Article

Colonial Legacies and State Institutions in China: Evidence From a Natural Experiment

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Abstract

What is the legacy of Japanese colonial rule in East Asia? In this article, I use a geographic regression discontinuity design to examine of the long-run effects of Japanese rule over northern China. I find that the Japanese colonization of northern China had a positive long-run effect on state institutions—with persistent increases in schooling, health, and bureaucratic density. I also find suggestive evidence that colonization led to increases in wealth, as measured by census data and nighttime luminosity. The positive legacy of Japanese colonization in northern China suggests that intense state building efforts can pay long-run dividends, even in the context of a brutal and extractive regime.

Keywords

state building, economic growth, historical legacies, colonialism, regression discontinuity, natural experiment, satellite data, China

Introduction

In an influential article, Acemoglu, Robinson, and Johnson (2001) argue that the long-run consequences of European colonial rule hinged on whether colonial powers set up extractive political institutions or politically liberal

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"European-like" states. Where colonial powers set up extractive institutions like forced labor, economies have stagnated; where they set up European-like states that respect private property and other rights, they have prospered. A number of empirical studies have borne out this basic insight. For example, indirect rule by the British has been credited with leaving a relatively positive legacy in South Asia, Latin America, and Africa (Iyer, 2010; Lee & Schultz, 2012; Mahoney, 2010). On the other hand, colonization by the Spanish, which more often focused on extracting mineral wealth through forced labor, has left a legacy of poverty and weak political institutions (Dell, 2010; Mahoney, 2003).

However, in the recent wave of attention to the long-run consequences of colonial rule, the colonization of northern China by Japan has been left out of the picture. The case is interesting because the Japanese did not introduce European-like liberal institutions in northern China, but at the same time they made considerable investments in local state institutions, making the experience of Japanese colonialism and its theoretical lessons different than that of European colonization. In northeastern China—and also in Korea and Taiwan—the Japanese trained bureaucrats, restructured bureaucracies, and expanded schooling and public health, but without introducing strong property rights or free and fair elections, and while often resorting to violence to control the local population.

It is crucial to note at the outset that south of the Great Wall, the Japanese invasion and occupation of southern China was by any reckoning brutal—notable for the massacre of hundreds of thousands of civilians and the coercion of tens of thousands of women into sexual slavery. However, two regions of northern China were spared the worst of the violence of the invasion: the Japanese colony of Manchukuo and, to the colony's west, Inner Mongolia.

In this article, I use a geographic regression discontinuity (RD) design to compare the former colony of Manchukuo with neighboring areas in Inner Mongolia. Both sides of the border have historically been part of the Mongolian heartland and, of crucial importance for the research design, the border was not an important political boundary before or after colonization, allowing me to isolate the long-run effects of being just inside or outside the colony. I draw on data from the 2000 Chinese census, statistical yearbooks, and satellite imagery of nighttime lights.

I find that colonization had a persistent positive effect on state institutions in northern China. The Japanese-run state of Manchukuo expanded enrollment in schools, improved public health and sanitation, and increased the size of the bureaucracy. More than half a century after colonization, I find strong evidence for long-run increases in schooling and sanitation in

the former colony. Colonization may have also led to long-run increases in the size of the local bureaucracy, although the results on this measure are less conclusive.

In addition, I find suggestive evidence that colonization led to long-term increases in wealth, as measured by census data and nighttime luminosity. These findings underscore the importance of strong state institutions in reducing poverty, especially in a state-led economy. This is consistent with foundational work by Oi (1992, 1999), who argues that China's rapid growth in the 1980s relied on capable bureaucrats at the township and village levels, as well as a more recent study by Looney (2012), which shows how state-led development has often transformed rural economies across East Asia.

The legacy of Japanese rule over northern China suggests that intense state building efforts can pay long-run dividends, even in the absence of liberal political institutions cited by Acemoglu et al. (2001) and others as the key legacy of British-style rule. This study also contributes to a long-running debate over the origins of East Asia's strong states. Kohli (1994, 2004) and Cumings (1984) have previously argued that Japanese colonial rule over Korea and Taiwan strengthened those states. However, others have rejected the idea that Japanese rule played a decisive role in creating East Asia's expert bureaucracies (Doner, Ritchie, & Slater, 2005; Ha & Kang, 2011; Haggard, Kang, & Moon, 1997). This article lends support to the view that Japanese colonialism strengthened East Asian states with evidence from China.

In what follows, I begin with a brief overview of the literature on the origins of high-capacity developmental states, and describe the history of Japanese imperial rule over Northeast China. I then outline the basic research design and present results from RD estimates.

State Building, Colonial Rule, and Economic Growth

Early work by Johnson (1982) and Evans, Rueschemeyer, and Skocpol (1985) suggest that states like Japan became industrial powerhouses because of carefully crafted policies implemented by highly capable bureaucracies. Strong, cohesive states can formulate economic policies and implement them; weaker states cannot. Subsequent work has demonstrated that high-growth East Asian countries like Taiwan and Korea also relied on capable states to lead industrialization efforts (Amsden, 1992; Wade, 1990), while countries like India, Brazil, and Indonesia grew more slowly because they possessed less capable states that struggled to modernize their economies (Evans, 1995; Haggard, 1990; Vu, 2007).

Although there is a consensus that strong states are one of several key preconditions for promoting growth, there is less agreement over their origins. Early contributions to the debate by both Cumings (1984) and Kohli (1994, 2004) suggest that Japanese colonization, though violent and exploitative, left in its wake a legacy of well-trained and highly efficient bureaucracies in Korea and Taiwan. They argue that the investments in state-building the Japanese undertook were important precursors to later economic growth and poverty reduction.

Kohli highlights several specific steps taken by the Japanese to strengthen the Korean state. First, the Japanese greatly expanded the civil service, which under Japanese tutelage increased in size by close to an order of magnitude. Second, they enlarged the number of police, again by a factor of 10, while improving police discipline and training. Finally, they expanded enrollment in state-run schools, which not coincidentally had a pro-Japanese curriculum.

Yet others have forcefully challenged the view that Japanese colonial rule left Korea with a stronger state, calling into question the causal link between Japanese imperialism and later economic growth. In response to Kohli's 1994 article, Haggard et al. (1997) argue that Japanese investment in state building in Korea was actually meager. They note that few Koreans held senior positions in either the civil service or police force, which both had primarily Japanese leaderships; Koreans were instead relegated to working as lower-level clerks and officers. They find more discontinuity than continuity between the Japanese colonial state and the later efficient, Korean-run state. Ha and Kang (2011) similarly credit bureaucratic reforms during the post-colonial era with creating Korea's efficient, if still somewhat corrupt, developmental state. Doner et al. (2005) also explicitly reject the idea that colonial rule played a decisive role in creating East Asia's expert bureaucracies.

In short, there is sharp disagreement over whether or not Japanese colonial rule had a positive long-run effect on state strength and therefore later economic growth in East Asia. In this article, I attempt to adjudicate between these competing positions with evidence from a natural experiment. The results suggest that Japanese rule indeed had a positive effect, at least in northern China.

