From Samurai to Skyscrapers: How Transaction Costs Shape Tokyo*

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Abstract: Whether transaction costs to assemble or split land can persistently hinder urban land use remains unknown. Constructing a 100 m*100 m-cell-level dataset of central Tokyo from the 19th-century pre-modern era to the 21st-century skyscraper era, we study how initial lot fragmentation has affected urban development. We exploit a plausibly exogenous supply shock of large lots in 1868, the release of local lords' estates (*daimyo yashiki*) scattered throughout central Tokyo. Using ordinary least squares and a regression discontinuity design, we find that cells previously used as local lords' estates have larger lots today, implying that lot size persists through transaction costs. Such cells today see more tall buildings, higher land prices, and higher labor productivity of firms. We also find these effects only in the core area, suggesting higher transaction costs in this area. Finally, the effect of lot size on land prices became positive only after the rise of skyscrapers. This implies that optimal lot size became larger and assembly friction became more salient in the skyscraper age. Overall, contrary to the Coase theorem, initial lot allocation affects the urban economy, particularly in the core area, despite the large benefits of land assembly.

Keywords: Transaction costs, historical persistence, skyscrapers, lot fragmentation, agglomeration economy
JEL Codes: R14, R30, O18, N95

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1 Introduction

The Coase theorem is a benchmark in analyzing whether rights allocation would affect outcomes. The central message of the theorem is that without transaction costs, the initial allocation of rights would not affect efficiency, and agents could reach an optimal outcome by negotiation. This message is critical for policymakers, because the Pigovian tax or market design can be replaced by decentralized negotiation to achieve efficiency. Accordingly, economists have empirically investigated how the allocation of rights affects economic outcomes using a variety of settings, such as emission-caps trading (Zaklan, 2020), divorce law (Wolfers, 2006; Stevenson and Wolfers, 2006; Voena, 2015), agricultural land (Hornbeck, 2010; Bleakley and Ferrie, 2016), and oil fields (Leonard and Parker, 2021).

By contrast, we know little about whether the Coase theorem is relevant in the land market of a city's central business district (CBD), where land transactions to improve efficiency are crucial (Glaeser, 2011). This is particularly true when the economic environment changes, for example, when the development of construction technology induces a change in demand for a particular size of land. In this case, one key type of land transaction is to change the lot size by either split or assembly. However, transaction costs, such as negotiation with multiple landowners to assemble land, may prevent such transactions, which makes lot size persistent. Such transaction costs are reported in the media and recognized by policymakers in many cities worldwide (Nelson and Lang, 2007; Kirk, 2017; Chen, 2021).

The presence of such transaction costs and lot size persistence may affect city development in the long run. Notably, recent studies using rural/suburban areas show that lot size persists, but this persistence gradually disappears in the very long run (i.e., 150 years) (Bleakley and Ferrie, 2014; Smith, 2020; Finley et al., 2021). However, findings in rural/suburban areas might not be applicable to cities. On the one hand, cities enjoy high benefit from optimal land use owing to agglomeration economies, which may weaken lot size persistence, as the Coase theorem would predict. On the other hand, transaction costs can be higher in cities, possibly because they tend to have more heterogeneous land uses or the potential benefits of land assembly itself intensifies landowners' strategic behavior in their negotiation of land assembly, which may strengthen lot size persistence. Understanding the relative importance of these two forces has implications for future cities, particularly those in developing countries, which have slums with fragmented lots (Bryan et al., 2020; Glaeser, 2021).

Furthermore, when transaction costs are high enough to generate lot size persistence, the consequence of such persistence can be different over space and time. For example, the value of large lots may be greater with the rise in tall buildings generating agglomeration economies, because tall buildings require large footprints.[1] By investigating how the lot size effect varies with the change in economic environment, we can shed light on the nature of the lot size effect and predict the effect in a particular setting.

In this study, we analyze land use and values in Tokyo over a 150-year period. Several features of Tokyo make its setting an ideal laboratory for studying the long-run effects of the initial lot size. First, there is a natural experiment that, in our view, offers the closest analog to exogenous releases of land with larger lot sizes on a large scale throughout central Tokyo. During the feudal era before 1868, 19% of the land in Tokyo was occupied by *daimyo*. Daimyo were among the top of the samurai (warrior) class in Japan and governed their local domain outside Tokyo as feudal local lords, but had to own estates in Tokyo (*daimyo yashiki*) for political reasons, which we explain later in the background section. These estates were much larger than the lots in the other areas in Tokyo. However, after a political regime change in 1868 (the Meiji Restoration), these local lords were forced to release their estates into the private market. This was a plausibly exogenous shock providing large lots to the Tokyo land market.

Furthermore, a particular central Tokyo area allows us to exploit a discontinuity in historical land use due to the central government's zoning before 1868. Specifically, around the beginning of the 17th century, the Tokugawa shogunate, Japan's feudal military government that preceded the Meiji period, designated the western half of newly developed areas to local lords' estates and the eastern half to commoners. When the Shogunate further reclaimed land to the east, the newly reclaimed land became the local lords' estate zone. These newly developed areas were in lowlands close to the seashore at the time, and therefore, are likely to share similar characteristics.

[1] We confirm this relationship using data for Tokyo (Figure A.1). In addition, we observe a similar pattern between building height and footprint for New York: using height and footprint data, we plot them in a similar manner to Figure A.1. The result shows a positive relationship between footprint and height. Moreover, assuming 4 m per story, the 120 m-or-higher group in New York corresponds to the 30-story-or-higher group in Tokyo, both of which have a very similar percentile of footprint (see Figure A.2). These results imply that the relationship in Tokyo (Figure A.1) is not solely due to earthquake risk in Japan.

Second, Tokyo provides the historical and modern datasets necessary for our study. We can keep track of land prices or lot fragmentation over time since the Meiji Restoration, when the modern property system was introduced to determine initial lot size. These data cover the entire process of Tokyo's transformation from a historical city with low-rise brick buildings to a modern megalopolis with skyscrapers. We can also measure the location and height of all buildings in today's Tokyo. This enables us to study the nature of lot persistence and transaction costs in an important city under different economic environments.

We analyze the full sample using ordinary least squares (OLS) with geographical control variables and, for a cleaner identification, we employ a regression discontinuity (RD) design using the clear zoning boundary for a particular area of the sample. The results of both approaches consistently show lot size persistence: the presence of local lords before 1868 results in larger lots in 2011. We also find that larger lots facilitate urban development today: these areas have taller and fewer buildings, and higher land prices. These effects seem economically substantial: for example, if we increase the share of local lords' estates from zero to one, the number of more-than-or-equal-to-30-story buildings increases by 0.036, which corresponds to its unconditional mean and decay being 4.5 km from the center. This persistence and its economic effects contrast with the prediction of the Coase theorem without transaction costs (Coase, 1960), whereby the initial allocation of property rights does not affect long-run outcomes.

To investigate the nature of lot size persistence, we compare the heterogeneous effects between the core area and the non-core area.[2] Lot size persistence and its related effects may not exist in the core area because the benefit of assembly by constructing high-rise buildings exceeds the transaction costs, as pointed out in Coase (1960).[3] However, the result is inconsistent with this view: we find lot size persistence and its effect on land use today only in the core area. This result implies that transaction costs are higher in the core area, consistent with other studies (Bleakley and Ferrie, 2014; Smith, 2020; Finley et al., 2021)

[2]For the OLS, we define the area inside the *Yamanote* loop line, which connects the major hub stations of regional and urban railway/subway services such as *Shinjuku*, *Shibuya*, and (central) Tokyo station, as the core area. Its area, 60 km^2, roughly corresponds to the area of Manhattan. For the RD analysis, we separate the border line into two parts: close to and far from the core area.

[3]Coase (1960) states that "it is clear that such a rearrangement of rights will only be undertaken when the increase in the value of production consequent upon the rearrangement is greater than the costs which would be involved in bringing it about."

finding no 150-year lot size persistence in the rural/suburban land market, which is more similar to the non-core area than to the core area.

The higher transaction costs in the core area can be explained by two channels. One is that higher potential gain of assembling land may endogenously increase transaction costs by intensifying landowners' strategic behavior in their negotiation of assembly costs, which is called the hold-out problem in the literature (Miceli and Sirmans, 2007; Brooks and Lutz, 2016; Grossman et al., 2019). Another possibility is that characteristics other than the potential benefit of assembly may play a role. For example, population or land use may be more heterogeneous in the core area and thus landowners may face difficulties in collective action (Olson, 2003). Although we cannot quantify these channels, the results suggest a large role of transaction costs in the urban core land market, which is against the natural conjecture that the large economic potential can overcome the cost of assembly.

Next, we analyze the mechanism by which lot size affects land prices. We find a positive effect on land prices in the 2010s, but the sign of this effect may change depending on the technological environment, such as the possibility of constructing skyscrapers. To investigate this point, we examine the effect on lots and land prices before WWII, when Tokyo had no skyscrapers and industries were less knowledge based. We find that local lords' estates decreased the number of lots, but had *negative* effects on land prices. We also find that the effect on land prices became zero in 1972 and turned positive in 1983, suggesting that before WWII, there were split frictions: lots in local lords' estates were too large for optimal land use, but were not split owing to split costs. However, after WWII, these large lots obtained advantages from technological change (i.e., increased high-rise buildings and the emergence of skyscrapers and the transition to the knowledge economy) and assembly costs. This suggests that the value of a large lot can change according to the technological environment (i.e., positive effects arise only after the 1970s with increased high-rise buildings).[4]

We consider other potential channels to explain the causal link from local lords' estates to the land prices of today. For example, lower transaction costs might have facilitated public infrastructure construction and increased amenities. In addition, larger lots might have alleviated destruction during WWII and affected subsequent land development. Furthermore,

[4]This also suggests that the positive effect on land prices in the main results is not driven by time-invariant location-specific effects.

the presence of local lords' estates might affect land prices by changing the size of the blocks (area surrounded by roads), floor–area ratio (FAR) regulation, economic activities before 1868 or initial land price in the 1860s. Although we do not exclude these channels, we find that controlling for these factors does not change the main results qualitatively. We also consider alternative channels to explain the change in the sign of the effect on land price changes after WWII, such as land use change, or owner change caused after WWII, but none of these alter the results.

Finally, to investigate a potential benefit of large lots through agglomeration economies, we examine the effect of local lords' estates on firm productivity using firm-level microdata in 2017 with OLS and RD analyses. We find a positive effect on revenue per worker, a proxy of total factor productivity (TFP). Furthermore, we find that this effect is higher in the upper quantiles, implying that the effect on firm productivity is through the agglomeration benefits channel, rather than the exit of less productive firms (the selection channel). To investigate the role of tall buildings more explicitly, we conduct a similar analysis using the data in 1993, when Tokyo had fewer skyscrapers. Both the OLS and the RD analyses show weaker effects on firm productivity in 1993 than in 2017. This difference between 1993 and 2017 is attenuated when we control for the height of buildings. These results suggest that the height of buildings is an operating channel behind the positive effect on firm productivity.

