovery being much faster when the high war-casualty prefectures are excluded. These results support the distance-based stationary bandit hypothesis.

Effect of *Likin* and disentangling alternative hypotheses

We now examine how the Taiping Rebellion war shaped *Likin* collection, and how *Likin* intensity is associated with population evolution. To proxy the level of *Likin* for the years 1880, 1910, and 1953 in our population data set, we use their annual average of years 1869 to 1879, 1880 to 1909, and 1910 to 1925.[47] Because *Likin* was initiated during the Taiping Rebellion and abolished in 1931, for the years before 1880 and after 1953 (1820 to 1851, and 1982 to 2000) we assign the *Likin* amount to be zero. Because *Likin* was irrelevant for China after 1931, but the population in 1953 still reflect the effects of *Likin* up to the year 1931, we exclude the periods after 1953.[48] We thus use the panel of 266 prefectures and the periods of 1851, 1880, 1910, and 1953.

To examine whether the rebellion led to higher *Likin* intensity (i.e., measured as log *Likin* revenue per thousand square kilometers) for the Taiping areas, we run the regression as follows:

$$Likin_{it} = d_t + \eta_i + \sum_t \gamma_t D_t TP_i + e_{i,t} \qquad (3)$$

Here d_t and η_i are the year and the prefecture fixed effects; TP_i could be a few variants as mentioned. The standard errors are clustered at the prefecture level. The results are in Table 7.

[47] The average *Likin* revenues from 1910-1925 are an imperfect proxy of *Likin* burdens for 1910 to 1953, but that is the only feasible option.

[48] It is likely that between the abolition of *Likin* and the Communist takeover, there was some persistence in tax burdens because local governments likely maintained similar governance structures and needed to maintain a similar level of government expenditures. Thus, *Likin* burdens may have just changed into other forms.

We obtain three findings. First, the Likin intensity was significantly higher for the Taiping areas (see column (1)). In the first post-rebellion year of 1880, the Taiping areas collected on average 24 times *Likin* per thousand square kilometers than non-Taiping areas. In 1931, 70 years after the initiation of *Likin*, its intensity in Taiping areas was still four times of that in non-Taiping areas. This finding supports the war-induced state-capacity hypothesis. Second, *Likin* intensity is much higher in the Late Taiping areas than in the Early Taiping areas (column (3)). The ratio of the *Likin* intensity of the Early Taiping areas to that of the control was 16 in 1880, and three in 1931; the counterparts for the Late Taiping were 57 in 1880, and eight in 1931. The advantage of Late Taiping areas in collecting *Likin* is consistent with the fiscal-and-institutional-capacity complementarity hypothesis. Third, once allowing the *Likin* intensity to differ by Early and Late Taiping areas, we no longer find a significant difference in the *Likin* intensity depending on the distance to Nanjing (columns (4)).

To examine whether the *Likin* intensity was a channel for the Taiping Rebellion's effect on population, we add the *Likin* intensity in our specifications (see Table 8). In column (1), we add it to the specification that allows the population effects to differ by Early Taiping area, Late Taiping area, and the distance to Nanjing. Here we adopt the parsimonious specification of shifts in the level and the growth rate of population. Column (2) repeats but excludes the high war-casualty prefectures.

Two findings emerge. First, the *Likin* intensity has a strong negative association with the population level. Increasing it by one standard deviation in 1910 (1.28) is associated with a drop in the population level by 7 percentage points. Second, as before, the Capital-Close areas and the Late Taiping areas have higher initial population losses, but faster population recovery (statistically significant only when the heavy-casualty prefectures are excluded).

Because Late Taiping areas and the distance to Nanjing are strongly correlated, and to shed light on the merits of both the stationary bandit property rights and the distance-based stationary bandit hypotheses, we allow the distance to Nanjing to have distinct effects for Early and Late Taiping areas. If the distance to Nanjing effects hold within the two subsamples, we will be more confident that the distance effect is not spurious arising from the correlation with land property rights. The results are in columns (3) and (4). To facilitate interpretation, the distance to Nanjing is normalized using Early- and Late-Taiping-specific standardization (i.e., using sample-specific means and standard deviations). Now, *Likin* intensity remains robustly and negatively related to the population level. The Late-Taiping-specific population recovery becomes robustly positive and significant, consistent with the stationary bandit property rights hypothesis. Furthermore, the faster population recovery rate for Capital-Close areas is

observed *within* both the Early Taiping and Late Taiping areas, adding support to the distance-based stationary bandit hypothesis.

VI. Malthusian Transition with Evidence from Long-Term Data

We have shown that the Taiping Rebellion permanently lowered the relative population level in Taiping areas, that the Late Taiping and Capital-Close areas had faster population recovery, and that *Likin* intensity is associated with a lower population. However, since lower population growth could also indicate being in the modern growth regime and the transition from the Malthusian and/or the Post-Malthusian transition regime (Galor 2005), the interpretation of the Taiping effects is incomplete if not misleading without looking at the long-term consequences on the quality of long-term development. The incompleteness is illustrated by the negative association between Likin and population level, which is consistent with both the *Likin*-as-taxation hypothesis and the *Likin*-helping-Malthusian-transition hypothesis (via the mechanism of facilitating modern sectors). We thus now examine how the rebellion and its various indicators are associated with indicators of modern development.

We measure the quality of modern development from two sources. Two measures come from the China Regional Economic Statistics Yearbook 2010. We use GDP per capita (in 2010) as a measure of the income level, and fiscal revenue per capita in 2010 as the measure of fiscal capacity. Several measures come from Census 2000 (China Data Center and Spatial Data Center 2017): the modern sector structure is represented by the share of GDP in manufacturing, and in non-agriculture; human capital is captured by average years of schooling and by the mortality rate. Using ArcGIS, we merge the modern outcome data set (2,876 counties in 348 cities in 2,000 administrative divisions) with the Taiping historical variable data set (266 prefectures in 1,820 Qing administrative divisions).[49] In the end, 272 modern cities are merged into 192 (Qing) prefectures. Additionally, several prefectures drop out in specific regressions due to missing values of a few variables.

We first examine the net effect of the rebellion on long-term outcomes. We present both the OLS and the IV results. The control variables are largely the same as before—except that we do not control for the prefecture and the year fixed effects because we now employ cross-sectional data.[50] When using the 2SLS specification, as before, we use the longitude of the

[49] There are 348 cities in the modern data set, of which 272 are in the territory covered by the Taiping data set (which consists of 266 prefectures). We first generate the center point of these cities, and then use the point-shape file to merge with the historical data set (polygon-shape files). When the central point of a city falls into one prefecture polygon, we call it a match.

[50] Naturally the interactions between the time dummies and the time-invariant variables are replaced with the time-invariant variables.

prefecture seat as the IV for the Taiping dummy. The results are in panels A and B of Table 9.

The Taiping areas have experienced a stronger Malthusian transition than other areas. The income levels and the human capital indicators in Taiping areas are the same as the other areas. However, the Taiping areas have significantly higher fiscal capacity. Based on the OLS estimate, in 2010, one-and-a-half centuries after the Taiping Rebellion, fiscal revenue per capita in the Taiping areas is 50 percentage points (0.6 standard deviations) higher than in other areas, a huge effect. The 2SLS estimate is 50 percent larger than that of the OLS. This supports the war-induced state-capacity hypothesis. Furthermore, based on the OLS, Taiping areas have a significantly higher share of modern sectors: these areas' share of manufacturing in GDP is higher by 4.6 percentage points (0.4 standard deviations). Based on the 2SLS, there is a positive but insignificant impact on manufacturing. However, the effect of schooling is significant and positive. The Taiping areas' average schooling level is 13 percent higher, again a large effect. These results support the Malthusian transition hypothesis.