This article also contributes to our understanding of how differential levels of state capacity drive growth patterns within China. China's rural "take off" of the 1980s required a strong state presence at the village and township levels, where the rural state took center stage in implementing modernizing reforms.[1] The classic account of economic growth in rural China by Jean Oi argues that rural development has been driven by local bureaucrats. Fiscal reforms gave officials in townships control over the revenue they generated,

which created incentives to cultivate rural industry, and to create state-controlled township and village enterprises (TVEs). As a result, as Oi (1992) writes, "Local governments have taken on the characteristics of a business corporation, with officials acting as the equivalent of the board of directors" (p. 100).[2]

However, the strength of village and township governments—and their ability to carry out successful state-led development pushes—is hardly a given. In China, the Qing and Republican governments that preceded the Communist state barely penetrated rural society in many areas of China (Duara, 1988). Elsewhere in East Asia, state-led modernization "campaigns" transformed rural economies by mobilizing township-level bureaucrats and farmers, and played a central role in rural development (Looney, 2012; 2015). What are the origins of East Asia's strong bureaucracies? Did Japanese colonial rule play a positive role or a negative one?

Manchukuo Before Colonization

To examine the consequences of Japanese colonial rule over northeastern China, I use a geographic border as a natural experiment. In particular, I use the western border of the Japanese colony of Manchukuo, which lies in what is today Inner Mongolia in northern China, shown in Figure 1. The eastern side of the border belonged to the *de facto* Japanese colony of Manchukuo from 1932 to 1945, while the western side was controlled by Mongolian elites.

For centuries, this area of Inner Mongolia had only a weak state presence. In an attempt to consolidate control over the region in the 19th century, the Qing encouraged Han migration and settlement into areas dominated by the Mongols, and the Han did indeed move in large numbers. Yet the Qing and the successor Republican governments both found themselves competing with the Japanese for influence over the region, and not entirely successfully (Duara, 1988).

Dissatisfied with informal control over Manchuria and Inner Mongolia, the Japanese invaded in 1931, creating a puppet state called Manchukuo that ultimately encompassed historically Manchu northeast China as well as the eastern region of Inner Mongolia. The heart of Manchukuo was the fertile Northeast China plain, suitable for growing wheat, soybeans, and other crops. The area I focus on in this study lies in western Manchukuo, in the mountainous region depicted in Figure 1, which was historically Mongolian.

To the extent that different sides of the colonial borders enjoyed different endowments before the Japanese invasion, it appears that the *non*-colonized side of the border was wealthier—which works against the results presented

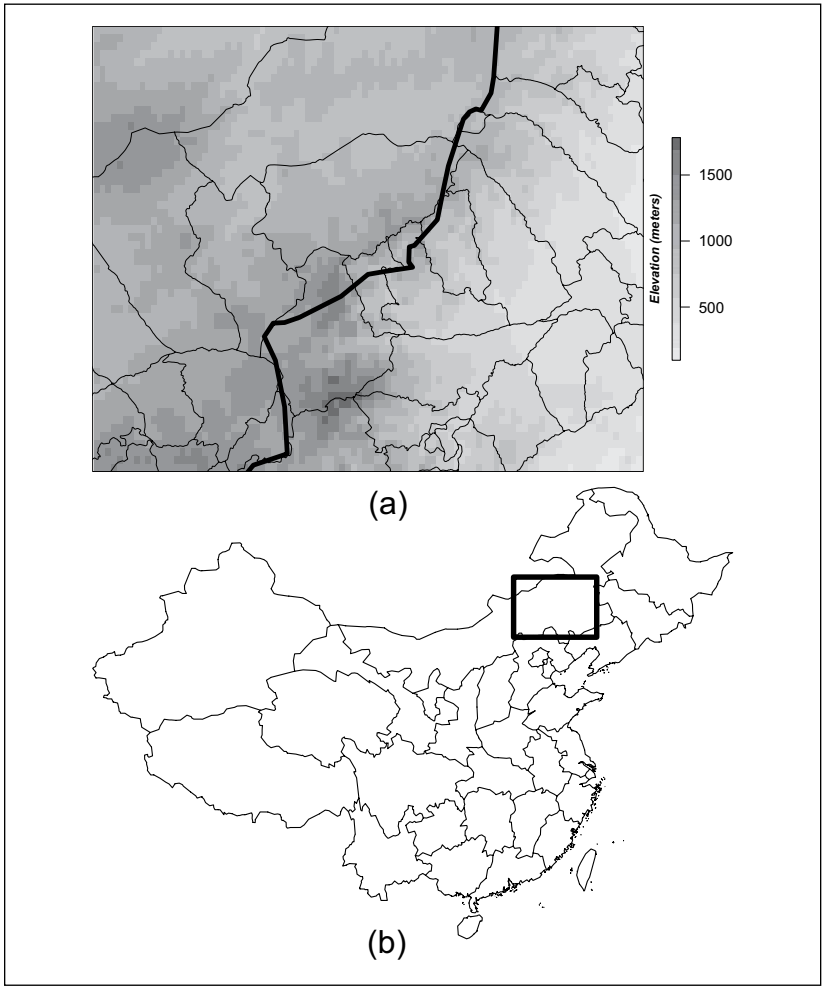

Figure 1. (a) The western border of the Japanese puppet state of Manchukuo, shown with a black line, and (b) The area of detail, which is approximately the size of South Korea.
In Figure 1a, current county borders are shown with lighter black lines, and altitude is shown in the background.

in this article. The data collected about the region by previous rulers are of limited value since the borders changed significantly just prior to Japanese rule. Still, as Table 1 shows, population data from the final Qing census

Table 1. Pre-Colonization Characteristics of the Colonized and Uncolonized Side of the Border.

	Colonized side	Uncolonized side
Percent of cultivated land irrigated (1932)	1%	11%
Farm households (1932)	78%	80%
Members per household (1912)	4.78	4.78
Post-primary schools (1916)	3	14
Middle school spending per pupil (1916)	US$32	US$51

The values are approximate since the border shifted significantly.

(Liang, 1980) show that both areas, roughly defined by political boundaries, had similar numbers of people per household. Given the strong positive correlation between wealth and household fertility in this era (Chen, Lee, & Campbell, 2010), this is at least suggestive of the fact that there were no major pre-colonization differences in wealth. Agricultural data from an independent assessment (Cressey, 1934) and earlier schooling data from the Republican government (Ling, 1921) suggest the uncolonized region could have been slightly wealthier before the Japanese invasion.

The Manchukuo Border

In any natural experiment, the strength of causal inference rests on the plausibility of the assumption of "as-if" random assignment of "treatment" (Dunning, 2008). In an ideal natural experiment that relies on a geographic border, some political actor would draw a new political line entirely arbitrarily. The western border of the Japanese colony of Manchukuo—in what is today Inner Mongolia—was the result of a confluence of events that approximates this ideal, though with some important limits.

The colony's western border was initially drawn with the aim of creating new divisions where none had existed before—that is, it was deliberately arbitrary. (The other borders of the colony were less arbitrary, and are therefore not used as points of comparison in this article: The southern border of the colony followed the Great Wall, an historically important discontinuity, while the northern border of the colony was with Russia.) The western boundary was created by the Chinese government during a reshuffling of the nation's political borders shortly before the Japanese invasion.[3] Crucially, the Chinese government's main consideration seems to have been to draw new provincial lines that cut against existing boundaries to divide and cripple the local Mongol elites. As Lin (2010) notes,

> Regardless of repeated petitions sent by the Mongol nobility in an effort to preserve their status of political autonomy, in 1929, Nanking legislatively proclaimed new provincial boundary lines in Inner Mongolia, which cut ruthlessly across the Mongol banner and league frontiers, contributing further to the Mongols' disunity and facilitating their ultimate absorption by the Chinese. (p. 174)

The Republican government split what had been six leagues during the Qing dynasty into what ultimately became more than 50 banners (Perry & Selden, 2003).