Our study contributes to the literature on the role of transaction costs in urban development. Past studies consider coordination problems in redevelopment (Hornbeck and Keniston, 2017; Owens et al., 2020) and delays owing to litigation (Gandhi et al., 2021), for example.[5] We find that the transaction costs incurred in changing lot sizes can generate lot size persistence and affect economic activities over 150 years, particularly in the core area, which is a novel finding in the literature.[6] These results are linked to recent studies on the formalization costs of slums (Gechter and Tsivanidis, 2018; Harari and Wong, 2019; Michaels et al., 2021). These studies discuss the role of weak property rights in slums limiting their land mobility and find its negative impact on urban development. On the other hand, our results in Tokyo suggest

[5] As a related study, Libecap and Lueck (2011) compare two land demarcation regimes, (1) metes and bounds and (2) the rectangular system, in Ohio and find a positive impact of the rectangular system on farmland value. Meanwhile, we examine an urban setting in which larger lots may have large benefits through the construction of tall buildings.

[6] As discussed earlier, we are not aware of studies on lot size persistence and its economic impact in the context of cities.

even if people in slums are entitled to strong property rights, it may not lead to urban development because slums, often dense and fragmented, face assembly costs at redevelopment, as Glaeser (2021) discusses.

Our study also offers a perspective on the conflicting results found in studies of lot size and land prices. Some studies find a negative premium of large lots (White, 1988; Brownstone and Vany, 1991), while others find a positive premium (Tabuchi, 1996) with a difference-in-differences strategy (Brooks and Lutz, 2016).[7] Our study examines the relationship between lot size and land prices based on a natural experiment and compares the relationship in different periods and locations to shed light on how lot size premia arise.

We also contribute to the recently growing literature on building heights (Liu et al., 2017; Ahlfeldt and McMillen, 2018; Ahlfeldt and Barr, 2022). We investigate the obstacles to constructing high-rise buildings (Barr et al., 2011; Jedwab et al., 2020), which is key to enhancing the benefits arising from the density of economic activities (Ahlfeldt et al., 2015). We offer a unique contribution to the literature by showing a very close link between lot fragmentation and tall buildings. This link is discussed in the previous literature (Barr, 2016), but systematic evidence is scarce. We also find that because lot fragmentation prevents the construction of tall buildings, the cost of lot fragmentation becomes more salient with the availability of construction technology for tall buildings.

Our study belongs to the expanding literature that analyzes cities with historical granular datasets (Hanlon and Heblich, 2021), such as O'Grady (2014), Baruah et al. (2017), Hornbeck and Keniston (2017), Brooks and Lutz (2019), Ambrus et al. (2020), Heblich et al. (2020), Harari (2020), Dericks and Koster (2021), Heblich et al. (2021), and Yamagishi and Sato (2022).[8] Our study offers a new channel through which history matters: historically determined lot size differences persist, but the positive effect of lot size develops only after the rise of the knowledge economy and the development of construction technology.

The rest of this paper is organized as follows. Section 2 explains our conceptual framework. Section 3 provides background information on land use in Tokyo. Section 4 describes the data and the empirical strategy. In Section 5, we present the results. In Section 6, we briefly discuss

[7] As a related study, Leonard and Parker (2021) find that land fragmentation decreases oil production in North Dakota because shale extraction is profitable only when a sufficient amount of contiguous land is used.

[8] See Davis and Weinstein (2002), Bleakley and Lin (2012), and Hanlon (2017) for studies using historical cross-city datasets, for example.

policy implications. Section 7 concludes.

2 Conceptual Framework

To guide our empirical analysis, we set up a simple framework of lot size, transaction costs of changing lot sizes, and land values by extending the framework in Brooks and Lutz (2016) as follows.

Suppose there are two commercial locations, i and j, in a city. Location i has a large lot with a size of $2a$, while j has two small lots with a size of a. The value of land is given by $V(a) = Aa^{\beta}$ where $\beta \geq 0$. In reality, $V(a)$ can take a more complicated function, and there will be an optimal a^* to maximize the value per area. However, we focus on the value of a and $2a$, and β is only to capture which of a or $2a$ makes the value per area higher rather than how the function V is shaped in the whole range. When tall and large buildings are not available, β will be less than one, because we need additional roads to obtain access to small buildings in a large lot (lot size discount). When high construction technologies become available and important, however, β will be larger than one (lot size premia). A represents local economic potential.

The lots are owned by landowners, and developers can negotiate with the landowner to assemble the small lots in j into one big lot. This entails transaction costs, $C_a = c_a A^{\gamma_a}$, where $\gamma_a \geq 0$ and $c_a \geq 0$. Therefore, when $V(2a) - 2V(a) > C_a$, small lots will be assembled. γ_a determines the nature of transaction costs. When $\gamma_a = 0$, transaction costs are constant ($C_a = c_a$) and, therefore, when the value of assembly is higher, assembly will happen. This corresponds to the classic argument of Coase (1960). However, to assemble the lots, they will have to spend a large amount of time to demolish the existing buildings and construct a new building. These opportunity costs can increase γ_a to the value of one. Moreover, when A is high, this will increase the value of assembly and the potential rent for landowners when negotiating assembly, resulting in intensifying the hold-out problem as examined in theory and lab experiments. In this case, we may have $\gamma_a > 1$.

Similarly, the large lot in i can be split into two small lots with a fixed cost, $C_s = c_s A_s^{\gamma}$. Therefore, when $2V(a) - V(2a) > C_s$, the large lot will be split. Note that, unlike in the case of assembly, we do not have the hold-out problem and γ_s is likely to be smaller than γ_a.

Using this model, we can relate empirical patterns we may find in the lot size or land prices to the parameters, β, γ_a, γ_s, and A.

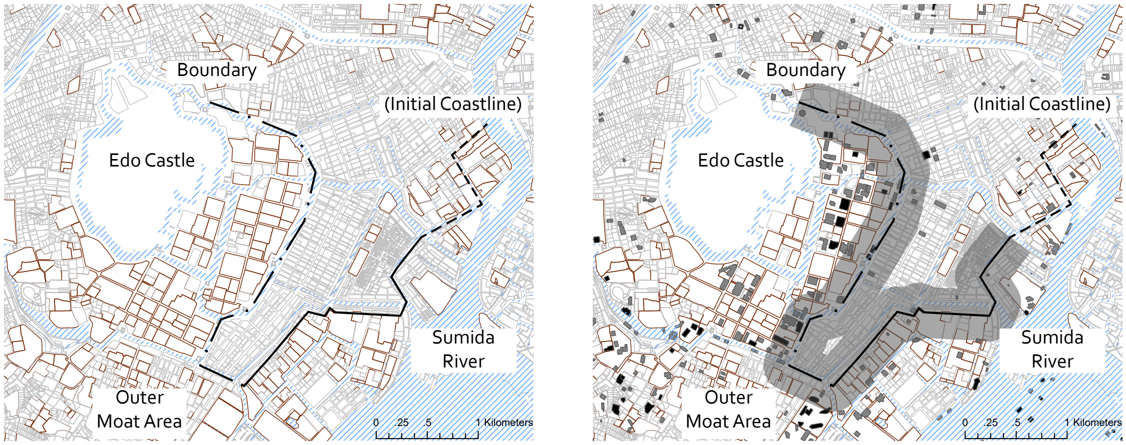
(1) Suppose $\beta > 1$. When C_a is large enough, transaction costs are too high and there is no assembly. Therefore, historical lot size determines the lot size (lot size persistence), and larger lots have higher land prices (lot size premia).

(2) In case (1), when c_a is not so large, γ_a predicts where we will observe the lot size persistence depending on the value of A. If $\gamma_a < 1$, we will see lot size persistence and its effect on land price only in the area with low A. This corresponds to a natural conjecture from Coase (1960). However, if $\gamma_a > 1$, we will see lot size persistence and its effect on land price only in the area with high A.

(3) Suppose instead $\beta < 0$. When C_s is large enough, we will see lot size persistence as well as in (1), but historically larger lots have lower land prices (lot size discount). Therefore, when β increases from a negative value to a positive value under large C_a and C_s, the effect of historical large lots will become positive from negative. $\gamma_s > 1$ ($\gamma_s < 1$) will similarly determine whether we observe the effects of historical lots in the area with high A (low A) area as in (2).

In the empirical analysis, we estimate the effect of local lords' estates on the lot size and land prices using data in the 2010s, corresponding to the comparison between locations i and j. The result would be one of the following three cases: (i) transaction costs are small and lot size difference disappears, (ii) transaction costs are large, lot size difference persists, and large lots have premia ($\beta > 0$) or (iii) transaction costs are large, lot size difference persists, and large lots are discounted ($\beta < 0$) in the case of today's Tokyo. Furthermore, by using the results before the skyscraper age, we examine whether the increase of β alters the relationship between lot size and land prices, as predicted in the conceptual framework. Similarly, by comparing the results between the core areas and non-core areas corresponding to high A and low A, respectively, we infer $\gamma_a \lesseqgtr 1$ or $\gamma_s \lesseqgtr 1$, or whether transaction costs are more or less proportionate in local economic potential.

Figure 1: Zoning in the Initially Developed Area



(a) (b)

Notes: Polygons with red borders are local lords' estates. The U-shaped line in both figures is the boundary between the local lords' estate zone (the outer side) and the commoners' zone (the inner side). The dash-dot part is the initial boundary between the zones. The solid and dash parts are the initial coastline. The solid part became part of the boundary after the second reclamation. The gray area in the right figure shows a 250-m buffer, which we use for the local randomization regression analysis. Another line in the right figure from south to north shows the overground railroad loop line (*Yamanote* line). In the right figure, we overlay high-rise buildings in 2011, indicated by black (more than or equal to 30 stories) and gray (15–29 stories) rectangles.

3 Background

We first describe the historical background in each period (1600–1868, 1868–1945, 1945–) and then explain the population growth in Tokyo, related regulations, and anecdotes.

3.1 During the Edo Period: 1600–1868

Tokyo, which was called Edo during the Edo period (1600–1868), is one of the most prosperous cities in the world, but it was not a big city prior to the Edo period.[9] A local lord constructed Edo Castle in 1457, but Edo remained a small town, surrounded by a marsh.

This situation changed in 1590, when *Tokugawa Ieyasu*, one of the most powerful feudal lords of that time, was transferred to Tokyo. He reconstructed the castle to strengthen his military capacity and reclaimed the inlet in front of the castle to expand the land. He also seems to have adopted class-based zoning inside the outer moat (the "inner area").[10] The area

[9]See Kawasaki (1965), Suzuki (2000), and Matsuyama (2014) for a more detailed historical context.

[10]Other local lords often adopted planning systems in their castle cities.

closest to the main gate on the east side of the castle was used for the estates of local lords, who govern their local domains outside Tokyo. The east side of this area was allocated to Tokugawa's bureaucrats and to commoners as business districts. Importantly, local lords were among the highest rank of the samurai class, and therefore, local lords' estates were on average larger than other buildings used by bureaucrats (lower-ranked samurai) or commoners. We exploit the clear zoning on the east side of the castle for the RD design (the dash-dot line in Figure 1(a)). Tokyo became the political capital after Tokugawa won significant wars in 1600 and 1615, and his government (Shogunate) ordered all local lords to have estates in Tokyo for political interactions.[11] As a result, the Shogunate further reclaimed land and allocated a new area for local lords. Therefore, the initial coastline (the solid line in Figure 1(a)) became a boundary between the local lords' estates zone and the commoners' zone, except in the northwestern part, where some local lords' estates were located by chance on both sides (the dash-line in Figure 1(a)). This is another discontinuity in our identification strategy. The Shogunate also developed an area outside the outer moat (the "outer area"). In the outer area, the local lords chose the location for their estates and had to ask permission from the Shogunate to use the land. In that sense, the Tokugawa shogunate controlled urban land use. However, unlike the inner area, there is no indication of a clear zoning policy.