Two variables have robust association with the modern outcomes (see also panels C and D for the robustness when we allow more nuanced Taiping variables). The number of wars between 1776 and 1853 is *negatively* associated with the income level in 2010; increasing it by one standard deviation (0.64) is associated with income per capita that is 9 percentage points lower. Thus, other domestic conflicts do *not* have the same effects as the Taiping Rebellion. Interestingly, one-and-a-half centuries after the rebellion, pre-war human capital is robustly and positively correlated with income levels, fiscal capacity, modern-sector structures, and human capital. Increasing pre-war human capital by one standard deviation (1.22) is associated with higher income per capita by 13 log points, fiscal capacity by 23 log points, the share of manufacturing by 2.3 percentage points, and the average schooling by 3 percentage points. This widespread impact is consistent with the human capital view of long-term development (Glaeser et al. 2004; Galor and Weil 2000; Galor 2005).

In Panel C, we add the full set of Taiping indicators and the initial *Likin* intensity (i.e., in 1880). Since it is hard to find even one solid IV, it is perhaps inappropriate to try to deal with multiple potential endogenous variables, and doing so would probably compromise inference too much (Young 2017). We thus only report the OLS results.

The long-term development of Taiping areas differs greatly depending on the (historically) brief encounter with the Taiping Revolution in the middle nineteenth century. First, the Early and the Late Taiping areas have vastly different long-term development. Early Taiping areas now have *lower* GDP per capita by 22 log points; otherwise, they do not differ much with the non-Taiping areas. Thus, the war effect of the Early Taiping areas is similar to that of other

domestic conflicts (i.e., "the number of wars between 1776 and 1853") in Panel A. In sharp contrast, the Late Taiping areas have advanced much further in the Malthusian transition than the control group: GDP per capita is 60 percent higher; fiscal capacity is 160 percent higher, the manufacturing share in GDP is 17 percentage points (1.2 standard deviation) higher. Surprisingly, Late Taiping areas also have higher mortality rates, perhaps reflecting the environmental and social costs associated with fast development, along the lines of what has happened in Europe (i.e., the consequences of increasing trade and urbanization on rising mortality) (Voiglander and Voth 2009, 2013b). These results support the Malthusian hypothesis. The strongly positive effects in the context of good property rights (i.e., Late Taiping areas), and the negative effects in the roving-bandit Early Taiping areas, support the idea that the large population losses associated with large wars exert positive long-term impact only when institutions are better.

Second, higher initial fiscal capacity developed in Taiping (say, its one SD increase, i.e., 3) is associated with higher GDP per capita (0.2 standard deviation), higher shares of manufacturing (0.15 standard deviation) and of the non-agricultural sector (0.2 standard deviation), and higher human capital (i.e., schooling, 0.5 standard deviation; and mortality rate, 0.6 standard deviation). These powerful and coherent results offer strong support to the *Likin*-as-state-capacity hypothesis, and to the viewpoint of the importance of developing a strong fiscal system for long-term development (Besley and Persson 2009, 2011). The positive and widespread associations with all key aspects of long-term development are especially impressive in light of the contrast between the contexts in the literature and our context: The literature emphasizes the positive impact of external wars, but not civil wars, and here we observe similar effects from a large *civil* war (Blattman and Miguel, 2010; Besley and Persson 2009). The literature emphasizes the positive effects of fiscal *centralization* (Dincecco 2015, Hoffman 2015), and here we obtain the novel finding of positive long-term effect of fiscal *decentralization* (in the presence of strong agency costs in a very large country). Furthermore, the findings that *Likin* is associated with lower population and faster Malthusian transition also support the *Likin*-helping-Malthusian-transition hypothesis. That is, *Likin*, by changing the tax base and facilitating the development of the modern sector, facilitates the Malthusian transition.

The findings on the distance to Nanjing support the distance-based stationary bandit hypothesis. Reducing it by one standard deviation (for the Taiping sample) is associated with: an increase in GDP per capita (9 percentage points, 0.15 standard deviation), higher fiscal capacity (19 percentage points, 0.2 standard deviation), higher share of non-agriculture (4.6 percentage points, 0.5 standard deviation), higher average schooling (1.7 percent, 0.17 standard

deviation), and lower mortality (0.25 percentage points, 0.3 standard deviation). It is useful to note that the associations of Late Taiping areas with income, fiscal capacity and the share of modern sectors tend to be more pronounced than those of the distance to Nanjing. The association with schooling is reversed; that is, the association is more pronounced for the distance to Nanjing than for Late Taiping areas.

In Panel D, we test the fiscal-and-institutional-capacity complementarity hypothesis. We interact the post-war *Likin* intensity with our three institutional variables: Early Taiping areas, Late Taiping areas, and the distance to Nanjing. When compared with the control sample, the coefficients of *Likin* on GDP per capita and fiscal capacity today in the Early Taiping areas are positive and significantly more pronounced. When compared with the control sample and the Early Taiping areas, the *Likin* coefficients in Late Taiping areas on all key outcomes (income, fiscal capacity, modern sector, and human capital) are all positive and much more pronounced. For instance, the *Likin* premiums on GDP per capita and fiscal capacity are both around 15 times larger for Late Taiping than for Early Taiping areas. And the positive *Likin* coefficient on non-agriculture is positive and significant only in Late Taiping areas. Increasing *Likin* intensity in 1880 by one standard deviation (i.e., three) is associated with an increase in average schooling of 4 percent in Early Taiping areas, but 77 percent in Late Taiping areas. The results are strongly in support of the fiscal-and-institutional-capacity complementarity hypothesis.

Another result is that *Likin*'s interaction with the distance to Nanjing is significant and negative in explaining average schooling, but not other outcomes. This supports the institution-induced skill-demand hypothesis: Since Capital-Close areas had denser urban networks and likely had higher concentrations of capitalists, the interest in improving schooling (to adapt to the reality of changing technology landscape) was stronger there, and state capacity improvement would have led to more provision of public schooling (Galor et al. 2009).

The evidence in this subsection thus suggests that exposure to the Taiping Rebellion has facilitated the Malthusian transition *only* where the timing and location led to better property rights, and/or a longer ruler's time horizon, and where initial fiscal capacity investment was greater, and, especially, where these favorable factors were bundled together.

VII. Conclusion

We offer evidence that the Taiping Rebellion, and the institutional and fiscal changes that were an outgrowth of the rebellion, affected the evolution of population levels, current incomes, fiscal capacity, shares of modern economic sectors, and human capital that continue to this day. The rebellion facilitated China's demographic transition from a Malthusian regime to a modern

growth regime. Indeed, the sharp population drop that took place after the revolution is similar to the loss of population experienced in Europe following the outbreak of the Black Death (Voigtlander and Voth, 2009, 2013a, 2013b). Revolutionary areas, on average, now have stronger fiscal capacity and larger modern sectors. In addition, random events such as the decision of experienced river bandit leaders to join the rebellion movement led some of their areas to adopt a longer time horizon for their rule, and led some Taiping-controlled regions to have more favorable land property rights policies; in turn, these regions then experienced faster population recovery, and they now have significantly higher current income and human capacity levels, greater fiscal capacity, and a larger modern sector. These findings support some of the prominent hypotheses in the literatures that examine long-term development and/or war and state capacity. Among these are the following (see Table 10 for a summary of the match between our findings and the hypotheses):[51] Wars facilitate state capacity; big population shocks at times of significant technological changes facilitate favorable demographic transitions; fiscal capacity and institutional quality are complementary; a Malthusian transition and significant technological changes facilitate schooling in situations in which capitalists' interest are well represented; and human capital has key long-term development impact.