The initial Japanese invasion in 1932 stopped at this newly drawn provincial border, shown on the map with the thick black line. Military–civilian tensions and fear of an international backlash led the Japanese emperor to halt the invasion at this boundary instead of pressing further west. As the chief aide noted in his private diary, the emperor halted the invasion here, evidently against the wishes of the military, "to demonstrate clearly to the people at home and abroad that Japan had no territorial designs on China proper" (Honjō & Hane, 1982, p. 75). (Of course, the Japanese military would a few years later launch a brutal invasion of the south). This decision turned a line that had recently been added to Chinese maps into an important international border.

Crucially for the purposes of causal identification, this border was only a politically important boundary during the Japanese rule over Manchuria. Early in the Communist regime, in 1955, the border era was absorbed into Inner Mongolia and Hebei Provinces. This occurred before most of the major development pushes that remade the Chinese countryside. To the extent that the analysis identifies *discontinuous* differences between the two sides of the colonial border, it helps to rule out the rival explanation that policies before or after colonization drove differences in political and economic outcomes.

Colonial-Era State Building

After conquering northeastern China, the Japanese set about strengthening the new puppet state of Manchukuo. Compared with the weak Qing and Republican governments that preceeded it, the Manchukuo state was brutal and efficient. As Prasenjit Duara (2006) notes, "Manchukuo presents us, on the one hand, with a record of cruel violence; and, on the other hand, with the record of a developmental state" (p. 60).

The Japanese effort to create a strong state had four major components. First, the occupiers undertook an extensive administrative restructuring. Second, they increased the number of local bureaucrats and invested in their

training, in particular creating a large police force that was 95% indigenous and served as the regime's grassroots bureaucracy, involved in practically every aspect of local governance. Third, they created an extensive network of health clinics and schools. And, finally, they introduced a planned economy that produced a large amount of raw materials for the broader Japanese war effort.

Administrative Restructuring

Following the invasion, the Japanese quickly created the rules, procedures, and divisions of authority that are essential for states to function. Within 4 months, colonial administrators had established a complete system of government bureaus and departments. They rapidly issued rules on nearly every conceivable aspect of the bureaucracy: pay scales, budget forms, the proper patterns for office furniture, and even the correct way for prison guards to walk (Han, 1995). The rules were often strictly enforced. For instance, as a shaming tactic, the state regularly published the names of absent or sick bureaucrats in the official daily gazette.

Among the most important administrative reforms undertaken by Manchukuo officials was the renovation and rehabilitation of the Chinese imperial *baojia* system. Under the *baojia* system, 10 households were organized into a *pai*; several *pai* were organized into one *jia*; and several *jia* made up one *bao*. The leaders at each level were responsible for enforcing order, for collecting taxes, for implementing state policy, and for monitoring their neighbors. The system had been established by Song Dynasty rulers, but under the Qing, the system had languished, particularly in Manchuria. The Japanese re-imposed the baojia system throughout the colony, even in urban areas, and it served as the basis for administration.

The administrative structure the Japanese created would not survive the Communist revolution, but it gave indigenous political elites important experience with a rationalized bureaucracy. As I discuss further below, there was in Inner Mongolia a surprising continuity between the pre-Communist state and the Communist state, which stands in stark contrast to other areas of China, where the victors in China's Civil War destroyed the existing elite.

Bureaucratic Training and the Police

Colonial administrators also invested in training a large cadre of local bureaucrats. Rather than destroying local political elites, Japanese administrators allied themselves with them (Lattimore, 1969; Mimura, 2011). The official

policy was one of "rule of the Mongols by the Mongols" (*Mōjin mō-ji*). Although the language of self-rule was propaganda, it nevertheless reflected a deeper truth: In Manchukuo, the Japanese colonial rule included a substantial number of indigenous administrators.

The local population was involved in nearly every aspect of the colonial states' administration. The Japanese set fixed ratios for the number of Japanese and local bureaucrats in each central department. The powerful General Affairs Agency was dominated by Japanese administrators by a 7 to 3 margin, but the Business Department had an even ratio of local officials to Japanese bureaucrats (Mimura, 2011).

The largest arm of the new Manchukuo was the police force, in which 95% of the positions were filled by Manchu, Mongol, and Han Chinese. The number of police in Manchukuo was staggering: there were 2½ times more policemen per person in Manchukuo than there were in Korea in 1936 (Han, 1995). A majority of the most senior positions in the police force, such as the governing board, were held by the Japanese. But many junior positions of command were held by Chinese officers. This meant that there was a sizable cadre of locals who were trained in the basic arts of bureaucracy and bureaucratic management.

The Manchurian police were the country's street-level bureaucrats, charged with a great deal more than enforcing law and order. Duara (2006) writes that

> Manchukuo's huge police force conducted punctiliously detailed censuses and surveys; made extensive and complex plans for settlements; paid close attention to hygiene and welfare; made available education, drinkable water, shelters; and mobilized the population for inoculations—though sometimes at gunpoint. (p. 60)

The Planned Economy

Soon after taking power, the Japanese also introduced a planned economy. The Soviet Union served as a model: Bureaucrats adopted 5-year plans, issued directives, and set production targets. The Japanese also created an extensive system of planning bureaus that would reshape the Manchurian economy. Among these were an industrial research bureau and scientific institutes (Mimura, 2011).

As in Soviet Russia, the Japanese-led planned economy was as coercive and ambitious. As Mimura (2011) notes, the "state bureaucracy, not the market, approved the entry and exit of firms; appointed managers; allocated labor, materials, and products; and determined prices." The government also

created special companies that operated like state owned enterprises, including central bank and telephone and telegraph company.

The state's heavy hand in industrial policy and development was in many ways successful. In the early years of the de facto colony, some 77% of investment occurred through the Manchukuo government or the Mantetsu railway company, which was also effectively controlled by the Japanese state (Young, 1997). The Japanese also reshaped the agricultural economy. Under Japanese influence, Manchuria's agrarian economy become reliant on a single crop: the soybean. By the outbreak of the war, half of the world's soybeans were grown in northern China (Young, 1997).

The planned economy gave Manchukuo an economic head start when the Communists took power. The region already had a well-developed base of heavy industry, and a decade of experience managing the economy would arguably prove to be useful training for the region's bureaucrats.

Education and Public Health

The Japanese state-building effort in Manchukuo included a substantial investment in schooling and public health. Within a year of the takeover, the Manchukuo state had surveyed schools, established a new curriculum, and issued hundreds of directives on school organization. Enrollment expanded rapidly throughout the colonial puppet state. Within 2 years, state officials had issued new textbooks in Japanese and Chinese (Han, 1995). The Manchukuo state also established a cadre of "social educators" who lectured on everything from Confucian morals to sanitation.

Improved sanitation was a priority for officials. In concert with the cadre of social educators, state bureaucrats spread knowledge about proper sanitation practices. They also improved sanitation by "inspecting horse-carts, having garbage removed, sprinkling water on streets to keep dust down, and inspecting water purity" (Sewell, 2004, p. 225). The state also opened hospitals and clinics throughout the region (James, 2003). Contemporary proponents of Japanese intervention in northern China noted that within a few years of the establishment of Manchukuo, the state had established 18 new hospitals (Saito, 1933).

The legacy of Japanese state building in northeastern China might, therefore, be expected to leave legacies in three distinct areas of statecraft. First, the expansion of the bureaucracy may have had long-run effects on the size of the local state. Second, investment in schooling may have led to persistent gains in education. Third, improvements to sanitation may have had long-run effects on public health outcomes. Below, I test each of these hypotheses.