Although local lords could swap their estates with other lords, the social class of land users for each land area seems to have been stable until the end of the Edo period in 1868. At that time, local lords' estates occupied about 20% of the land in Tokyo, as shown in a map from the 1850s (Figure 2). Tokyo experienced significant economic and cultural growth during the Edo period, and its estimated population at the end of the 1860s was about 1 million.[12]

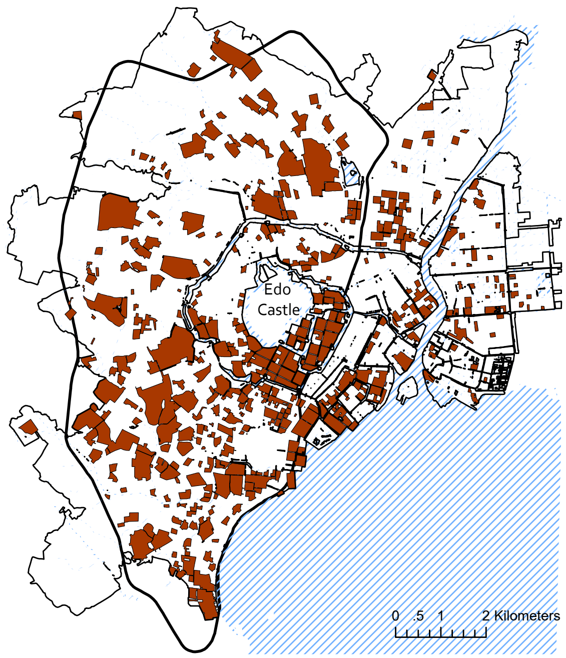
3.2 Meiji Restoration and Pre-WWII: 1868–1945

A commonly held view among historians is that the Meiji Restoration caused a significantly negative shock on Tokyo's economy. After the collapse of the Tokugawa shogunate, local lords were no longer required to stay in Tokyo and their estates became vacant. Around half of

[11]In particular, demand for land grew because Tokugawa required that all local lords (approximately 250) alternate between living in Tokyo and living in their local domains and that their families stay in Tokyo as hostages. These policies significantly increased demand for local lords' estates.

[12]There are many estimates of the population of Edo, but most estimates range from 1 million to 1.5 million. See, for example, Kito (1989).

Figure 2: Distribution of Local Lords' Estates



Notes: This map covers the whole of Edo's city area (*Sumibiki sen-nai*). Red areas represent local lords' estates. The thick solid line shows the loop (*Yamanote*) line.

Tokugawa's bureaucrats moved to Shizuoka, where Tokugawa was transferred to, about 150 km from Tokyo. As a result, the samurai class, which occupied a large proportion of the Tokyo population, migrated out of Tokyo and its economy, which had previously been sustained by the samurai class, collapsed. Moreover, part of Tokyo became a battlefield (during the Battle of Ueno) in the civil war during the Meiji Restoration. Due to this economic turmoil in Tokyo, it was uncertain which of Tokyo, Osaka, or Kyoto, three important economic and political cities, would become the new capital of the Meiji Restoration. Finally, the new government chose Tokyo as its capital, and Tokyo began to grow economically as the nation's modern economy took off. In that sense, the Meiji Restoration is regarded as the initial point of modern Tokyo's economic growth.

Local lords typically held three estates during the Edo period, but the Meiji government allowed local lords to own just one estate in Tokyo and confiscated the others. In the core area, Kasumigaseki, the Meiji government transformed these estates into government offices or training fields for the army. The Meiji government sold or gave the remaining estates to the private sector.

There was continuity in the lot boundary between the periods before and after the Meiji Restoration. Along with these land transformation processes, the Meiji government introduced a modern property rights and tax system (*chiso kaisei*) and determined the boundaries of lots based on the land usage before the Meiji Restoration. Therefore, the local lords' estates retained their large lots in the early Meiji period.

3.3 After WWII: 1945–

After 1945, the descendants of local lords experienced a significant policy shock. Despite the regime change in 1868, local lords retained their political elite status as noblemen (*kazoku*) and possessed privileges such as seats in the house of peers. However, in 1946, the General Headquarters introduced a very high asset tax to remove the political and economic elites supported by Imperial Japan. In addition, the General Headquarters deprived the elite of their political and economic privileges. There are many anecdotes of local lords being required to sell their properties to pay the asset tax (Sakai, 2016). Consequently, most of the former local lords' estates became owned by the private sector in this period, with the exception of those in the Kasumigaseki area.

3.4 Population Growth and Related Regulations

After Tokyo became the capital of Japan in 1871, its population recovered and began to grow. In the eight wards of central Tokyo, the residential population, which had been 0.89 million in 1883, rose to 2.17 million by 1920 (Tokyo Hu, 1887, 1923). Since WWII, the population became stable (in 2015, it was 1.95 million), but the daytime population (number of people present during normal business hours) has been increasing (2.95 million in 1955 vs. 4.72 million in 2015), implying that business activities have continued to expand (Tokyo To, 2015). Old Tokyo is now the center of Greater Tokyo, which has about 38 million inhabitants and is the biggest megalopolis in the world.

Post-WWII economic growth increased demand for high-rise buildings. In 1952, the government deregulated the height restriction that had prohibited buildings over 31 m since 1919. In 1968, the first skyscraper, the *Kasumigaseki* Building, was constructed. The number of buildings over 30 stories has been increasing in Tokyo's 23 wards, rising from 32 in 1990 to 86 in 2000 and 260 in 2010 (Tokyo Shobo Cho Kikaku Chouseibu Kikakuka, 1990–2010).

3.5 Anecdotes of High Assembly Costs

Several anecdotes suggest the presence of high assembly costs, consistent with our argument. A large conglomerate, *Mitsui*, was originally an exchange trader and *kimono* trader in the Edo period, and held a small lot as its head office in a former commoners' area in the CBD (*Muromachi*). After *Mitsui* became a large conglomerate, it planned to assemble lots nearby to expand its headquarters, but it did not succeed and faced opposition by landlords. It finally completed the planned assembly in 1969, but lots in *Muromachi* remain fragmented.

Meanwhile, a former local lords' estate area in the CBD (just about 1 km from *Muromachi*) has been owned by another large conglomerate, *Mitsubishi*, since the 1890s, when it bought the land from the government. Lots are larger than in *Muromachi*, and there have been large-scale developments such as Western-style brick buildings before WWII and skyscrapers today. Comparing these two close but different areas, Washizaki (2015) suggests that lot fragmentation is a potential reason for the low number of skyscrapers in Tokyo.

As another example, the Mori Building Company planned a large-scale (5.6-ha) redevelopment in *Akasaka* in 1967 and obtained a small lot. Although the government approved the plan, it was not until 1983 that it could obtain permission from landlords and start the construction of the building (Akasaka ARK Hills). In 1986, the building finally opened. The company also planned a similar redevelopment project in another area, and it took 17 years to open the building (Roppongi Hills, opened in 2003). The former CEO looks back on these developments as a project that would have been impossible if the company had not been family owned or long-sighted (Mori, 2009).

4 Data

We constructed a 100 m*100 m-cell-level dataset spanning 150 years based on scanned printed maps and other electronic data.[13] We constructed the dataset within the old Tokyo's (Edo's) city area, which covers and remains the center of economic activities in Tokyo during the

[13]This cell size roughly corresponds to the median of area of local lords' estates (13845 m^2).

Edo period. Among Japanese listed firms with their headquarters in Tokyo, the headquarters of 72% of firms are located in our sample area.[14] In this section, we present a table with definitions of the main variables and their sources (Table 1) and briefly explain the sources of the main variables. Panel A in Table 2 shows the descriptive statistics. For the firm-level microdata, we do not aggregate the data at the cell level to analyze firm-level locational or entry/exit choices and/or use firm-level information (i.e., industry) as control variables. Panel B in Table 2 shows the descriptive statistics in 1993 and 2017.

Land Usage before 1868 We digitized a map showing landownership in the 1850s. This map documented the types of ownership for each lot (local lords, bureaucrats, commoners, and other owners such as temples).[15] Figure 2 plots local lords' estates, showing they are well distributed across Edo city. Based on this map, we calculated the share of land owned by local lords for each cell.[16]

Lots Cadastral maps are available for 1869, 1876, 1912, 1931, and 2011 (Nishikawa and Nishikawa, 1880; Ichihara, ed, 1876; Tokyo Shiku Chosakai, 1912; Seizusha, ed, 1931-1935; TDi and Inc, 2017). We digitized or used these maps to calculate the number of lots within a cell.

Land Prices Before 1945, land prices were available for 1876, 1912, and 1931. The 1876 map can be connected with the land price list published later (Nakai, ed, 1880) using the addresses.[17] The cadastral maps in 1912 and 1931 list the land prices for each lot. These lists have land prices (and land rental prices for 1931) so that we can calculate the area-weighted average land price for each cell.

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[14] *Source:* `http://disclosure.edinet-fsa.go.jp`. These firms with headquarters in our sample area account for 35% of the total number of firms in Japan.

[15] We used georeferenced digital images of this map for creating shapefile (APP Company, ed, 2009). The primary sources are several maps published at that time, such as (Kageyama et al., eds, 1849-1862).

[16] An alternative and perhaps more natural treatment variable is the number of lots in the 1850s, but the map describes only blocks (area surrounded by roads) in the commoners' area without lot boundaries, and thus, we cannot count the number of lots from the map. Instead, in the robustness check, we employ the maximum lot size of local lords' estates as an alternative treatment variable.

[17] Some areas changed the address system during these periods and we could not match all of them. This resulted in significant missing values for land prices in 1876 in the dataset. In addition, the maps in 1912 and 1931 cover slightly different areas from the area covered by the map during the Edo period. See Figure A.3 for the heatmaps of the land price variables.

These land prices are based on the evaluations used as the basis for land tax. The evaluation of each lot in the 1860s–1870s referred to the market land price used in the Edo period. However, for land owned by local lords and bureaucrats, there were no market transactions during the Edo period. For this land, the price when the land was sold to the private sector by auction was used. When such land was transferred for free, the neighbor's land prices sold by auction to the private sector were used.[18]

In 1910, the government updated the land prices in cities using market land rental prices, and the data in 1912 contained this land price. The rental price was multiplied by 10 to calculate the land price. If it exceeded the previous land price by more than 18 times, the land price was reduced to avoid a drastic increase in the tax burden for landowners. In 1929, they again updated the land prices by simply using rental prices, which are published in Seizusha, ed (1931-1935).[19]

After 1945, the government started to use a different tax system. It first evaluated the place value at the road level and then multiplied it by lot-specific factors such as shape. Because lot-specific factors are automatically related to lot size, the road-level price is suitable to capture the effects of lot size on economic activities. The data in 2012 (Research Center for Property Assessment System, 2012) contain this road-level price, and we calculated the length-weighted average land price data within a cell.