The Taiping Rebellion marks a turning point in Chinese history: the beginning of fiscal and military decentralization, possibly the beginning of the post-Malthusian regime, and the beginning of China's modernization drive. Since then, China has continued to struggle with the choice between centralization and decentralization. While decentralization delayed the Qing Dynasty's collapse, it also led to stronger local authorities, and the eventual Qing collapse (Sng 2014). After the founding of the Republic of China, the central government remained weak, and there was a period characterized by a segmented China led by dozens of warlords; that is, complete decentralization reigned. Beginning with the reform in 1978, the Chinese government attempted strong decentralization through the mid-1990s, and it then reversed this trend by moving toward fiscal centralization. It also tried to decentralize state-owned enterprises to improve efficiency, and to maintain centralized control where the benefits of such control would be larger (Huang et al. 2017). The issue of centralization versus decentralization remains important for China − and potentially for other large countries − now, and for years to come.

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[51] We have previously listed the origins of these hypotheses, and so we will not repeat them here.

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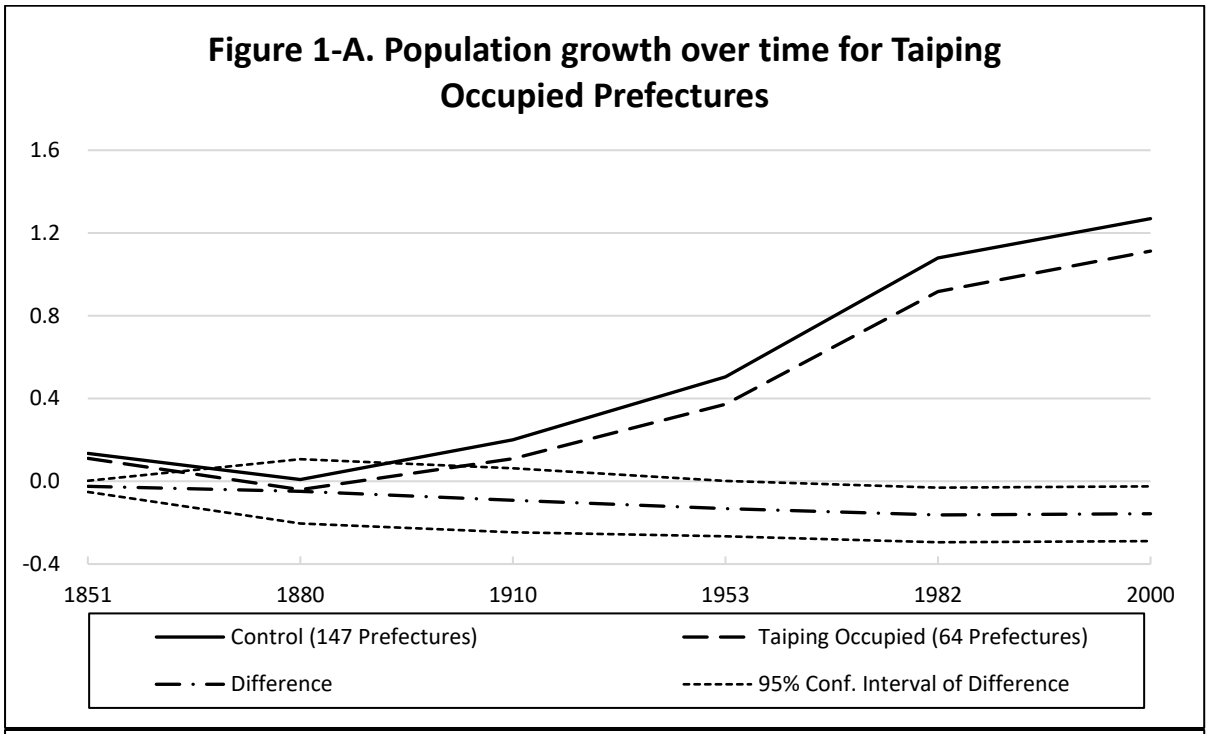
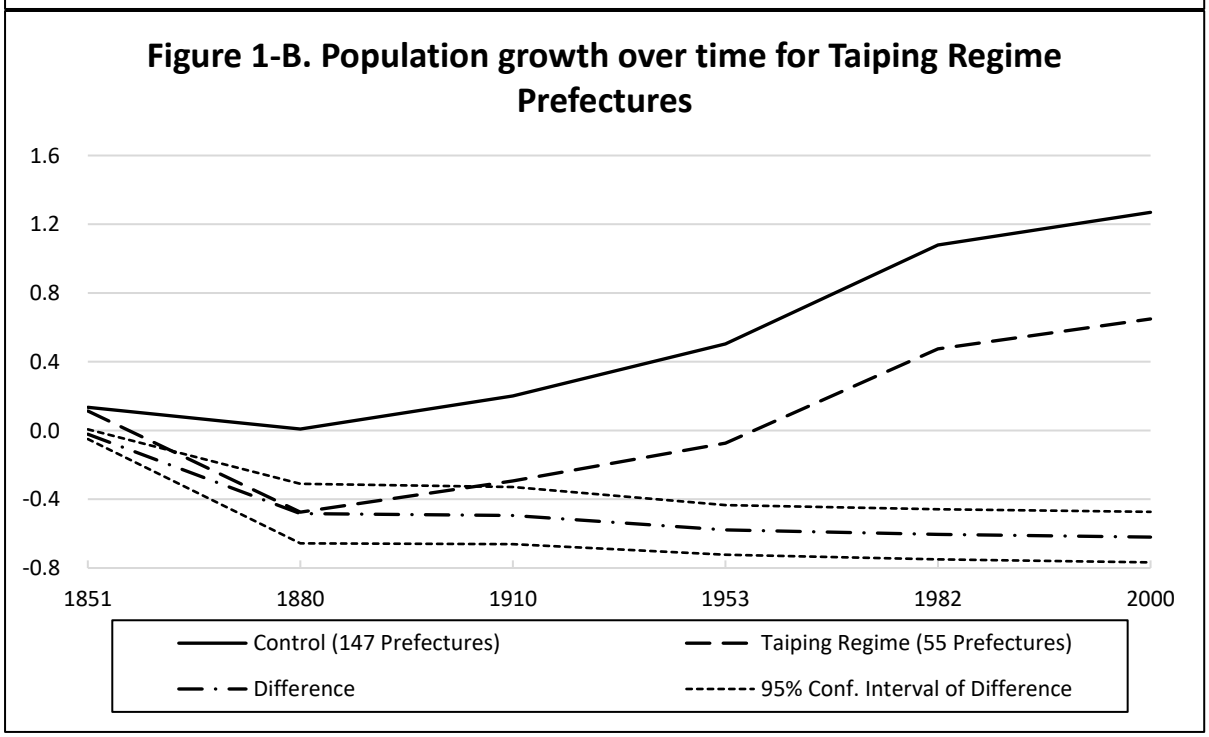
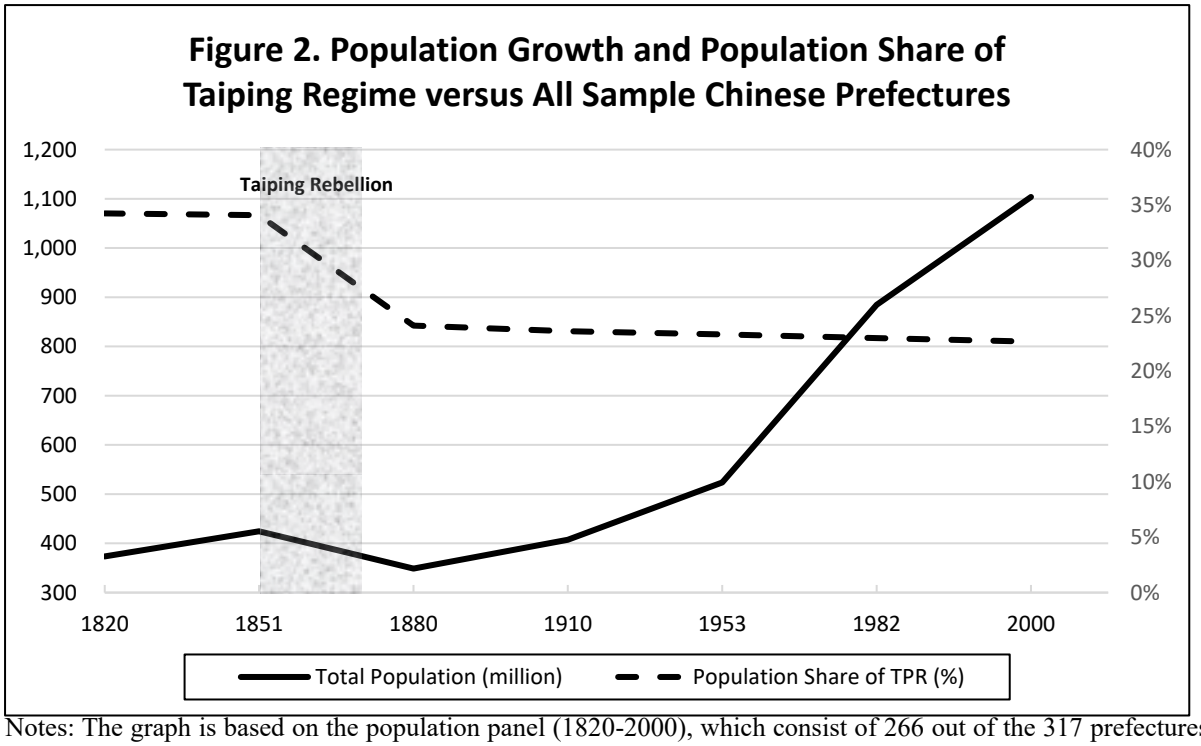