Post-Colonial Inner Mongolia

After Japan's defeat in 1945, China fell into 4 years of civil war, but when the Communists emerged victorious, they did not simply demolish the relatively strong and capable Manchukuo state, at least not in eastern Inner Mongolia. To be sure, in other regions of China they quickly set about introducing reforms designed to destroy existing power structures, dismantle whatever was left of the Republican state, and increase the Party's control over the state. Yet strategic concerns forced Mao to pursue a more moderate course in Inner Mongolia, both to woo the Mongolians away from the Nationalists during the civil war, and to persuade the Mongolians to not pursue independence after the war ended.

For two decades after Japanese rule, the leaders of Inner Mongolia enjoyed a relatively high degree of autonomy, though it was not absolute. In this era, Mongolians who had been trained by the Japanese and even served in the puppet state's army were not branded collaborators and shut out of power. Rather, as the historian Uradyn Bulag notes, from the mid-1940s to the mid-1960s the leaders of Inner Mongolia "relied on many young eastern Mongol Communists, who were far better educated under Japanese rule than the majority of [western] Mongols"; Bulag notes that the Japanese-trained bureaucrats "were a formidable force" in the region's politics, and often outmaneuvered the Maoists who had been poorly trained by the Communist Party (Bulag, 2004, p. 97). In general, "the Mongols in Manchukuo . . . proved to be politically savvier after the war," in part because they were able to draw on a "common experience of colonization and unified administration" (Bulag, 2004, pp. 88-89).

The Cultural Revolution temporarily disrupted this order. As occurred elsewhere in China, a cloud of suspicion soon descended on the existing political elite. As Bulag notes, by 1966 service in the Japanese-run Hingan Army became a liability. Leaders who had served under the Japanese were labeled class enemies and persecuted.

Yet while the colonial border had all but disappeared on maps by 1955, the division between eastern and western Mongolia forged by Japanese rule remained a powerful political force. Bulag notes that even now there remains three important factions in Inner Mongolian politics: the ethnic Chinese; western Mongols; and Eastern Mongols, the former colonial subjects of Japan.

Data

I test the effect of colonization on township-level outcomes using data from a variety of sources. The key data source is the 2000 Chinese census, for

which the China Data Center at the University of Michigan has created a geocoded township-level data set. I use the census data to measure the location of townships, as well as their populations and ethnic compositions. The 2000 census is high quality in comparison with many other developing world censuses (Lavely, 2001), but does have well-known issues with proper counting of migrants and, due to incentives created by the One Child Policy, accurate reporting of sex ratios.

I draw on the census to measure whether colonial efforts to expand the size of the local bureaucracy and invest in schooling and sanitation have persisted. Consistent with the standard measure used by the World Bank and other organizations, I measure improved sanitation as the percentage of households that report having flush toilets. I also use the census to measure the percentage of people in each township with post-primary school education, and the percentage of the employed population that works for the government.

I draw on a combination of census and satellite data to measure whether the colonized side of the border is wealthier than the non-colonized side. Census data are used to estimate the percent of households that report spending more than 10,000 yuan on housing, which is the most direct census question about spending habits.[4] I also use nighttime luminosity data from the Global Defense Meteorological Satellite Program Operational Linescan System (DMSP-OLS) Nighttime Lights Time Series. These data are thought to correlate with the level of economic activity (Henderson, Storeygard, & Weil, 2012). In the data I present here, I process data using the earliest available date for this data series, 1992, to demonstrate that the discontinuity was also present soon after China's economic reforms started.

Additional variables are drawn from several sources, and are used to measure pre-treatment covariate balance. Estimates for township terrain are calculated using data from the Shuttle Radar Topography Mission (Rabus, Eineder, Roth, & Bamler, 2003). Data on average yearly precipitation come from the WorldClim project, which bases its estimates on interpolations from weather stations (Hijmans, Cameron, Parra, Jones, & Jarvis, 2005). Finally, data on average soil quality are drawn from the Harmonized World Soil Database created by the Food and Agriculture Organization of the United Nations, which based the data for China on a soil map produced by the Chinese Academy of Sciences (Fischer et al., 2008).

Results

In this section I present results that compare the two sides of the colonial border five decades after the end of the Japanese rule. In the first section, I

review simple difference in means results that make relatively few assumptions. Next, I turn to results from RD tests. These regressions model each townships' distance from the border and control for potential post-"treatment" sorting of populations. Finally, as a robustness check, I present results from placebo tests.

Difference of Means Results

Difference of means tests require few assumptions and, in natural experiments, are a simple and transparent way of assessing the credibility of the design and its results. For the design of this study to be valid, townships close to the border must have similar underlying pre-treatment characteristics. Previously, I presented data from the Qing and Republican eras that suggested, though inconclusively, that the areas had similar economic conditions before Japanese colonization. However, there should also be no discontinuous jumps in natural features that might also influence economic development, like climate or geography.

Figure 2 shows difference in means estimates, comparing colonized and uncolonized towns using different "bandwidths." A bandwidth of 10 kilometers includes all towns within 10 kilometers of either side of the colonial border, while a bandwidth of 20 kilometers compares all towns within 20 kilometers of the border, and so forth. The solid line indicates the difference in means estimate for a given bandwidth and the dotted lines indicate 95% confidence intervals (CIs).

The difference in means estimates shows that both sides of the border have similar natural endowments, using a range of different distances from the border as the bandwidth. The two sides of the border have equally rough terrain, which is often associated with poor provision of government services in China (Tsai, 2007). They also have statistically indistinguishable ratings of their soil quality. Close to the border, townships also experience nearly equal amount of rainfall, though at bandwidths of larger than 40 kilometers balance on this measure deteriorates.

A potential concern in coal-rich Inner Mongolia is that one side or another of the border might have more mineral wealth. Employment data from the census are reassuring. Figure 2d shows difference in means results on the percent of the population employed in mining and other aspects of mineral resource development. There is good balance between the colonized and uncolonized side of the border.

While the two sides of the border have similar natural endowments, in the present day state institutions are stronger on the colonial side of the border. Figure 3 presents difference in means results for several outcome variables at

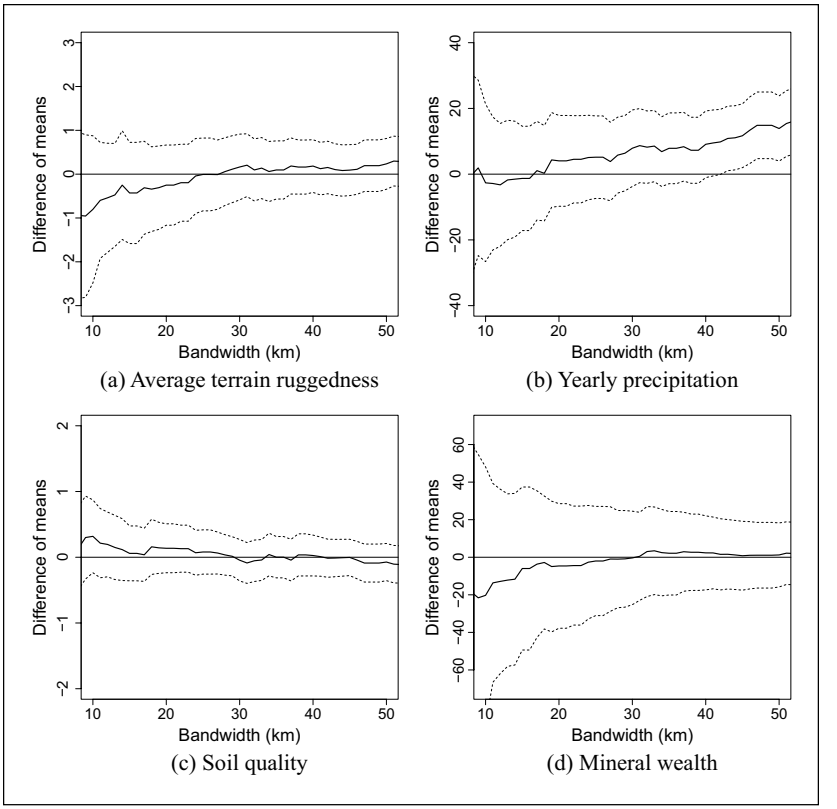

Figure 2. Pre-treatment covariate balance: Difference in means estimates at varying bandwidths, including townships on both side of the former colonial border. Dashed lines are 95% CIs. CI = confidence interval.