These variables before the 1980s are not easily available, and thus, we complemented the land price data in 1972 and 1983 by using Tokyo-to Takuchi Tatemono Tohirikigyo Kyokai (1972) and Tokyo-to Takuchi Tatemono Tohirikigyo Kyokai (1983). These maps produced by the real estate agents' association record the estimated market value of land per area at each place.

Buildings The Tokyo Metropolitan Government has been producing an electronic map covering all the buildings and land usage in Tokyo every 5 years since 1986 for urban planning (Tokyo Metropolitan Government, 1986, 1991, 1996, 2001, 2006, 2011). From these maps, we

[18]There might be a concern that local lords' estates were priced differently for political reasons. However, this way of selling their land suggests that the land price fairly reflects the market value (Fukushima, 1962). We also analyze whether such political consideration might change our results using whether landowners are former local lords' descendants in the landowner characteristics data of 1931.

[19]Seizusha, ed (1931-1935) lists both the land rental price and land price. When we regress the log of rental price on the log of land price at the lot level, we obtain 1.02 as the coefficient and 0.89 as R^2, implying that the land price well reflects market value.

calculated the number of buildings, total floor area provided, and average number of stories. We also confirmed the positive relationship between the number of stories and footprints of buildings using data in 2011. In addition, the government has been making electronic maps for land usage, from which we calculated the share of land used for business or residence.

Geographies We used geographical variables as control variables, because geography may affect the supply of buildings (Saiz, 2010) and determine the location of local lords' estates. Altitude data are available from the Ministry of Land, Infrastructure, Transport and Tourism (2014). We calculated the average and standard deviation of altitude in a cell: higher places may attract richer people and flatter places may be suitable for large-scale development. We also controlled for earthquake risk. Tokyo Metropolitan Government (2018) assesses several types of risk (e.g., building materials) at the community level, and we used the risk resulting from the type of ground to focus on purely geographical risks. We took the area-weighted average of these community-level risks at the cell level.

Firm-level Microdata To analyze firm-level productivity and firms' locational or entry/exit choices, we used a firm-level dataset in our sample area. We obtained the data from the Teikoku Databank Center for Advanced Empirical Research on Enterprise and Economy (TDB-CAREE) at Hitotsubashi University. Teikoku Databank is a major Japanese credit research company, and this dataset covers most Japanese firms. These data contain basic information such as industry, locations of headquarters, and the number of workers and revenue, so that we could construct revenue per worker, a proxy of TFP.

Before discussing the regression analysis results, we illustrated our analysis using raw data for an area around a station in the CBD. Figure 3(a) shows one of the primary sources. Figure 3(b) shows the distribution of local lords' estates using red-hatched polygons. We overlaid the cadastral map of today with the Figure 3(c) and found that former local lords' estates are associated with larger lots today. When we overlaid today's tall buildings with Figure 3(d), most of the tall buildings were found to be located on land that was formerly local lords' estates. In the regression analysis, we confirmed these relationships using the whole sample while considering potential endogeneity bias. When we examined the aerial images of the area using Figure 3(e), we observed a great deal of variation in the height of buildings in this small area, suggesting high land assembly costs.

Table 1: Definition of Variables and Their Data Sources

Variable	Definition	Data Source
Main variables		
Local Lords' Estates Share	The share of areas owned by local lords in the 1850s.	APP Company, ed (2009)
Number of Lots	The number of lots located (at least a part of the lot) in a cell.	Nishikawa and Nishikawa (1880), Ichihara, ed (1876), Tokyo Shiku Chosakai (1912), Seizusha, ed (1931-1935), TDi and Inc (2017)
Number of Buildings	The number of buildings located (at least a part of the building) in a cell.	Tokyo Metropolitan Government (2011)
Stories	The average number of buildings' stories in a cell. *(aboveground)* counts only the stories aboveground, whereas *(including underground)* includes the stories underground.	Tokyo Metropolitan Government (2011)
Log Land Price in 2012	The average of the road-level price factor by weighting the length of each road.	Research Center for Property Assessment System (2012)
Log Land Price in 1876, 1912, and 1931	The area-weighted average of the lot land price.	Nakai, ed (1880), Tokyo Shiku Chosakai (1912), Seizusha, ed (1931-1935)
Log Land Price in 1972 and 1983	The average of land prices.	Tokyo-to Takuchi Tatemono Tohirikigyo Kyokai (1972) and Tokyo-to Takuchi Tatemono Tohirikigyo Kyokai (1983)
Other variables		
Average Road Width	The length-weighted average width of roads in a cell.	Shobumsha (2018)
Hospital, University, and Park Share	The share of areas used for these purposes in each cell.	Tokyo Metropolitan Government (2011).
Distance to Station in (Year)	The distance in meters to the nearest station in each year.	Ministry of Land, Infrastructure, Transport and Tourism (2014)
FAR Regulations	The average of maximum floor-area ratio.	Tokyo Metropolitan Government (2011) and Shobumsha (2018)
Block Area	The average of blocks' (areas surrounded by roads)s area.	Tokyo Metropolitan Government (2011)
WWII Destruction Share	The share of area destroyed during WWII air raids on Tokyo in each cell.	Ueno (1945)
Remaining Estates Share in 1931	The share of area owned by the descendants of local lords and used as their estate. in each cell	Kazoku Kaikan (1931)
Other Lords' Land / Military Use Share in 1931	The share of area owned by the descendants of local lords not as their estate/used as military infrastructure in each cell.	Seizusha, ed (1931-1935)
Lon and Lat controls	This includes latitude, longitude, their squared terms, and their interaction term.	Centroid of each cell

5 Results

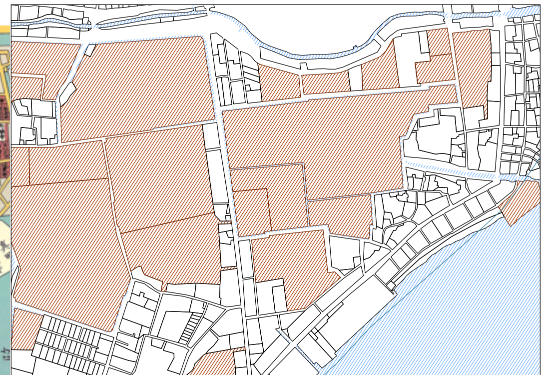
We first show the main results analyzing the effect of local lords' estates on the outcomes of lots, buildings, and land prices in our modern data. Then, we analyze the nature of persistence and the lot size effect, the role of tall buildings, and other possible mechanisms that might explain the main results. We also present the effects on firm productivity using firm-level microdata as suggestive evidence for the agglomeration benefits generated by large lots.

5.1 Main Results

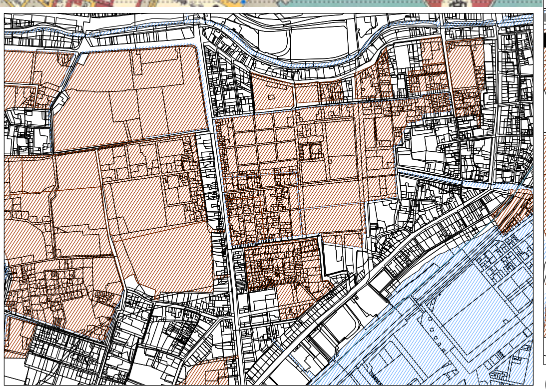
OLS using the full sample Table 3 shows the baseline results from the OLS regressing the outcome variables on the local lords' estates share variable. Distance from the center (Edo Castle or today's Imperial Palace) is associated with a reduction in local lords' estates and

Figure 3: Illustration from a Corner of the Tokyo CBD

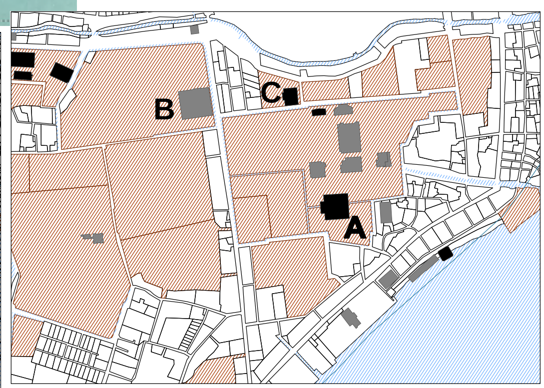
(a) Original Data Source



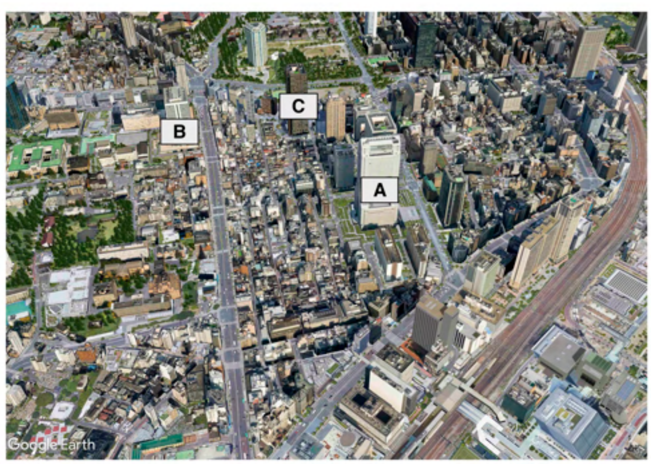
(b) Local Lords' Estates (Red-hatched Area)



(c) (b) + Lot in 2008–2011



(d) (b) + Tall Buildings: Black (Gray) Buildings Have More Than 30 (15) Stories



(e) Google Earth's Aerial Image Suggesting High Land Assembly Costs: Labels (A, B, and C) correspond to buildings in (d).

Notes: These figures show the raw data and aerial images around *Tamachi* station, a station in the CBD. Panel (a) is a reprinted map of one of the original data sources (Yomiuri Shimbun Hanbaikyoku, ed, 1990-1991). Panel (d) is the aerial image as of November 2021 taken from Google Earth.

Table 2: Descriptive Statistics

	Observation	Mean	SD	Min	Max
Panel A: Cell-level Variables					
Local Lords' Estates Share	9761	0.190	0.330	0	1
Number of Lots in 1872	5530	12.15	10.02	1	80
Number of Lots in 1931	7830	17.21	11.65	1	129
Number of Lots in 1912	8133	14.38	10.11	1	86
Number of Lots in 2008–2011	9101	55.99	36.57	1	202
Land Price in 1876 (Thousand Yen)	3644	0.00649	0.00890	9.99e-09	0.105
Land Price in 1912 (Thousand Yen)	7122	0.0485	0.0622	5.69e-08	0.612
Land Price in 1931 (Thousand Yen)	4711	0.0334	0.0441	0.000000302	0.424
Land Rental Price in 1931 (Thousand Yen)	7024	0.0391	0.0369	0.000000711	0.360
Log Land Price in 1972 (Thousand Yen)	6071	573.2	530.6	91.30	6640.0
Log Land Price in 1983 (Thousand Yen)	3276	1512.3	1492.1	249.7	22650.2
Land Price in 2012 (Thousand Yen)	8971	908.1	1516.5	98	16658.2
Stories (aboveground) in 2011	9542	5.764	4.687	0	56.00
Number of Buildings in 2011	9542	35.17	25.22	1	136
Number of Buildings >= 30 Stories in 2011	9542	0.0380	0.214	0	3
Panel B: Firm-level Variables					
Log Revenue per Worker in 2017	80473	3.363	1.167	-3.466	12.48
Log Revenue per Worker in 1993	85313	3.579	1.085	-3.020	12.04

affects urban development; therefore, we control for this variable as a baseline specification in Column (1). Panels A and B show that the greater the proportion of local lords' estates, the less lots are fragmented, both for 1872 and for 2008–2011. The point estimate shows that if a cell is occupied by local lords' estates, it decreases the number of lots in the 2010s by 23.30, about half of the mean, implying substantial lot size persistence.