Notes: Population Growth in year t = ln (Population in year t / Population in 1820);
Control group covers 147 prefectures which were never occupied by Taiping Army; Taiping Occupied group covers 64 prefectures which were occupied by Taiping Rebellion, but without being in the Taiping territory; Taiping Regime group covers 55 prefectures which were occupied by Taiping Rebellion and in the Taiping territory.



Notes: The graph is based on the population panel (1820-2000), which consist of 266 out of the 317 prefectures in the Qing dynasty in 1820 in China. We exclude prefectures in minority areas of China that were underdeveloped and less populated before 1953, that is, Xinjiang, Tibet, Qinghai, and the north of the Great Wall (Inner Mongolia, Outer Mongolia); we similarly exclude three provinces in Northeast of China (Fengtian, Jilin, and Heilongjiang).

Table 1. Population changes for Taiping and non-Taiping prefectures

	Control	Taiping		Early Taiping		Late Taiping	
	Mean	Mean	Diff.	Mean	Diff	Mean	Diff
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Population Growth in 1851	0.128	0.114	-0.014	0.123	-0.004	0.094	-0.034
	(0.092)	(0.079)	(0.014)	(0.042)	(0.015)	(0.125)	(0.023)
Population Growth in 1880	-0.006	-0.475	-0.469***	-0.412	-0.406***	-0.605	-0.598***
	(0.526)	(0.547)	(0.080)	(0.572)	(0.095)	(0.480)	(0.128)
Population Growth in 1910	0.173	-0.294	-0.467***	-0.226	-0.399***	-0.433	-0.606***
	(0.524)	(0.465)	(0.078)	(0.489)	(0.093)	(0.388)	(0.126)
Population Growth in 1953	0.464	-0.074	-0.538***	-0.059	-0.523***	-0.104	-0.569***
	(0.456)	(0.476)	(0.070)	(0.506)	(0.083)	(0.422)	(0.111)
Population Growth in 1982	1.030	0.475	-0.555***	0.532	-0.498***	0.358	-0.672***
	(0.452)	(0.467)	(0.069)	(0.477)	(0.081)	(0.436)	(0.111)
Population Growth in 2000	1.222	0.649	-0.573***	0.704	-0.518***	0.537	-0.685***
	(0.452)	(0.498)	(0.070)	(0.508)	(0.082)	(0.469)	(0.111)
Population in 1820 (Baseline)	4.311	5.231	0.920***	5.051	0.740***	5.602	1.291***
	(1.057)	(0.690)	(0.150)	(0.692)	(0.180)	(0.532)	(0.252)
Longitude	110.155	117.126	6.971***	115.635	5.481***	120.189	10.03***
	(5.415)	(2.954)	(0.759)	(2.408)	(0.907)	(0.814)	(1.280)
Observations		55		37		18	

Note: Population Growth in year *t* = ln (Population in year *t* / Population in 1820). The control group covers 211 prefectures not in the Taiping jurisdiction.
Standard errors in brackets. The differences indicate the difference of the mean between the treatment and the control groups.

Table 2. Regression results on log population

	Taiping Regime is measured as:					
	Taiping				Taiping*ln(No. of battles)	Taiping*ln(Taiping durations)
	Full	Full	Full-High War Casualty	Full	Full	Full
Taiping *Year 1851	-0.015	-0.003	-0.003	-0.004	-0.004	-0.001
	[0.018]	[0.020]	[0.020]	[0.020]	[0.009]	[0.003]
Taiping *Year 1880	-0.469***	-0.456***	-0.444***	-0.460***	-0.211***	-0.089***
	[0.101]	[0.095]	[0.096]	[0.095]	[0.034]	[0.012]
Taiping *Year 1910	-0.470***	-0.438***	-0.426***	-0.442***	-0.204***	-0.082***
	[0.095]	[0.092]	[0.094]	[0.092]	[0.034]	[0.013]
Taiping *Year 1953	-0.562***	-0.514***	-0.500***	-0.513***	-0.232***	-0.090***
	[0.095]	[0.093]	[0.095]	[0.093]	[0.035]	[0.013]
Taiping *Year 1982	-0.499***	-0.444***	-0.429***	-0.443***	-0.206***	-0.079***
	[0.088]	[0.085]	[0.085]	[0.084]	[0.033]	[0.012]
Taiping *Year 2000	-0.484***	-0.431***	-0.419***	-0.430***	-0.210***	-0.079***
	[0.092]	[0.089]	[0.090]	[0.089]	[0.033]	[0.012]
Occupied *Year 1851	-0.024*					
	[0.013]					
Occupied*Year 1880	-0.023					
	[0.076]					
Occupied*Year 1910	-0.061					
	[0.073]					
Occupied*Year 1953	-0.091					
	[0.066]					
Occupied*Year 1982	-0.106*					
	[0.063]					
Occupied*Year 2000	-0.103					
	[0.064]					
Ln (frequency of war since 1776)	0.008	0.006	0.007	0.006		
	[0.007]	[0.008]	[0.008]	[0.007]		
Number of Palace Scholars (jinshi)				-0.002		
In each period				[0.001]		
Observations	1,862	1,862	1820	1862	1862	1862
R-squared	0.797	0.796	0.798	0.796	0.801	0.804
Number of prefectures	266	266	260	266	266	266
Control, prefecture FE, year FE	Y	Y	Y	Y	Y	Y
Cluster at Prefecture Level	Y	Y	Y	Y	Y	Y

Note: The full sample ("Full") contains the prefecture-year panel for 266 prefectures and seven time periods (from 1820 to 2000). The Full-high war casualty sample (i.e., excluding high Taiping war casualty cities) contains the prefecture-year panel for 260 prefectures (after dropping six prefectures including Wuchang, Anqing, Songjiang, Jiangning, Suzhou, and Hangzhou), which were heavily affected by the Taiping) and seven time periods (from 1820 to 2000).