different bandwidths (again, all towns within a specified distance in kilometers from the border). Based on the 2000 census data, the colonized side of the border has higher levels of education, which is consistent with a persistent effect of Japanese investment in schooling. There are also persistent increases in sanitation across a wide range of possible bandwidths for the difference in means. The difference in means tests show that townships on the Japanese side of the border have more bureaucrats, but this difference is not statistically significant at the traditional cutoff. There is also suggestive evidence that the Japanese side of the border has higher levels of wealth. The census income proxy shows higher levels of wealth using a wide range of potential bandwidths.

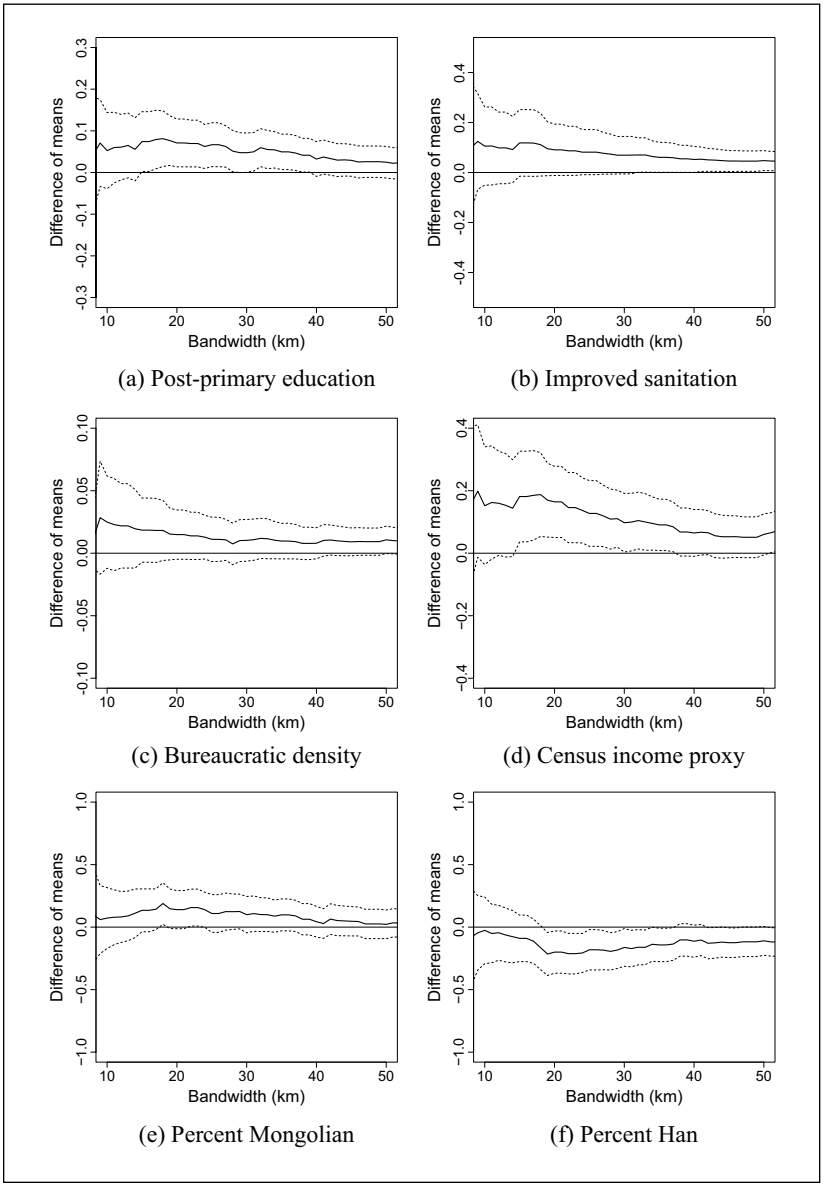

Figure 3. Outcome variables: Difference in means estimates at varying bandwidths, including townships on both side of the former colonial border.
Dashed lines are 95% CIs. CI = confidence interval.

Finally, it is important to note that some population sorting appears to have occurred across this border. The colonized, eastern side of the border has more ethnic Mongolians than the uncolonized side of the border, which has a significantly larger Han population. In many respects, it is surprising to find more Mongolians on the eastern side of the border since the Mongolian heartland lies in the opposite direction, to the west. Although the data are not definitive, a significant portion of the ethnic sorting across the border likely occurred *during* the years of Japanese colonization; many Mongolians were sympathetic to the Japanese after years of colonization by the Han, and the Japanese promised the Mongolians some degree of autonomy. At the same time, the Japanese invasion would likely have induced many ethnic Han to flee the region.

This sorting of ethnic populations is unlikely to explain the main results—rather, they are likely to work against them. Throughout Inner Mongolia, towns with high concentrations of Han are significantly wealthier than towns with high concentrations of Mongolians. Yet I find that the western, Han-dominated side of the border is by all available measures poorer than the eastern side, which has fewer Han and yet is more wealthy. The results are also robust when I add the ethnic composition of townships as a control variable to regression models, which I present in the following section.

RD Results

I next turn to results from RD estimates that make stronger functional form assumptions, but that unlike the difference in means tests estimate an effect size right at the cutpoint, or border. Within the RD framework, I can also add conditioning variables and explicitly model geographic distance from the border. For statistical inference with RD designs, one approach to estimate a local average treatment effect (LATE) is to assume linearity in a narrow bandwidth around the cutpoint, which in this case is a geographic border (Imbens & Lemieux, 2008). Using ordinary least squares regression, I estimate the following:

$$y_i = \alpha + \beta_1 c + \beta_2 z_i + \beta_3 z_i \cdot c_i + \varepsilon, \quad (1)$$

where c_i is a dummy variable for whether a township i has been colonized or not and z_i is its distance in kilometers from the nearest point of the colonial border.

In this specification, β_1 is the estimate for the LATE, and the usual least squares standard errors are used for inference. Green, Leong, Kern, Gerber, and Larimer (2009) compare an actual randomized experiment with

a simulated RD and find this local linear approach to give the least biased estimate. This assumption ignores the two-dimensional geographic nature of the design by collapsing distance from the border into a one dimensional measure, which may be an unreasonable assumption (Keele & Titiunik, 2014). For instance, this design presumes a township on the most northerly point of the border can be compared with a township on most southerly part of the border. Below, I relax this assumption by modeling the distance from the border as a function of latitude and longitude.

When calculating the LATE using a local linear approach, the size of the "bandwidth" is critical. That is, should the data set include all townships within 25 kilometers of either side of the border? All townships within 50 kilometers of the border? 150 kilometers? There are a number of validation procedures for finding the optimal bandwidth to use in the local linear estimate, which generally require the analyst to make decisions about what properties to optimize (Imbens & Kalyanaraman, 2012). In this article, I elect for a simpler and more transparent approach that shows estimates for the LATE (that is, β_1 and its standard errors in the model above) for a continuous range of bandwidths. This has the virtue of showing very clearly the degree to which results are sensitive to bandwidth selection.