In Panels C to E of Table 3, we find negative impacts on the number of buildings and positive impacts on the number of stories and tall buildings. The decreased number of buildings implies that large-scale developments with greater footprints are more common in areas that used to be local lords' estates. The point estimate for the number of buildings more than or equal to 30 stories is 0.037, which is about the same size as its mean.[20] In Panel F, we find that land prices increase as predicted. The point estimate shows a large impact: if local lords' estates occupy a cell (corresponding to a reduction in the number of lots by 23.3 in 2011), it increases the land price by 29.9%.

[20]The point estimate for the number of stories is just 0.5, but this is the result of a mixture of positive and negative effects. When we run a quantile regression, in the 10th percentile, the point estimate is about −0.3, suggesting that some local lords' estates became more low-rise housing areas. However, in the 90th percentile, which is more relevant for our study than the lower percentiles, the point estimate becomes 3.8, as predicted. See Table A.1 for the results for the other percentiles and the results with the control variables.

In Column (2) of Table 3, we control for the key geographical variables, the distance from the center, and altitude (mean and standard deviation). We add the mean and standard deviation of altitude, as higher places may attract richer people, whereas flatter places may be suitable for large-scale development. In Column (3), we control for the longitude and latitude polynomials to exploit more local variation. In Column (4), we also control for earthquake risk, which would affect the construction cost and the decision to build high-rise buildings. The results remain largely unchanged by adding these controls. We also consider the spillover effects from adjacent cells, but the qualitative results do not change.[21][22][23]

Overall, these results indicate lot size persistence and lot size premia. This corresponds to the following parameters of the conceptual framework described in Section 2: $\beta > 0$, the land value per area is increasing in lot size, high C_a, and high transaction costs to assemble land.[24]

Exploiting a Historical Zoning Policy As another identification strategy, we exploit a historical zoning policy to conduct a local randomization analysis, as briefly explained in the background section. Figure 1(a) shows a part of central Tokyo area, some of which the Tokugawa shogunate developed via reclamation. At the initial declamation, the shogunate developed the land to the eastern part of the U-shaped line, the dash and solid part, which became the initial coastline. At the same time, the shogunate clearly set the dash-dot part of the U-shaped line as a boundary between the local lords' estates zone and the commoners' zone, although we are not aware of formal documents specifying this zoning. The estates shown with a red border are obviously larger than the lots to the east of the dashed line, the

[21] Expecting positive spillover effects from adjacent local lords' estates is natural, and if local lords' estates are spatially correlated, this would bias the coefficient in the main results. Note that it does not alter the general interpretation that local lords' estates prevent lot fragmentation and increase skyscraper construction and land prices. Still, we investigate the spillover effects by adding the local lords' estate variables defined by a larger square (e.g., 3*3 cells) into the main specification. Table A.2 shows that the spillover effect exists up to the 3*3 cells (100–140 m from each cell) in most outcome variables. One exception is the result of the land price, which is unstable, but may suggest a spillover effect reaching farther. From this finding and to address the concerns discussed in Kelly (2019), we examine the robustness of the main result against the choice of threshold for the spatial correlation in the error terms, but the results are mostly robust even when we extend the threshold to 500 m or 1000 m, as shown in Table A.3.

[22] To check the robustness to the specification of the treatment variable, we also use the maximum of the lot area (km^2) of local lords' estates in each cell. The results are qualitatively the same, as presented in Table A.4.

[23] As a further robustness check, in Table A.5, we show the coefficient stability using the method developed by Oster (2019). We find that unobserved confounders do not alter the signs of the estimated effects.

[24] As shown in Figure A.3 and Panel A in Table 3, the geographical coverage of the data in 1872 is substantially lower than those of other datasets. As a robustness check for Table 3, we conduct an analysis using a consistent sample without missing values for any outcome variables in Table 3. Table A.6 presents the result, showing a similar pattern to Table 3.

Table 3: Main Results

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1872 (N: 5530)				
Local Lords' Estates Share	-11.92***	-11.82***	-12.06***	-12.10***
	(0.722)	(0.703)	(0.745)	(0.746)
Panel B: Number of Lots in 2008–2011 (N: 9101)				
Local Lords' Estates Share	-23.30***	-21.44***	-19.69***	-19.75***
	(2.970)	(2.935)	(3.032)	(3.031)
Panel C: Number of Buildings in 2011 (N: 9542)				
Local Lords' Estates Share	-12.91***	-11.12***	-10.41***	-10.37***
	(1.847)	(1.834)	(1.859)	(1.860)
Panel D: Stories (aboveground) in 2011 (N: 9542)				
Local Lords' Estates Share	0.526	0.663*	0.809**	0.757**
	(0.378)	(0.389)	(0.352)	(0.339)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 9542)				
Local Lords' Estates Share	0.0369**	0.0364**	0.0386**	0.0369**
	(0.0160)	(0.0167)	(0.0162)	(0.0156)
Panel F: Log Land Price in 2012 (N: 8971)				
Local Lords' Estates Share	0.299***	0.262***	0.179***	0.165***
	(0.0713)	(0.0749)	(0.0629)	(0.0590)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	No	Yes	Yes	Yes
S.D. of Altitude	No	Yes	Yes	Yes
Lon and Lat Controls	No	No	Yes	Yes
Earthquake Risk	No	No	No	Yes

Standard errors are shown in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of variables.

commoners' zone. After the increase in demand for land by local lords, the shogunate further reclaimed the area to the east of the initial coastline, reaching today's Sumida River. These areas were occupied largely by local lords. Therefore, the initial coastline became another boundary between the local lords' estate zone and the commoners' zone, and as a whole, the U-shaped line works as a boundary between the two zones except the northeastern dash part without the gray-colored buffer in Figure 1(b), where local lords' estates happened to be located in both zones. In Figure 1(b), we also overlay high-rise buildings in 2011, indicated by the black (more than or equal to 30 stories) and gray (15–29 stories) rectangles, and we observe that they are mainly located in the local lords' estate zone.

We first rely on graphical representation using the sample average and a polynomial regression, as shown in Figure 4, to examine the distribution of the variables. We use cells whose centroids are within 1 km of the boundary, but exclude cells whose centroids are within 50 m of the boundary, because such cells are separated on both sides and attenuate the jump (if any) at the discontinuity. The x-axis is the distance from the boundary, taking a positive and negative value in the local lords' estate zone and the commoners' zone. Figure 4(a) shows a clear discontinuous jump in the presence of local lords' estates. Figure 4(b) and 4(c) show the mean and standard deviation of altitude, respectively. Figure 4(b) shows no clear discontinuity at the boundary in the mean of altitude. Figure 4(c) shows some discontinuity at the boundary in the standard deviation of altitude, but higher ruggedness is disadvantageous to development, and thus, the simple RD design does not overstate the positive effects on development. We check the robustness to controlling for these variables in the regression analysis. Figure 4(d)–4(f) show that the western area has fewer lots, more high-rise buildings, and higher land prices.[25]

For the regression analysis, we employ a local randomization approach, because we do not have a large sample along the boundary (Cattaneo et al., 2018).[26] We use the cells whose centroid is within 250 m of the boundary, corresponding to about one block from the boundary, which is shown as the gray-shaded area in Figure 1(b). We do not use the boundary in the northeastern part for this analysis (dashed-line without the gray-shaded buffer), because some local lords had estates along the intimal coastline. We define a *Local Lords' Estates Zone* dummy by the location of the centroid of cells and regress the outcome variable on this dummy and the other controls. Table 4 shows the results. In Column (1) of Panel I, we regress the share of local lords' estates on the *Local Lords' Estates Zone* dummy, which confirms the expected large impact.[27] Column (2) adds the distance from the center and whether the centroid is on the western or eastern side of the overground railroads (also shown on the map), because overground railroads often divide economic activities. Column (3) adds the controls for the

[25]The plot of land prices within about 500 m of the boundary suggests the presence of positive spillovers arising from economies of density, which is consistent with the spillovers we find in the OLS analysis (Table A.2).

[26]We also employ an RD approach using the polynomials of the distances from the boundary as the control variables. Table A.7 shows qualitatively consistent results with the local randomization approach (Table 4), but larger standard errors, as expected.

[27]In the tables showing the RD results, we add Panel I into the top of the panels so that the panel structure is the same with that in the OLS tables.