Only the estimation results of the key variables are presented. The time-varying control variables are the duration of treat ports, the duration of concessions and leased territories, the frequency of wars since year 1776. Also included are time dummies interacted with the following time-invariant controls: the distance to Yangzi River, to the coastline, and to the Grand Canal; the number of neighboring provinces; the pre-war level of land taxes per mu; the total number of palace graduates per million people from 1793-1820; silk and tea prefectures dummy; the four post designations classified by the Qing government in 1820.

In Column 4, as robustness check, we also controlled the number of newly elected palace graduates for each period.

Standard errors are robust, clustered at the prefecture level.

*** p<0.01, ** p<0.05, * p<0.1.

Table 3. 2SLS Estimation with One Endogenous Variable

Panel A. Second Stage

Year	1880	1910	1953	1982	2000
Taiping	-0.734***	-0.766***	-1.103***	-0.992***	-1.099***
	[0.233]	[0.225]	[0.275]	[0.277]	[0.294]
Observations	798	798	798	798	798
R-squared	0.322	0.231	0.404	0.799	0.841

Panel B. First Stage

Longitude	0.039***	0.040***	0.036***	0.036***	0.037***
	[0.006]	[0.007]	[0.007]	[0.007]	[0.008]
Observations	798	798	798	798	798
F Test	37.46	35.46	28.08	28.08	28.08
Number of prefectures	266	266	266	266	266
Control	Y	Y	Y	Y	Y
Cluster at Prefecture Level	Y	Y	Y	Y	Y
Year Fixed Effect	Y	Y	Y	Y	Y
Prefecture Fixed Effect	Y	Y	Y	Y	Y

Panel C. Falsification test on IV validity

	Pop1820	Pop1820	War Frequency	Land tax per mu 1820	No. of Jinshi 1893-1820	Chong	Fan	Pi	Nan
Longitude	0.040**	-0.003	0.001	-0.002	-0.11	-0.011	-0.004	-0.027***	-0.002
	[0.016]	**[0.003]**	**[0.009]**	[0.001]	[0.341]	[0.009]	[0.006]	[0.010]	[0.009]
Constant	1.801	1.125**	-0.580	0.408	21.813	0.926	1.226	4.959***	0.194
	[2.638]	[0.469]	[1.329]	[0.279]	[66.996]	[1.563]	[1.060]	[1.661]	[1.463]
Observations	266	266	266	266	266	266	266	266	266
R-squared	0.485	0.971	0.106	0.104	0.364	0.249	0.146	0.221	0.195
Number of prefectures	266	266	266	266	266	266	266	266	266
Control	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cluster at Prefecture Level	Y	Y	Y	Y	Y	Y	Y	Y	Y
Control Pop 1776	N	Y	Y	Y	Y	Y	Y	Y	Y

Note: The sample contains the prefecture-year panel for 266 prefectures and three time periods, 1820, 1851, and one post-Rebellion year. Only the estimation results of the key variables are presented.

In Panels A and B, the time-varying control variables are the duration of treat ports, the duration of concessions and leased territories, the frequency of wars since year 1776. Also included are time dummies interacted with the following time-invariant controls: the distance to Yangzi River, to the coastline, and to the Grand Canal; the number of neighboring provinces; the pre-war level of land taxes per mu; the total number of palace graduates per million people from 1793-1820; silk and tea prefectures dummy; the four post designations classified by the Qing government in 1820.

In Panel C, the control variables include the following variables (and in case it is the dependent variable, it is excluded): the distance to Yangzi River, to the coastline, and to the Grand Canal; the number of neighboring provinces; the duration of treaty ports; the level of land taxes; the total number of palace graduates per million people from 1793-1820; silk and tea prefectures dummy; the four post designations classified by the Qing government in 1820; the frequency of wars since 1776; and population in 1776.

We obtain qualitatively similar results when using the 2SLS results with one equation with all TP variables interacted with the year dummies using the "Full-High Casualty Cities" sample, or with alternative measures of Taiping.

Standard errors are robust, clustered at the prefecture level. *** p<0.01, ** p<0.05, * p<0.1

Table 4. Taiping Status and Idle Land

Panel A. The Distribution of counties in the control, Early, Late counties

	Taiping Regime		Control	Total
	Early Taiping Regime (AJH)	Late Taipijng Regime (JZ)		
Anhui	49		8	57
Jiangxi	64		14	78
Hubei	38		26	64
Jiangsu		27	31	58
Zhejiang		68	7	75
Total (Provinces with Taiping Regime)	151	95	86	332

Panel B. Determinants of the Percentage of Wasteland in 1915

	(1)	(2)	(3)
Taiping	2.710**		
	[1.034]		
Early		3.555***	3.855***
		[1.278]	[1.327]
Late		1.26	1.692
		[1.437]	[1.493]
Standardized ln(distance to Nanjing)			-1.519
			[1.252]
Initial Likin			-1.025
			[0.701]
Observations	332	332	332
R-squared	0.108	0.11	0.079
Control	Y	Y	Y
Province Fixed Effect	Y	Y	N

Note: The sample contains the cross-sectional county level data from 1915, coving the 5 provinces (Anhui, Jiangxi, Hubei, Jiangsu, and Zhejiang) within the Taiping regime. Only the estimation results of the key variables are presented. The control variables include the distance to Yangzi River, to the coastline; the dummy for being prefecture capital seat in 1820, dummy for being the most important county in 1820, and dummy for being trade center in 1915.

Standard errors are robust, clustered at the prefecture level.

*** p<0.01, ** p<0.05, * p<0.

Table 5. Property rights and Population Growth
The dependent variable is log (population)

	Full	Full – high war casualty
Early Taiping*Year 1851	-0.005	-0.003
	[0.020]	[0.020]
Early Taiping*Year 1880	-0.448***	-0.447***
	[0.101]	[0.104]
Early Taiping*Year 1910	-0.426***	-0.418***
	[0.095]	[0.097]
Early Taiping*Year 1953	-0.558***	-0.553***
	[0.099]	[0.101]
Early Taiping*Year 1982	-0.473***	-0.467***
	[0.089]	[0.091]
Early Taiping*Year 2000	-0.452***	-0.446***
	[0.095]	[0.095]
Late Taiping*Year 1851	0.005	-0.000
	[0.036]	[0.039]
Late Taiping*Year 1880	-0.504***	-0.417**
	[0.194]	[0.184]
Late Taiping*Year 1910	-0.508***	-0.425***
	[0.163]	[0.152]
Late Taiping*Year 1953	-0.314**	-0.236**
	[0.142]	[0.117]
Late Taiping*Year 1982	-0.317**	-0.240*
	[0.141]	[0.123]
Late Taiping*Year 2000	-0.340**	-0.288**
	[0.151]	[0.144]
Observations	1,862	1820
R-squared	0.797	0.798
Number of prefectures	266	260
Control	Y	Y
Cluster at prefecture level	Y	Y
Year Fixed Effect	Y	Y
Prefecture Fixed Effect	Y	Y

Note: The full sample contains the prefecture-year panel for 266 prefectures and seven time periods (from 1820 to 2000).

The time-varying control variables are the duration of treat ports, the duration of concessions and leased territories, the frequency of wars since year 1776. Also included are time dummies interacted with the following time-invariant controls: the distance to Yangzi River, to the coastline, and to the Grand Canal; the number of neighboring provinces; the pre-war level of land taxes per mu; the total number of palace graduates per million people from 1793-1820; silk and tea prefectures dummy; the four post designations classified by the Qing government in 1820.