Figure 4 shows estimated LATE for each of the four main dependent variables drawn from the Chinese census, which have been standardized to aid comparability. The horizontal axis shows the size of the bandwidth, which ranges between 0 to 20 and 0 to 150 kilometers. (Full regression models for selected bandwidths are presented in the appendix). At a bandwidth less than 20 kilometers, there is a very small number of townships, too few to estimate effect sizes. At a very large bandwidth, the data set includes towns far from the border that are unlikely to be comparable.

The results show that colonization caused persistent increases in the quality of schooling and sanitation of just under one standard deviation above the average. These results hold using any bandwidth between 40 and 100 kilometers. Substantively, this is equivalent to a 50% increase in the number of middle and high school graduates; that is, colonized towns witnessed an increase of approximately 5% in the number of people educated above the primary school level in a region where the average is close to 10%. Colonization also lead to a 9% increase in improved sanitation in a region where townships average a 2% rate.

The results also show an increase in bureaucratic density, although the results are not as robust. At a bandwidth between 60 and 100 kilometers, the results are generally significant at the 90% level. With such a small sample—the data set ranges from 127 to 229 total townships with a bandwidth of between 60 and 100 kilometers—the design is not able to detect small effect

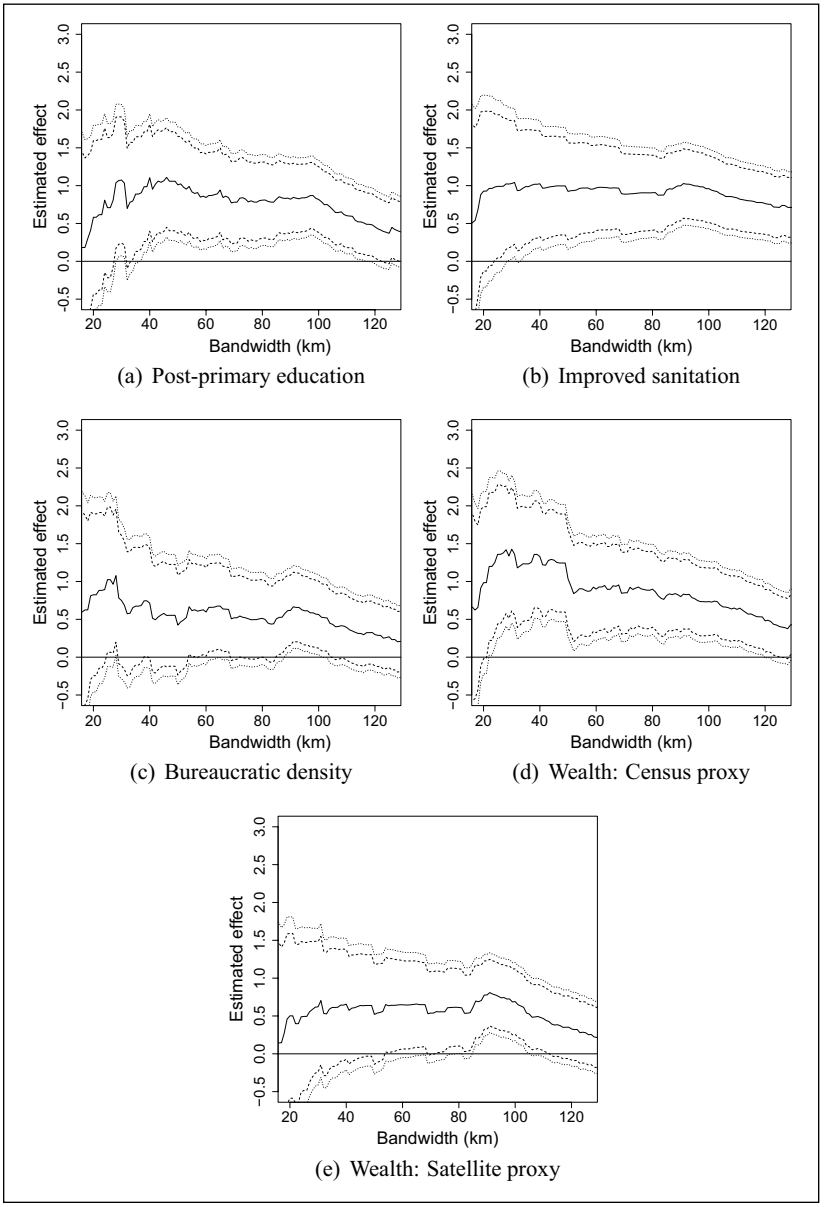

Figure 4. Local linear estimates for the local average treatment effect of Japanese imperial rule, standardized dependent variables.
Dashed lines are 90% CIs, dotted lines are 95% CIs. CI = confidence interval.

sizes. The measured effect is equivalent to an increase in around 2% in the percent of the population employed by the government, where the average is around 12%.

Finally, the census data also present suggestive evidence of an increase in wealth, though caution is warranted in interpreting the results. The data show an increase in the number of people who report spending more than 10,000 yuan on housing, which is the most direct census question about wealth and spending habits. However, self-reporting on this measure may be inaccurate, and local governments in China sometimes manipulate data with the goal of improving leaders' promotion prospects (Wallace, 2016).

Nighttime lights satellite data are an alternative to these self-reported measures of economic activity. Nighttime luminosity data are frequently used to create proxies for economic activity, not only at the national but also at the subnational levels, where the high resolution of the data allows analysts to create measures as low as the township (Chen & Nordhaus, 2011). The nighttime lights data show that colonization by the Japanese led to a long-run increase in nighttime luminosity of approximately half a standard deviation. With bandwidths larger than 50 kilometers, the results are significant at the $p = .90$ level and generally also significant at the $p = .95$ level. These effect sizes are consistent with the direction of the effect using the census data, but are not as large and statistically significant. Taken together, these provide suggestive but not conclusive evidence that Japanese colonization had a positive effect on wealth.

Do the results also hold if I model distance from the border in two dimensions rather than just one? There are several ways to approach such a problem. For instance, Keele and Titiunik (2014) generalize the local linear regression RD estimator to account for the two dimensions present in geographic RD designs with kernel weighting. Following Dell (2010), I estimate a polynomial function that controls for smooth functions of geographic location. The specification for these regressions is as follows:

$$y_i = \alpha + \beta c_i + \omega X_i + \gamma Z_i + \phi W_i + \varepsilon. \quad (2)$$

In the geographic RD design, standard errors and point estimates are computed using least squares regression. The outcome of interest is y in township i, while c_i is again a vector of dummy variables that takes a value of 1 if the township was on the colonized side of the border and 0 if it was on the uncolonized side of the border. β is the estimated treatment effect. X_i is a matrix of control variables that includes the ethnic composition of the township (the percentage Han, Mongolian, and Manchu) to account for sorting across the border, as well as soil quality, terrain, and precipitation. Z_i is a

matrix of the geographic location of the town. In the specifications presented below, I model this as a linear function of longitude and latitude, though the results are essentially identical using other functional forms like first- and second-order polynomials.[5] Finally ϕ includes latitude and longitude coordinates for the nearest point on the border.