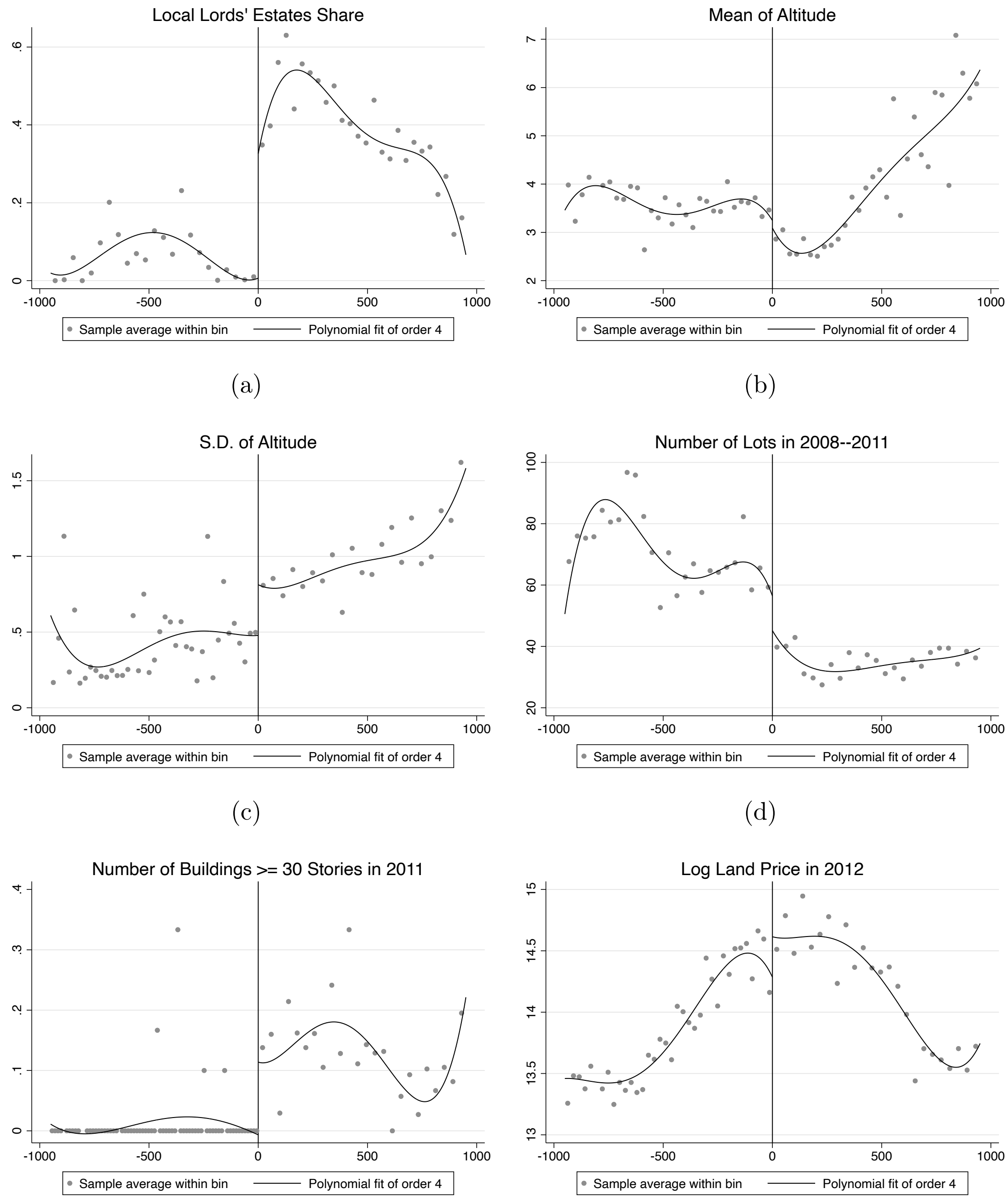
other geographical variables, the mean or standard deviation of altitudes, and earthquake risk. The results are similar across the specifications. In Panels A–G, we find a very similar pattern to that shown for Panels A–G in Table 3. Again, there is a negative effect on the number of lots, implying lot size persistence, and a positive effect on high-rise buildings. The effect on land prices is not statistically significant, unlike in Table 3 because of higher standard errors. We analyze the effect on firm-level productivity in the next section, which gives us more precise and direct evidence of the effect on firm productivity. Another finding is that the point estimates for high-rise buildings and land prices are larger in magnitude than those in Table 3. This is because this area is the most central part of Tokyo and the agglomeration benefits from constructing high-rise buildings are larger.[28]

Size of the effects To understand the magnitude of the effects in the OLS analysis, we compare them with the distance-decay function in land prices and the number of skyscrapers. By regressing the log of land prices on the distance from Tokyo station (today's center), we find, on the one hand, that the land price decreases by about 17% when 1 km from Tokyo station. On the other hand, our local lords' estate effect is 26% (column (2) in Panel F, Table 3), meaning that the effect is comparable to being about 1.5 km from the center. Similarly, we find that the effect on the number of tall buildings is comparable to being about 4.5 km from Tokyo station. These estimates imply a non-negligible role of transaction costs.

A within-city analysis is limited for assessing a city's overall impact. For example, the number of skyscrapers when we replace the commoners' zone with local lords' estates is hard to predict because our data do not tell us the aggregated demand function of skyscrapers in Tokyo. As an extreme case, demand for skyscrapers in Tokyo is fixed (i.e., the demand curve is vertical), and thus, removing the transaction costs may not increase the total number of skyscrapers. However, this is very unlikely given the recent growth in skyscrapers in Tokyo and removing transaction costs would increase land prices and tall buildings at the city level as well.

[28]As a further robustness check, in Table A.8, we show the coefficient stability using the method of Oster (2019). We find that unobserved confounders do not alter the signs of the estimated effects. We also show the results using the donut hole approach excluding cells on the boundary in Table A.9, showing qualitatively similar results with Table 4.

Figure 4: Distribution along the Zoning Boundary



(a) (b) (c) (d) (e) (f)

Notes: We use all cells within 1 km of the boundary in Figure 1(b) excluding cells within 50 m of the boundary to avoid mechanical attenuation effects. The x-axis is the distance from the boundary, which is shown as the solid line and dash-dot line in Figure 1(b), taking a positive and negative value in the local lords' estate zone and the commoners' zone, respectively. The points show the average of each outcome variable within each bin. The number of bins is chosen using the mimicking variance evenly spaced method using spacing estimators. The lines show the fourth-order polynomial fit for each zone.

Table 4: Local Randomization Design

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share (N: 351)			
Local Lords' Estates Zone	0.411***	0.402***	0.351***
	(0.0579)	(0.0547)	(0.0592)
Panel A: Number of Lots in 1872 (N: 350)			
Local Lords' Estates Zone	-12.14***	-11.97***	-10.79***
	(1.896)	(1.777)	(2.059)
Panel B: Number of Lots in 2008–2011 (N: 352)			
Local Lords' Estates Zone	-23.74***	-24.29***	-22.22***
	(7.128)	(5.781)	(6.297)
Panel C: Number of Buildings in 2011 (N: 351)			
Local Lords' Estates Zone	-10.06**	-11.16***	-10.60***
	(4.446)	(3.866)	(3.656)
Panel D: Stories (aboveground) in 2011 (N: 351)			
Local Lords' Estates Zone	2.159***	2.317***	2.020**
	(0.746)	(0.715)	(0.873)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 351)			
Local Lords' Estates Zone	0.114**	0.126**	0.124***
	(0.0452)	(0.0512)	(0.0469)
Panel F: Log Land Price in 2012 (N: 341)			
Local Lords' Estates Zone	0.179	0.443*	0.343*
	(0.333)	(0.244)	(0.202)
Distance from the Center (Castle)	No	Yes	Yes
West of the Yamanote line	No	Yes	Yes
Mean of Altitude	No	No	Yes
S.D. of Altitude	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
Local Lords' Estates Zone takes a value of one if the central point of the cell is in the local lords' estate zone, the outer side of the U-shaped boundary in Figure 1.

5.2 Mechanisms

5.2.1 Pattern of Persistence

The main results indicate lot size premia and the presence of assembly costs. To examine the nature of the assembly costs (γ_a), we split the sample into the core area and the non-core area. The core area will have higher potential for redevelopment. This could result in two scenarios.

If land assembly costs are constant or less than proportional to the value of redevelopment ($0 \leq \gamma_a < 1$), we would find weaker persistence in the core area, because there would be enough benefits by assembling land and constructing skyscrapers to cover the assembly costs. However, if land assembly costs are more than proportional to the value of redevelopment ($\gamma_a > 1$), owing to the hold-out problem, for example, we might find stronger persistence in this area.

We investigate the heterogeneous impacts between the core and non-core areas in our OLS and RD analyses. For the OLS analysis, we split the sample into the core area and the non-core area using the *Yamanote* loop line and execute the regression analysis as in Table 3. This loop-line railway connects terminal stations in Tokyo, and the area inside the circular line is generally recognized as the center of Tokyo. Table 5 shows the results. In columns (1) and (2), we use a 300-m buffer from the loop line to define the core and the non-core area. We find that the number of lots in 1876 is lower in both samples (Panel A), but the lot size persists only in the core area (Panel B). Accordingly, we find positive impacts on tall buildings and land prices only in the core area (Panels C–F). This result implies that the effect of local lords' estates on buildings or land prices today comes through lot size persistence.

This pattern does not alter when we change the 300-m buffer to a 1000-m or 2000-m buffer in columns (3)–(6).[29] We also examine this pattern using the local randomization design by estimating the effect of the coastal boundary far from the core area and the non-coastal boundary close to the core area separately (Table 6).[30] Again, we find lot size persistence and effects on buildings or land prices only in the core area, although both show initial effects on the number of lots. These results imply that land assembly costs are not constant and are higher in the core area ($\gamma_a > 1$).

5.2.2 Nature of Lot Size Effect: Role of Skyscrapers

Before the prevalence of skyscrapers or transition to an office economy, there would have been fewer agglomeration benefits and the value of land per area would be decreasing in lot size

[29]We also check the robustness against using an alternative definition of the core area using the distance from the five major terminal stations, which have large commuter market access (Tsivanidis, 2019). The maximum of the distance is 7.8 km, and thus, we split the sample using 4 km as a threshold to define core and non-core areas. Table A.10 shows the result, which is qualitatively similar to Table 5.

[30]See Figure A.4 and Figure A.5 for the graphical representations in each boundary.

Table 5: Lot Size Persistence, Core vs. Non-core

	Inside vs Outside the Circle (*Yamanote*) Line					
	300 m		1000 m		2000 m	
	Inside	Outside	Inside	Outside	Inside	Outside
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Number of Lots in 1872						
Local Lords' Estates Share	-11.89***	-11.75***	-12.37***	-9.899***	-12.40***	-6.987***
	(0.824)	(1.384)	(0.796)	(1.595)	(0.776)	(1.633)
Panel B: Number of Lots in 2008–2011						
Local Lords' Estates Share	-24.37***	-3.130	-22.08***	-0.819	-20.68***	3.029
	(3.166)	(6.323)	(3.215)	(5.098)	(3.131)	(6.888)
Panel C: Number of Buildings in 2011						
Local Lords' Estates Share	-12.03***	-1.303	-10.39***	0.482	-9.669***	6.105
	(1.927)	(4.735)	(1.985)	(4.112)	(1.930)	(5.845)
Panel D: Stories (aboveground) in 2011						
Local Lords' Estates Share	0.880**	-0.115	0.723**	0.481	0.646*	0.0777
	(0.349)	(0.565)	(0.351)	(0.644)	(0.340)	(0.890)
Panel E: Number of Buildings >= 30 Stories in 2011						
Local Lords' Estates Share	0.0396**	0.00143	0.0387**	0.0156	0.0351**	0.0431
	(0.0165)	(0.0175)	(0.0163)	(0.0215)	(0.0157)	(0.0274)
Panel F: Log Land Price in 2012						
Local Lords' Estates Share	0.215***	-0.162**	0.146**	-0.00200	0.140**	-0.0664
	(0.0540)	(0.0811)	(0.0613)	(0.0489)	(0.0616)	(0.0463)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes	Yes	Yes
Lon and Lat Controls	Yes	Yes	Yes	Yes	Yes	Yes
Earthquake Risk	Yes	Yes	Yes	Yes	Yes	Yes
N in Panel A	3555	1975	4045	1485	4702	828
N in Panel B	6137	2964	7160	1941	7977	1124
N in Panel C	6144	3398	7333	2209	8315	1227
N in Panel D	6144	3398	7333	2209	8315	1227
N in Panel E	6144	3398	7333	2209	8315	1227
N in Panel F	5704	3267	6855	2116	7811	1160

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
Column (1) uses cells inside the (*Yamanote*) loop line or cells whose centroid is within 300 m of the loop line. Column (2) uses the other cells. Columns (3) and (4), or (5) and (6) use 1000 m or 2000 m for the threshold, respectively.

($\beta < 1$). In that case, smaller lots would be preferred, and if split costs (C_s) were small, large lots would be split.