Standard errors are robust, clustered at the prefecture level.

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Testing distance-based stationary bandits

	Full	Full	Full-High War Casualty
Taiping *Year 1880	-0.491***		
	[0.089]		
Taiping *Year 1910	-0.469***		
	[0.085]		
Taiping *Year 1953	-0.541***		
	[0.093]		
Taiping *Year 1982	-0.466***		
	[0.084]		
Taiping *Year 2000	-0.451***		
	[0.089]		
Taiping * post year 1880		-0.500***	-0.608***
		[0.095]	[0.114]
Taiping *the number of decades since 1865		0.002	0.01
		[0.007]	[0.009]
Taiping * post 1880 *standardized distance to Nanjing	0.209***	0.209***	0.623***
	[0.057]	[0.057]	[0.208]
Taiping *number of decades since end-Taiping *standardized distance to Nanjing	-0.008**	-0.008**	-0.038***
	[0.004]	[0.004]	[0.014]
Observations	1,862	1,862	1,820
R-squared	0.799	0.799	0.8
Number of prefectures	266	266	260
Control, prefecture FE, year FE	Y	Y	Y

Note: The full sample contains the prefecture-year panel for 266 prefectures and seven time periods (from 1820 to 2000). The "full – high war casualty" prefectures contain the prefecture-year panel for 260 prefectures (after dropping 6 cities, Wuchang, Anqing, Songjiang, Jiangning, Suzhou, and Hangzhou which were heavily affected by the Taiping Rebellion) and seven time periods (from 1820 to 2000).

The time-varying control variables are the duration of treat ports, the duration of concessions and leased territories, the frequency of wars since year 1776. Also included are time dummies interacted with the following time-invariant controls: the distance to Yangzi River, to the coastline, and to the Grand Canal; the number of neighboring provinces; the pre-war level of land taxes per mu; the total number of palace graduates per million people from 1793-1820; silk and tea prefectures dummy; the four post designations classified by the Qing government in 1820.

Standard errors are robust, clustered at the prefecture level.

*** p<0.01, ** p<0.05, * p<0.1

Table 7. Likin Determinants
Dependent variable: Likin per 1000 square km (in logs)

	(1)	(2)	(3)	(4)
Taiping *Year 1880	3.184***	3.184***		
	[0.227]	[0.227]		
Taiping *Year 1910	1.857***	1.857***		
	[0.123]	[0.122]		
Taiping *Year 1953	1.442***	1.442***		
	[0.095]	[0.093]		
Early Taiping *Year 1880			2.763***	2.750***
			[0.217]	[0.217]
Early Taiping *Year 1910			1.432***	1.417***
			[0.106]	[0.106]
Early Taiping *Year 1953			1.124***	1.124***
			[0.073]	[0.074]
Late Taiping *Year 1880			4.050***	4.078***
			[0.210]	[0.211]
Late Taiping *Year 1910			2.732***	2.763***
			[0.084]	[0.087]
Late Taiping *Year 1953			2.094***	2.095***
			[0.073]	[0.073]
Taiping *standardized Distance to Nanjing*Year 1880		-0.115***		0.068
		[0.041]		[0.074]
Taiping * standardized Distance to Nanjing*Year 1910		-0.110**		0.076
		[0.053]		[0.089]
Taiping * standardized Distance to Nanjing*Year 1953		-0.132***		0.002
		[0.027]		[0.017]
Observations	1,064	1,064	1,064	1,064
R-squared	0.897	0.897	0.898	0.898
Number of prefectures	266	266	266	266
prefecture FE, year FE	Y	Y	Y	Y

Note: For all regressions, the full sample contains the prefecture-year panel for 266 prefectures and four time periods, 1851, 1880, 1910, 1953. Only the estimation results of the key variables are presented.

Likin revenue are converted into 1887 silver teal.

Standard errors are robust, clustered at the prefecture level.

*** p<0.01, ** p<0.05, * p<0.1

Table 8. Testing the effects of fiscal capacity, and related hypotheses

	Full	Full-High War Casualty	Full	Full-High War Casualty
Likin per 1000 sq. km	-0.049***	-0.052***	-0.052***	-0.052***
	[0.009]	[0.009]	[0.009]	[0.009]
Early Taiping * post 1880	-0.396***	-0.548***	-0.372***	-0.391***
	[0.108]	[0.135]	[0.105]	[0.109]
Early Taiping *number of decades since end-Taiping	-0.014	0.003	-0.014	-0.011
	[0.011]	[0.013]	[0.010]	[0.011]
Late Taiping * post 1880	-0.388*	-0.521***	-0.593***	-0.918***
	[0.199]	[0.177]	[0.179]	[0.234]
Late Taiping * number of decades since end-Taiping	0.023	0.033*	0.038**	0.068***
	[0.021]	[0.019]	[0.019]	[0.025]
Taiping * post 1880 * standardized distance to $\text{Nanjing}_{\text{Taiping}}$	0.230***	0.795***		
	[0.079]	[0.232]		
Taiping * number of decades since end-Taiping * standardized distance to $\text{Nanjing}_{\text{Taiping}}$	-0.01	-0.069***		
	[0.008]	[0.019]		
Early Taiping * post 1880 * standardized Distance to $\text{Nanjing}_{\text{Early}}$			0.296***	0.296***
			[0.106]	[0.106]
Early Taiping * number of decades since end-Taiping * Standardized Distance to $\text{Nanjing}_{\text{Early}}$			-0.025***	-0.026***
			[0.008]	[0.008]
Late Taiping * post 1880 *standardized Distance to $\text{Nanjing}_{\text{Late}}$			0.264***	1.586***
			[0.058]	[0.574]
Late Taiping * number of decades since end-Taiping *standardized Distance to $\text{Nanjing}_{\text{Late}}$			-0.005	-0.138**
			[0.006]	[0.574]
Observations	1,330	1,300	1,330	1,300
R-squared	0.461	0.457	0.468	0.457
Number of prefectures	266	260	266	260
Control, prefecture FE, year FE	Y	Y	Y	Y

Note: The full sample contains the prefecture-year panel for 266 prefectures and seven time periods (from 1820 to 2000). The "full – high war casualty" prefectures contain the prefecture-year panel for 260 prefectures (after dropping 6 cities, Wuchang, Anqing, Songjiang, Jiangning, Suzhou, and Hangzhou which were heavily affected by the Taiping Rebellion) and seven time periods (from 1820 to 2000).

The time-varying control variables are the duration of treat ports, the duration of concessions and leased territories, the frequency of wars since year 1776. Also included are time dummies interacted with the following time-invariant controls: the distance to Yangzi River, to the coastline, and to the Grand Canal; the number of neighboring provinces; the pre-war level of land taxes per mu; the total number of palace graduates per million people from 1793-1820; silk and tea prefectures dummy; the four post designations classified by the Qing government in 1820.

Standard errors are robust, clustered at the prefecture level.