The results from the geographic RD analysis are consistent with the results presented above for the one-dimensional local linear regressions and for difference in means tests. Figure 5 shows estimates for bandwidths that include all towns between 0 to 20 kilometers of the border to all towns between 0 and 120 kilometers of the border. These estimates suggest that colonization caused an increase in improved sanitation and post-primary education of between a ½ and 1 standard deviation from average. The results for bureaucratic density and the income proxies are sensitive to bandwidth selection. Although they are significant at the $p = .90$ level for many potential bandwidths, the results are only intermittently significant at the $p = .95$ level. As noted above, the sample size makes it difficult to detect smaller effect sizes.

Placebo Tests

In addition, I also conducted simple placebo tests to demonstrate that the discontinuity I document is not a quirk in the structure of the data. It could theoretically be the case, for example, that any north–south border would create the appearance of a discontinuity in wealth if each town to the east is significantly wealthier than its neighbor to the west. (Examining the signs of the forcing variable—the distance from the border—in the regression tables in the appendix should allay this particular concern, since it shows that the general trend is exactly the opposite.)

I created "placebo" borders at 20 kilometer intervals from the actual colonial border, then reran the local linear regression tests. This approach is similar to that used by Lee and Schultz (2012). The results, presented in Figure 6, show that for nearly all of the measures, a border in a different location will not return a significant results. An exception is that if I move the border 20 kilometers to the east, there is still a positive and statistically significant estimate for sanitation, but the presence of a false positive is not surprising with 24 statistical tests. The results generally show that placing the border in another location generally returns a result closer to zero or even negative result.

Do Policies After Colonization Explain the Results?

One alternative explanation for the results is that they are the result of policies in the Maoist or Reform Eras. The research design guards against this

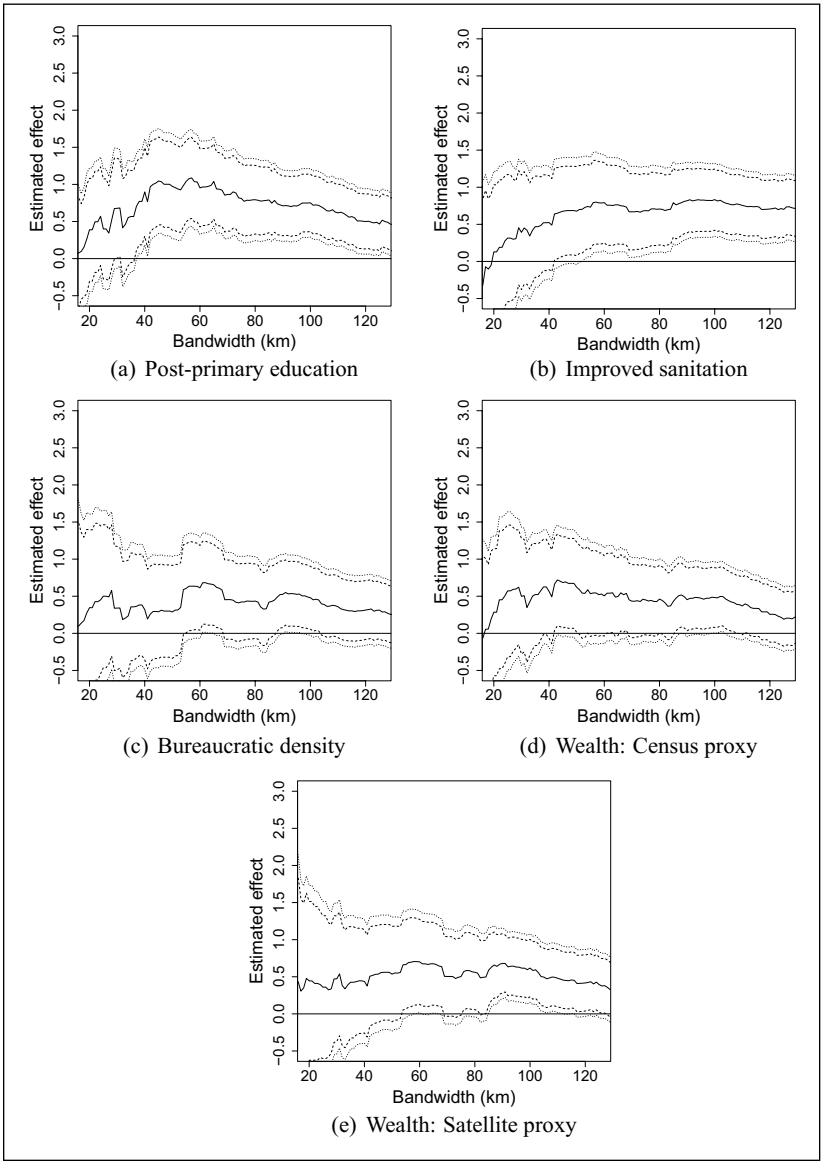

Figure 5. Local average treatment effect of Japanese imperial rule, standardized dependent variables.

Estimated using geographic polynomial. Dashed lines are 90% CIs, dotted lines are 95% CIs. CI = confidence interval.

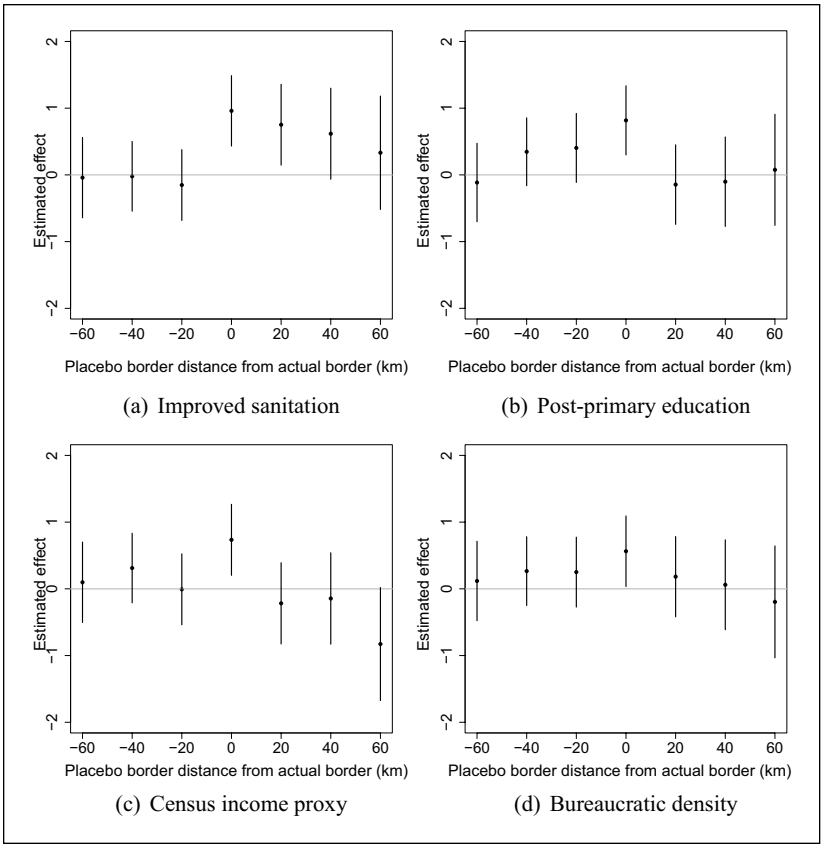

Figure 6. Placebo borders with 95% CIs.
Standardized dependent variables. Estimated using local linear regressions at 100 kilometer bandwidth. CI = confidence interval.

possibility. Recall that the colonial border does not precisely follow pre- or post-colonization provincial or county borders, and the RD design estimates the effect of colonization precisely at the colonial border. For this rival explanation to be true, it would require policies in the Communist era that for some reason affected townships discontinuously along this now defunct border. Although possible, the most natural interpretation has to do with policies in the colonial era.