To analyze this point, we use cadastral map and land price data before the 2010s when there were fewer skyscrapers. We examine how local lords' estates affected lot fragmentation and land prices in 1876, 1912, 1931, 1972, and 1983 using the same set of specifications as in Table 3 (OLS) and Table 4 (RD). We graphically show the results with the baseline control variables, as shown in Figure 5.[31] The point estimates show that local lords' estates had negative effects on the number of lots before WWII (Figure 5(a)), affecting land prices *negatively* before WWII (Figure 5(b)). In 1972 and 1983, when high-rise buildings became more common, the effect on land prices increased to around zero, and in the 2010s, when there were many skyscrapers, there was a clear positive effect. This pattern is particularly prominent in the RD analysis using the boundary in the core area (see Figure 6 for a graphical representation).[32] These findings suggest two insights about lot size and land price relationships: (1) before WWII, smaller lots were preferred, but there were substantial split costs ($\beta_{preWWII} < 1$ and $C_s > 0$), generating lot size persistence and lot size discount; and (2) technological progress after WWII (the development of construction technology for high-rise buildings and the transition in production from factories to offices) changed the relationship between lot size and the land value per area ($\beta_{preWWII} < 1 < \beta_{postWWII}$).[33]

5.2.3 Discussion: Comparison with Other Studies

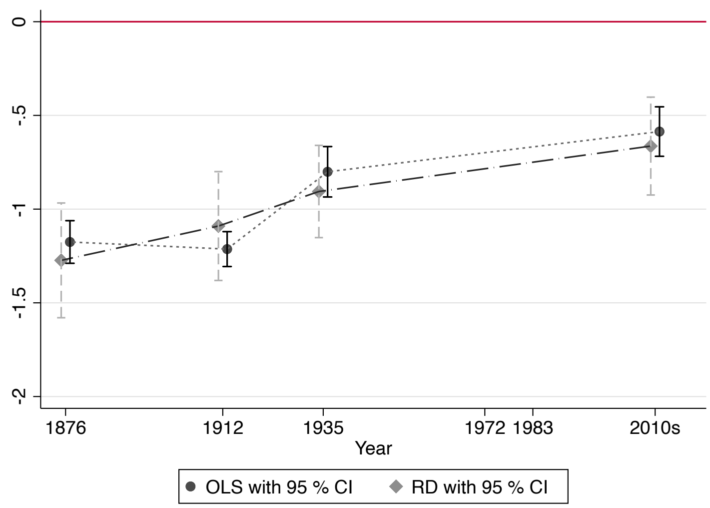
The results so far suggest that substantial transaction costs are incurred in changing lot size in Tokyo's CBD, generating lot size persistence over 150 years and lot size premia. This is in contrast to the results of other studies using rural/suburban areas (Bleakley and Ferrie, 2014; Finley et al., 2021; Smith, 2020), which also find the gain of assembly but weaker lot size persistence (persistence disappears after 150 years). Through the lens of our conceptual framework, this difference is attributed to local economic potential (A) and the nature of transaction costs (γ_a): A is higher in cities than in rural/suburban areas, and because assembly costs are increasing in economic potential ($\gamma_a > 1$), lot size persistence is stronger in cities.

[31]See the regression results with other specifications for Table A.11 (OLS) and Table A.12 (RD). We find qualitatively similar results across the specifications. In Table A.13, we repeat the same analysis with Table A.11 by using the sample in Table A.6, which does not have missing values for any lot in 1872 or for price, lot, and buildings in the 2010s. The results are largely unchanged.

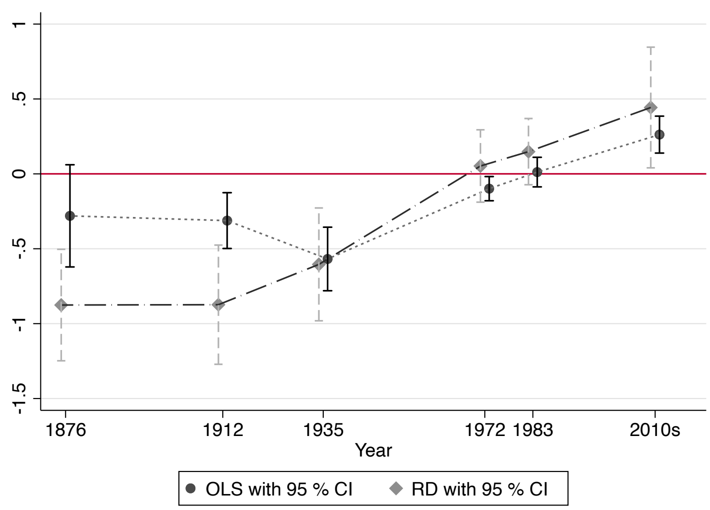
[32]See Figure A.6 and Figure A.7 for graphs using both boundaries and the non-core boundary only. See Figure A.8 for aerial images of areas around the core boundary in 1970 and 2011, showing the growth in high-rise buildings between these periods.

[33]There is anecdotal evidence that larger lots were less preferred in 17th-century Manhattan as well (Barr, 2016).

Figure 5: Time-varying Effects of Local Lords' Estates



(a) The Effect of Local Lords' Estates on the Number of Lots

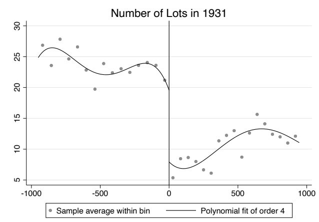


(b) The Effect of Local Lords' Estates on Land Prices

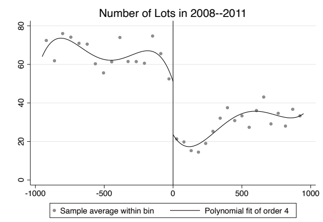
Notes: The circles show the point estimates using OLS with controlling for *Distance from the Center (Castle)*, *Mean of altitude*, and *S.D. of Altitude*. The diamonds show the point estimates using local randomization while controlling for *Distance from the Center (Castle)* and *West of the Yamanote line*. Figure 5(a) shows the effect of local lords' estates on the number of lots after normalization, and Figure 5(b) shows the effect of local lords' estates on the log of land price.

Figure 6: Number of Lots and Land Prices along Zoning Boundary in the Core Area from 1912 to the 2010s

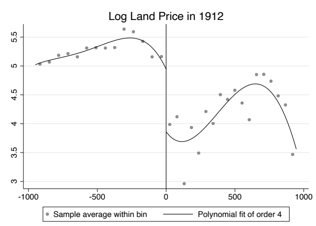
(a) Number of Lots in 1912



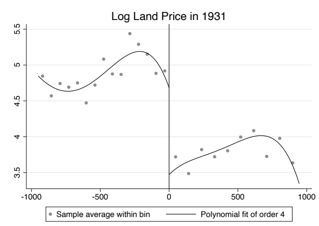
(b) Number of Lots in 1931



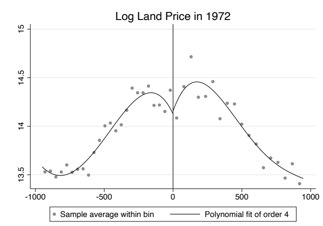
(c) Number of Lots in the 2010s



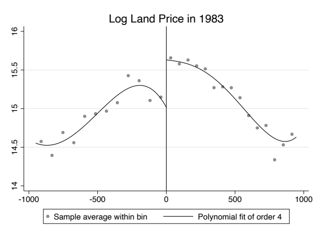
(d) Log Land Price in 1912



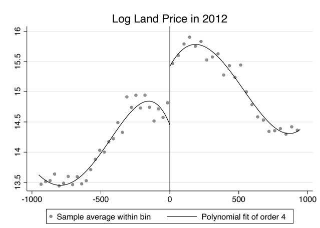
(e) Log Land Price in 1931



(f) Log Land Price in 1972



(g) Log Land Price in 1983



(h) Log Land Price in the 2010s

Notes: We use all cells within 1 km of the boundary in Figure 1 excluding cells within 50 m of the boundary to avoid mechanical attenuation effects. The x-axis is the distance from the boundary, which is represented by the dash-dot line in Figure 1, taking a positive and negative value in the local lords' estate zone and the commoners' zone, respectively. The points show the average of each outcome variable within each bin. The number of bins is chosen using the mimicking variance evenly spaced method using spacing estimators. The lines show the fourth-order polynomial fit for each zone.

The observation that γ_a is greater than one is consistent with prior theoretical studies on hold-out (Eckart, 1985; O'Flaherty, 1994; Strange, 1995; Miceli and Sirmans, 2007), and lab experiments confirm that the net benefit of redevelopment can affect hold-out (Winn and McCarter, 2018).

Our results suggest that the rise of skyscrapers generates the value of large lots, resulting in the change of the case from $\beta_{preWWII} < 1$ to $\beta_{postWWII} > 1$.[34] On the contrary, some previous studies find lot size discount, not premia, by hedonic regression (White, 1988; Brownstone and Vany, 1991). However, their setting is suburban residential areas in the U.S., and the mean lot size is 0.71 acres or 0.64 acres, respectively, which is 10 times more than the typical lot size for four-member families in the U.S. Therefore, split would be preferred over assembly in their case, corresponding to the case of $\beta < 1$.

5.2.4 Other Possible Mechanisms

The results above support the view that local lords' estates increase lot size today, facilitate skyscraper construction by decreasing the transaction costs of assembly, and increase the land price. We consider alternative channels to explain the link between local lords' estates and land prices.[35]

First, transaction costs may be relevant in the public sector. For example, large lots may facilitate the construction of transportation infrastructure (wider roads and proximity to railroad stations) or buildings for the public sector (hospitals, universities, and parks), which would increase the land price. We consider these channels by controlling for average road width, the share of land used as hospitals, universities, and parks, and distance to the nearest station in 2017 and 1950 for both the OLS and the RD analyses;[36] however, the main results mostly hold.[37] This suggests that these factors are not the main drivers of the key results.

Second, local lords' estates may facilitate skyscraper construction, but not through lot size. We consider the size of blocks (not each lot, but the area surrounded by roads) as an

[34] An alternative explanation for this change is that there is a constant optimal size of lots but lots are split over time by exogenous reasons, such as inheritance. This would generate the transition from lot size discount to lot size premia over time as well. However, this is inconsistent with Figure A.9, showing the change from upward slope to downward slope in the relationship between lot fragmentation and land price.

[35] See "Other variables" Table 1 for the data sources of the variables used to account for alternative channels.

[36] Demolished stations can have persistent effects, as shown in Brooks and Lutz (2019).

[37] See Table A.14 and Table A.15 for the OLS and RD results. The effect on land prices is less significant in the RD design, but the core area shows significant signs in Panel G of Table A.15.

alternative channel, because it is another constraint for constructing large buildings. Another alternative channel is the FAR regulation, because it can affect skyscraper construction.[38][39] We add these variables into the main specification, finding that the main results remain largely unchanged.[40][41] Finally, the fact that local lords' estates were used for non-business purposes before 1868 might affect the dynamic path of land use after 1868 through its lower economic activities during the pre-modern era. One way to control for this effect is to compare local lords' estates area with bureaucrats' houses area, which is also used for housing for the samurai class but is more fragmented than the local lords' estates area. We exclude the other areas (e.g., commoner's area and temples) and conduct the OLS analysis, finding qualitatively similar results to the main result.[42] Similarly, when controlling for the land price in 1876 in the OLS and RD analyses, the coefficient of local lords' estates hardly changes.[43] Overall, these channels may exist in the causal chain from local lords' estates to land prices, but they do not fully explain the main results.