*** p<0.01, ** p<0.05, * p<0.1

Table 9. Taiping and current income, state capacity, modern sector, and human capital

Panel A. OLS	Ln(GDPPC 2010)	Ln(Fis Rev 2010)	Share pop: ind 2000	Share pop: nonAg 2000	Ln(Sch 2000)	Death rate 2000
Taiping	0.004	0.409***	0.046***	0.035*	0.016	-0.304
	(0.101)	(0.150)	(0.016)	(0.018)	(0.016)	(0.189)
Ln (Edu_{1820})	0.108**	0.191***	0.019***	0.020***	0.028***	-0.006
	(0.047)	(0.052)	(0.006)	(0.007)	(0.008)	(0.067)
Ln (pre-TP Wars)	-0.137**	-0.079	0.008	0.006	-0.017	-0.012
	(0.059)	(0.080)	(0.009)	(0.012)	(0.012)	(0.108)
Controls	Yes	yes	yes	yes	yes	yes
Adj R^2	0.358	0.385	0.539	0.110	0.293	0.186
Obs.	185	185	191	191	191	191
Panel B. 2SLS						
Taiping	0.311	0.657*	0.052	-0.003	0.131***	-0.345
	(0.237)	(0.368)	(0.042)	(0.041)	(0.048)	(0.426)
Controls	Yes	yes	yes	yes	yes	yes
Adj R^2	0.333	0.375	0.539	0.095	0.178	0.186
N	185	185	191	191	191	191
F stat	35.7	35.7	42.9	42.9	42.9	42.9
Panel C.						
Early Taiping	-0.221**	0.256	-0.003	0.025	-0.016	-0.226
	(0.109)	(0.167)	(0.014)	(0.018)	(0.017)	(0.190)
Late Taiping	0.469***	0.984***	0.169***	0.020	-0.025	0.779***
	(0.160)	(0.215)	(0.035)	(0.031)	(0.026)	(0.261)
Ln ($Likin_{1880}$)	0.038**	-0.005	0.006***	0.008**	0.019***	-0.173***
	(0.017)	(0.019)	(0.002)	(0.004)	(0.004)	(0.030)
Taiping * standardized	-0.089**	-0.176***	0.001	-0.046***	-0.017*	0.248***
distance to $Nanjing_{Taiping}$	(0.035)	(0.050)	(0.006)	(0.008)	(0.009)	(0.067)
Ln (Edu_{1820})	0.142***	0.208***	0.027***	0.023***	0.035***	-0.048
	(0.048)	(0.054)	(0.006)	(0.007)	(0.007)	(0.056)
Ln ($Wars_{pre\text{-}TP}$)	-0.130**	-0.078	0.008	0.008	-0.013	-0.051
	(0.056)	(0.081)	(0.008)	(0.011)	(0.010)	(0.093)
Controls	yes	yes	yes	yes	yes	Yes
Adj R^2	0.427	0.433	0.626	0.170	0.404	0.366
Obs.	185	185	191	191	191	191
Panel D.						
Early Taiping	-2.622**	-2.850*	0.132	-0.225	-0.216	2.111
	(1.024)	(1.478)	(0.169)	(0.273)	(0.236)	(3.785)
Late Taiping	-44.945***	-49.872***	-3.091	-8.984**	-7.500***	28.264
	(12.677)	(15.064)	(2.257)	(3.607)	(2.437)	(19.396)
Ln ($Likin_{1880}$)	0.031*	-0.012	0.005**	0.007*	0.017***	-0.169***
	(0.017)	(0.019)	(0.002)	(0.003)	(0.004)	(0.030)
Taiping * standardized	0.154	-0.696	0.001	-0.039	0.582**	4.445
distance to $Nanjing_{Taiping}$	(2.032)	(2.959)	(0.322)	(0.398)	(0.292)	(3.692)
Ln (Edu_{1820})	0.123**	0.187***	0.026***	0.020***	0.033***	-0.037
	(0.048)	(0.055)	(0.006)	(0.007)	(0.007)	(0.057)
Ln ($wars_{pre\text{-}Taiping}$)	-0.147***	-0.096	0.007	0.004	-0.019**	-0.044
	(0.055)	(0.078)	(0.009)	(0.010)	(0.009)	(0.095)
Ln ($Likin_{1880}$)* Early	0.277**	0.359**	-0.015	0.029	0.022	-0.278
Taiping	(0.120)	(0.171)	(0.020)	(0.032)	(0.027)	(0.439)
Ln ($Likin_{1880}$)* Late	4.564***	5.112***	0.328	0.905**	0.750***	-2.768
Taiping	(1.279)	(1.516)	(0.227)	(0.364)	(0.246)	(1.960)
Ln ($Likin_{1880}$)* Taiping	-0.016	0.061	0.001	0.001	-0.059**	-0.426
*stan. dist to $Nanjing_{Taiping}$	(0.202)	(0.294)	(0.032)	(0.040)	(0.029)	(0.367)
Controls	yes	Yes	yes	yes	yes	Yes
Adj R^2	0.452	0.450	0.624	0.205	0.439	0.365
Obs.	185	185	191	191	191	191

Note: The other controls in Panels B are: silk and tea prefectures dummy; the four post designations classified by the Qing government in 1820; log population in 1820, log land tax burden per mu in 1820, log distance to the coast, to Yangzi River. $Wars_{pre\text{-}TP}$ refers to the frequency of war between 1776 and 1853.

In Panel B, the instrumental variable for TP is the longitude of the prefecture seat.

Table 10. Summary of key findings and match with the hypotheses

	Pop level	*Modern GDP per capita*	*Modern Fiscal Capacity*	*Modern sector*	*Modern Human capital*	*Support Hypotheses*
Fast pop growth before TP						Malthusian transition
Taiping (vs not Taiping)	-*		+*	+*	+* (2sls)	Malthusian transition. The war-induced-state-capacity.
Late (vs Early) Taiping	initial -*; recovery +*	+* (early -*)	+*	+*	-* on health	Stationary-bandit property-rights. Malthusian transition.
Early Taiping	-*	-*				Against the naïve Malthusian transition hypothesis.
More idle land in Early than in Late Taiping						Stationary-bandit property-rights.
Taiping-Capital-Close	initial -*; recovery +*	+*	+*	+*	+*	Distance-based stationary bandits. Malthusian transition.
Initial post-war fiscal capacity	-*	+*		+*	+*	Likin-as-fiscal-capacity. Not: Likin-as-tax.
Initial Likin*Early Taiping		+* (sml)	+* (sml)			Malthusian transition.
Initial Likin*Late Taiping		+* large	+* large	+*	+*	The fiscal-and-institutional-capacity complementarity.
Initial Likin*Capital-Close					+*	The institution-induced skill demand.
No. of wars since 1776		-*				Inconsistent with War-and-Development hypothesis.
Initial human capital		+*	+*	+*	+*	The HC-long-term-development view

Appendix

Table A. Distribution of Prefectures in Different Groups

	Treatment Group			Control	Total
	Occupied	Taiping			
		Early Taiping	Late Taiping		
Provinces within TP	1	37	18	5	61
Anhui	*0*	*13*		*0*	*13*
Jiangxi	*0*	*14*		*0*	*14*
Hubei	*0*	*10*		*1*	*11*
Jiangsu	*1*		*7*	*4*	*12*
Zhejiang	*0*		*11*	*0*	*11*
Province outside Taiping	63	0	0	142	*205*
Whole Sample	64	37	18	147	*266*