Still, it would be reassuring to examine the available time series data to be reassured that the discontinuity is not more recent. Unfortunately, fine-grained

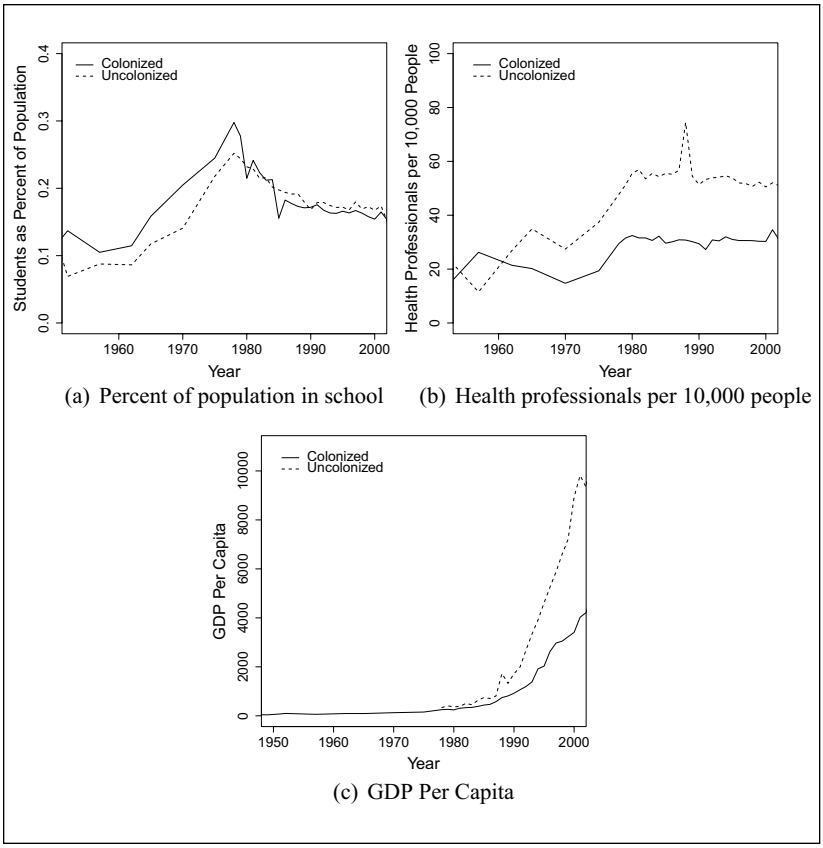

Figure 7. Outcomes after colonization.
The "colonized" and "uncolonized" aggregations are only approximate.

data at the township level are to my knowledge not publicly available for pre-2000 censuses. The next best option is banner-level (the equivalent to the county) data for Inner Mongolia. As previously stated, the colonial border does not precisely follow banner lines, and so many banners in the area of study include both colonized and non-colonized regions (please see Figure 1). With this caveat in mind, I constructed running yearly averages based on statistical yearbook data for the banners on either side of the border, counting a geographical unit as being "colonized" if the majority if the unit's surface area was on the colonized side of the border.

Before examining the results, it is also essential to note that counties are large enough divisions that the results should be strongly attenuated. In the RD

framework, it is similar to a difference in means test with a very large bandwidth, in this case of about 100 kilometers from the border. At this large bandwidth, the pre-treatment characteristics of the borders are no longer exchangeable. And even if Japanese colonization has a strongly positive effect, leading to discontinuous effects on either side of the border, it will be difficult to detect when we lump border towns with towns 100 kilometers distant.

With these caveats in mind, Figure 7 shows data on schooling from the early 1950s to the 2000s. The schooling data (which measures the percent of the population in school, the best available proxy for educational attainment in the pre-reform data) show that in the early 1950s, the colonial side of the border has more students per capita than the uncolonized side of the border. This is consistent with the historical evidence that the Japanese greatly expanded enrollment in schools.

In terms of health outcomes, trends in the Maoist and Reform Era if anything bias the estimates downward, since the Communists have invested more in the non-colonized side of the border. The two sides begin the Communist Era with roughly equal numbers of medical professionals per capita. Starting during the Cultural Revolution, however, the uncolonized side of the border doubles and then triples the number of medical professionals per capita, while on the colonized side of the border the numbers rise more gradually.

Similarly, the results for GDP per capita show that reform era policies have benefitted the uncolonized side of the border, which may partly explain the attenuated results for the effect of colonization wealth. (GDP figures for the uncolonized region are generally not available for the pre-reform era). Rather than explaining the results, reform era policies most likely downward-bias the estimates for the effect of the colonial legacy on wealth.

Taken together, the county-level evidence suggests that policies after Japanese colonization do not explain the results—to the contrary, the Mao and Reform eras have most likely weakened the effects of Japanese rule. In the era after Japanese colonization, investment in schooling and health has favored the uncolonized region. And in recent decades, economic growth has been stronger in the uncolonized region as well. Given these trends, future analyses might examine whether and when more recent trends overwhelm the influence of history.

Conclusion

The Japanese invasion of China will be remembered for its brutality, but Japanese colonial rule over Manchuria has left, at least in some regard, a positive legacy. Manchukuo's rulers expanded the size of the bureaucracy,

increased enrollment in schools, and improved sanitation and public health. One contribution of this study is to show that investment in these basic political institutions can have persistent effects, even in the absence of liberal political institutions.

A second contribution of this study is to explain patterns of unequal development within China. Although China is sometimes held up as a model of authoritarian efficiency, the uneven strength of the state remains important. Recent scholarship has attempted to pry apart the black box of the Chinese state, with scholars examining how official behavior is shaped by factors as varied as inter-jurisdictional political competition (Lü & Landry, 2014), ethnic favoritism (Distelhorst & Hou, 2014), kinship networks (Deng & O'Brien, 2013; Xu & Yao, 2015), citizen contacting (Chen, Pan, & Xu, 2016; Meng, Pan, & Yang, 2017), and ties with business (Ang & Jia, 2014; Hou, 2014; Truex, 2014). These studies paint a picture of a Chinese state whose operation little resembles a rational Weberian bureaucracy, and is of uneven strength, and yet has lifted hundreds of millions out of poverty.

I argue that this great variation in the strength of state institutions within China has important historical roots. As Rithmire (2014) notes, recent years have witnessed a flourishing of work on Chinese politics that looks at regional differences in political economy, and some of this work argues that the patterns of economic development are products of the socialist era. However, as Rithmire cautions, many of these "socialist legacies" are often in fact consequences of China's pre-socialist past. When hunting for the causes of regional differences in China, scholars might do well to pay greater attention to these deeper historical legacies.

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Notes

1. As Lorentzen, Landry, and Yasuda (2014) and Huang (2008) argue, in more recent years, China's political economy has been dominated by large state owned enterprises in cities, with arguably negative consequences for governance and economic equality.
2. The conditions that gave officials in China incentives to make investments in township and village enterprises (TVEs) that broadly benefitted their community have evidently been short lived. Work by Ong (2012) shows that fiscal, banking, and administrative reforms in the 1990s eroded local state capacity and officials' control over local enterprises, and created incentives for clientelism and collusion.
3. Another border was used in partitioning Inner Mongolia into autonomous regions in 1914, and this border was promptly ignored as the Chinese central state effectively disintegrated a few years later.
4. The question asks whether households spend under 10,000 yuan on housing or spend within eight other increments of varying size, making it impossible to construct a continuous measure.
5. In a first order polynomial specification, for instance Z_i includes $x + y + x^2 + y^2 + xy$, where x is latitude and y is longitude.

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