Appendix B: Variable Definitions and Resources

Variables	Definitions and source
ln(Population)	Population size of a Prefecture in 10,000 (in logs) in specific years. Source: China Population Census Data, Cao (2001).
Taiping	equal to 1 if there was any county in the prefecture under the control of the Taiping Regime. Source: Hua (1991).
Occupied	equal to 1 if the prefecture is not in the Taiping Regime but was occupied by the Taiping Army. Source: as above.
Early Taiping	Equal to 1 if the prefecture was under TP control and in Anhui, Jiangxi, or Hubei Province, which experienced the early phase of the land policy of TP. Bol and Ge (2007)
Late Taiping	Equal to 1 if the prefecture was under TP control and is in Zhejiang or Jiangsu Province, which experienced the late phase of the land policy of TP. Bol and Ge (2007)
log (No. of Battles)	Number of Battles in the prefecture during Taiping Rebellion (in logs). Source: Taiping tianguo dilizhi: (Geographical Records of Taiping Heavenly Kingdom) (Hua, 1991)**.**
log (Duration)	Duration (days) of TP occupation (in logs). Source: as above.
Distance to XXX	distance (in meters) from the seat of the prefecture to XXX. XXX could be Yangzi River, or Coast, or Grand Canal. Source: Bol and Ge (2007).
Standardized distance to $\text{Nanjing}_{\text{region}}$	Standardize (log) distance to Nanjing for *region*¸ *region* being *Taiping, Early (Taiping), Late (Taiping).*
Land tax per mu in 1820	The farm land tax in taels of silver per mu in each prefecture in 1820. Source: Liang (1980)
Number of Palace Graduate, 1793 to 1820	The number of people received Palace Graduate (*Jin Shi*) title per million population in each prefecture from 1790 to 1820. Source: Jiang (2007).
Number of Palace Graduate, time-varying	The number of people received Palace Graduate (*Jin Shi*) title per million population in each prefecture between the end of the last period and the end of this period. Source: Jiang (2007). For the base year 1820, the measure refers to that between 1793 and 1820.
Number of Neighboring Provinces	Number of Neighboring Province for the prefecture. Bol and Ge (2007).
Tea Prefecture	Equal to one if any county in the prefecture is a tea production area. Source: Wu (1990).
Silk Prefecture	equal to one if there was an official silk bureau established in the prefecture in Ming Dynasty. Source: Zhu (1992).
Post Designations being XXX	Dummy variable equal to 1 if the prefecture importance level was classified in 1820 as XXX, which could be: “Communication (Chong)”, “Business (Fan)”, “Difficulty (Pi)”, and “Crime (Nan)”. Source: Bo and Ge (2007).
Duration of the Treaty Port	Duration of the Treaty Port in years before 1949. Source: Yan (1955).
Duration of the Concession	Duration of the Concession in years before 1949. Fei (1991).
Duration of the Leased Territory	Duration of the leased territory in years before 1949. Fei (1991).
Frequency of Wars since 1776	The number of wars/battles since 1776 up to the sample year in each prefecture. Source: Li (2007), Chinese Military History Editorial Committee (2003).
Longitude	Longitude of the prefecture seat. Source: Pol and Ge (2007).
Percentage of Wasteland	Wastelands / (Wastelands + Cultivated Land) in 1915. Source: The Agriculture and Commerce Statistic Table of Republic of China (1915).
Prefecture Capital Seat	Equal to 1 if the town hall of prefecture is located in the county. Bol and Ge (2007)
Greatest-Importance County	Equal to 1 if the county was classified as the most important in 1820. Source: Bol & Ge (2007).
Trade Center	equal to 1 if the county is a trade center designed by Shina Shobetsu Zenshi (1915). Source: as above.
Likin per 1000 square kilometers	The annual provincial revenue of likin in taels of silver per 1000 square kilometers for the province. Source: Luo (1936); The Second Historical Archives of China (1996).
ln (GDP PC 2010)	GDP per capital in logs, Yearbook of China Region Economic Statistics, 2011
ln (Fis Rev 2010)	Revenue of Local Government per Capita in 2010 in logs, Yearbook of China Region Economic Statistics, 2011
Share pop: ind 2000	Share of population in industries in 2000, Population Census of China 2000
Share pop: nonAg 2000	Share of population in the non-agricultural sector in 2000. Source: as above.
ln (Sch. 2000)	Average years of schooling in 2000 (in logs). Source: as above.
Death rate	Death rate (% of total population). Source: as above.

Appendix C: Summary Statistics

Variable	level	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable						
Population Size (in logs)	Prefecture-year	1862	4.854	1.120	1.194	8.173
ln (GDP PC 2010)	Prefecture	186	9.846	0.618	8.421	11.927
ln (Fis Rev 2010)	Prefecture	186	-2.415	0.799	-4.166	0.212
Share pop: ind 2000	Prefecture	192	14.481	11.462	2.305	57.77
Share pop: nonAg 2000	Prefecture	192	21.026	10.252	6.186	73.81
ln (Sch. 2000)	Prefecture	192	1.989	0.112	1.625	2.234
Death rate	Prefecture	192	6.139	0.907	3.174	8.933
Key independent Variables						
Taiping	Prefecture	266	0.207	0.406	0	1
Occupied	Prefecture	266	0.241	0.428	0	1
Taiping *log(No. of Battles)	Prefecture	266	0.817	1.072	0	4
Taiping*log(Duration)	Prefecture	266	2.097	3.067	0	10
Early Taiping	Prefecture	266	0.068	0.252	0	1
Late Taiping	Prefecture	266	0.139	0.347	0	1
Control Variables						
Distance to Yangzi	Prefecture	266	13.027	1.297	5.582	14.552
Distance to Coast	Prefecture	266	12.484	1.255	5.066	14.038
Distance to Yunhe	Prefecture	266	12.710	1.152	7.572	14.448
Land Tax per Mu in 1820	Prefecture	266	0.080	0.076	0.002	0.664
Number of Jinshi from 1793 to 1820	Prefecture	266	10.508	17.319	0	148
Number of Neighboring Provinces	Prefecture	266	1.083	0.825	0	3
Tea Prefecture Dummy	Prefecture	266	0.500	0.501	0	1
Silk Prefecture Dummy	Prefecture	266	0.083	0.276	0	1
Post Designations_Chong in 1820	Prefecture	266	0.658	0.475	0	1
Post Designations _Fan in 1820	Prefecture	266	0.917	0.276	0	1
Post Designations_Pi in 1820	Prefecture	266	0.380	0.486	0	1
Post Designations_Nan in 1820	Prefecture	266	0.805	0.397	0	1
Duration of the Treaty port	Prefecture-year	1862	5.214	17.729	0	106
Duration of the Concession	Prefecture-year	1862	1.425	9.767	0	99
Duration of the Leased Territory	Prefecture-year	1862	0.367	3.887	0	58
Frequency of Wars since 1776	Prefecture-year	1862	2.346	2.940	0	17
Number of Jinshi in each prefecture by period	Prefecture-year	1862	9.515	23.135	0	302
Instruments and others						
Longitude	Prefecture	266	111.596	5.746	95.789	121.543
Famine	Prefecture	266	0.158	0.365	0.000	1.000
ln (Likin per 1000 sqare km in 1880)	Prefecture	266	6.561	2.996	0.000	10.075
ln (Likin per 1000 sqare km in 1910)	Prefecture	266	7.658	1.280	6.424	10.193
ln (Likin per 1000 sqare km in 1953)	Prefecture	266	8.527	1.102	6.084	10.426
standadized distance to $\text{Nanjing}_{\text{Taiping}}$	Prefecture	266	0	0.451	-6.748	0.709
standadized distance to $\text{Nanjing}_{\text{Early}}$	Prefecture	266	0	0.369	-2.231	1.290
standadized distance to $\text{Nanjing}_{\text{Late}}$	Prefecture	266	0	0.253	-3.945	0.475
Agriculture Data in 1915						
Percentage of Wasteland	County	332	4.460	9.838	0	75.105
Taiping	County	332	0.741	0.439	0	1
Early Taiping	County	332	0.455	0.499	0	1
Late Taiping	County	332	0.286	0.453	0	1
Initial Likin (1880)	County	332	9.154	0.976	0	10.075
standadized distance to $\text{Nanjing}_{\text{Taiping}}$	County	332	0	0.997	-13.190	1.176
Prefecture Capital Seat	County	332	0.196	0.397	0	1
Greatest Important County in 1820	County	332	0.057	0.233	0	1
Trade Center in 1915	County	332	0.386	0.487	0	1