Next, we consider alternative historical shocks that might explain why we observe persistence only in the core area or the sign of the effect on land price changes. We first consider the destruction during the WWII bombing.[44] This might be concentrated in the non-core area and affect lot size persistence. In addition, it might affect the change in the land price after WWII. However, the results are unchanged when we control for the share of the destroyed

[38]Note that the FAR regulation may be loosened by increased demand for skyscrapers, and thus, it may just exist in the causal chain between lot size and skyscraper construction in the main results rather than as an alternative mechanism.

[39]Before 1919, there were no height restrictions or FAR regulations. However, in response to rapid city growth, in 1919, the government established height regulations, and in 1961, the government switched from height regulations to FAR regulations.

[40]FAR regulations depend on the land use zones established under urban planning laws and the width of the roads that the buildings face under construction laws. Specifically, when road width x is equal to or more than 12 m, the maximum FAR is equal to that set by land use zones (FAR_{zone}). When x is less than 12 m, the formula $\min\{FAR_{zone}, x * k * 100\}$ determines the maximum FAR, where $k = 0.6$ ($k = 0.4$) when the land is commercial (residential). For example, suppose that the land use zone regulation specifies 500% as the maximum ratio. If the road in front of the land is 6 m and the land is commercial, the maximum FAR is reduced to 360%. Although there are some special cases in which $k > 0.6$ due to policies by local municipalities, in the regression analysis, we calculate the road-level maximum FAR using the formula above and use its weighted mean using the length of each road segment as the control variable.

[41]See Table A.16 and Table A.17 for the OLS and RD results. The effect on land prices is less significant in the RD design, but the core area shows significant signs in Panel G of Table A.17.

[42]See Table A.18 for the OLS result. There is no bureaucrats' houses area in the sample area of RD analysis.

[43]See Table A.19 and Table A.20.

[44]Harada et al. (2022) investigate the long-term effect of this bombing on local communities and their livelihood in residential areas.

area.[45]

Second, we consider the change in land use caused by the end of WWII. Before WWII, the descendants of local lords still used a part of the estates to live on or for military infrastructure. There should be a significant change in land use in those areas after WWII, which may explain the difference between the core and non-core areas or in the sign of the effect on local lords' estates. Similarly, land owned by local lords' descendants in 1931 might have been priced lower than its market value for political reasons, as discussed in the data section. After WWII, lords were deprived of their political privilege; they might have sold their land and their land might have been highly valued. To address these concerns, we control for the descendants' estates or their other land and military infrastructure in the regression analysis. However, the results are robust to controlling for these factors.[46]

5.3 Effect on Firm Productivity

To further examine the positive effect of local lords' estates on land prices through agglomeration benefits ($\beta_{postWWII} > 1$), we analyze the impact on firm productivity using microdata. There are two channels of how local lords' estates affect local-level TFP through high-rise buildings: the selection channel in which competition becomes tougher and less productive firms exit and the agglomeration benefits channel in which firms increase their TFP by knowledge spillovers, a thick labor market, sharing common sources, and so on. If the selection channel is the main driver of the effect on land prices, it does not represent a productivity gain for firms.

To disentangle these channels, we examine the distribution of firm productivity in each cell (Combes et al., 2012). The selection channel generates a cutoff in the lower tail, because the least productive firm exits. Meanwhile, the agglomeration benefits channel shifts the whole distribution to the right and/or the upper tail becomes thicker when productive firms can enjoy the agglomeration benefits more.

Figure 7(a) shows the distribution of firm productivity in 2017 proxied by revenue per worker in cells whose local lords' estates share is zero and one (the solid line and dash line, respectively). We find that the lower tail does not show a significant difference, suggesting

[45] See Table A.21, Table A.22, Table A.23, and Table A.24.

[46] See Table A.25, Table A.26, Table A.27, and Table A.28.

a very weak cutoff channel, but the upper tail becomes thicker in the local lords' estates zone. We find a very similar pattern when we compare firms in the local lords' estates zone and the other zone using firms close to the boundary, as in the local randomization design (Figure 7(b)). Quantile regression analysis with the inclusion of the other cells in the sample and controlling for other variables (controls in the main analysis and industry fixed effects) confirm this pattern, with a larger effect in the upper tail (see the point estimates shown by gray diamonds in Figure 8(a) and Figure 8(b)). These results imply that local lords' estates contribute to productivity gains for firms mainly through agglomeration benefits.[47]

For further investigation of the selection channel, we examine firms' moving, exit, and entry using the datasets in 1993 and 2017. We find no evidence that less productive firms disappear from the local lords' estates zone through these channels.[48] These two sets of results indicate that the presence of local lords' estates contributes to firm productivity through the agglomeration benefits channel, which is a pure gain for firms.

The comparison between 1993 and 2017 is also useful for examining the role of tall buildings in generating the lot size premia. Although the results in Figure 5 show a stark difference in the effect of lot size on land prices between the periods, there may be changes in those 150 years other than the emergence of skyscrapers or the knowledge-based economy to explain the difference. To investigate the role of tall buildings more explicitly, we focus on more recent changes in the height of buildings from 1993.[49][50] Using the same specification as in

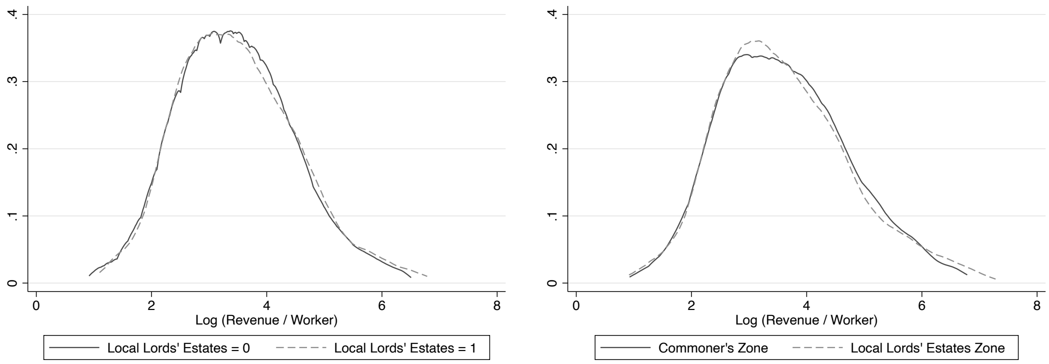
[47] Among the alternative channels discussed in the previous section, public amenities may affect firm productivity, but not through skyscrapers. We include these variables as additional controls and confirm that the main results hold. See Table A.29 and Table A.30.

[48] Focusing on firms that change their location from 1993 to 2017, we find that more productive firms do not significantly move into areas with a high local lords' estates share (Panel A in Table A.31). Focusing on firms that exist in 2017, we find that new firms that did not exist in 1993 are less productive, but this pattern does not become stronger in the high local lords' estates share area (Panel B in Table A.31). Similarly, focusing on firms that exist in 1993, we find that firms that exit by 2017 are less productive, but this pattern does not become stronger in the high local lords' estates share area (Panel C in Table A.31). These results suggest that the selection channel does not operate in these margins. As a counterpart of our local randomization design, Table A.32 analyzes the move from or to the local lords' estates zone and entry and exit from our sample area for local randomization. We find that more productive firms moved to the commoners' zone and the other margins are not significant once we control for the interaction between local lords' estates share and industry fixed effects in column (3). Overall, these results also do not support the selection channel.

[49] The effect of local lords' estates on skyscrapers was increasing in these 25 years. See Table A.33 and Table A.34.

[50] We also split the sample into a business zone (more than half of the land is used for the purpose of business) and a residential zone (similarly defined) to investigate heterogeneous effects. This classification is endogenous, and thus, the results should be interpreted with caution. Table A.35 shows that in both zones, local lords' estates prevent lot fragmentation and encourage large-scale development (Panels A–C), but promote the construction of high-rise buildings only in the business zone (Panels D–E). For land prices, both zones show

Figure 7: Firm Productivity Distribution in the Local Lords' Estate Area and Other Areas



(a) OLS (b) Local Randomization

Notes: Figure 7(a) shows the distribution of firm productivity in 2017 proxied by revenue per worker in cells whose local lords' estates share is zero and one (solid line and dash line, respectively). Similarly, Figure 7(b) shows the distribution of firm productivity in 2017 proxied by revenue per worker in the local lords' estates zone and the other zone within the sample, respectively, for the local randomization design.

the analysis using the 2017 data, we find that the effects are smaller in 1993 (shown as black triangles in Figure 8(a)) than in 2017. In addition, once we control for the average number of stories, the effect of local lords' estates attenuates and the difference between 2017 and 1993 becomes smaller (Figure 8(c)). We find a similar pattern when we employ the local randomization design (Figure 8(b) and Figure 8(d)).[51] Although the point estimates are not precisely estimated and the analyses are not free from the bad control problem, they provide suggestive evidence that local lords' estates contribute to a productivity gain for firms through agglomeration benefits in high-rise buildings.

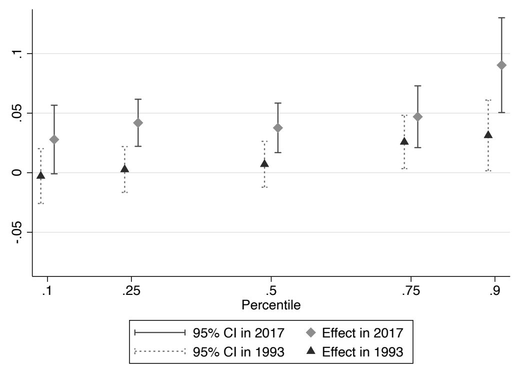
6 Policy Implications

Policymakers recognize that lot fragmentation is an important obstacle in urban development (Nelson and Lang, 2007), but the long-run effects of lot fragmentation are not well understood. This is particularly relevant to today's growing cities in developing countries (Bryan et al., 2020), which often have poor urban slums in core areas. The provision of property rights

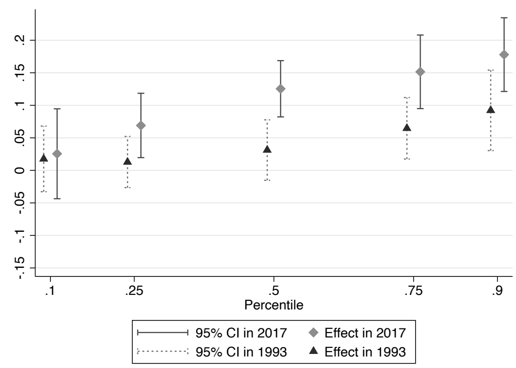
the positive impacts of local lords' estates and the effect in the business zone is higher in the core area, although the significance varies owing to the different levels of standard errors. This suggests that the presence of local lords' estates may affect land prices in the residential zone through different channels such as higher amenities arising from less density and the presence of parks.

[51]See Table A.36 and Table A.37 for the corresponding regression tables.

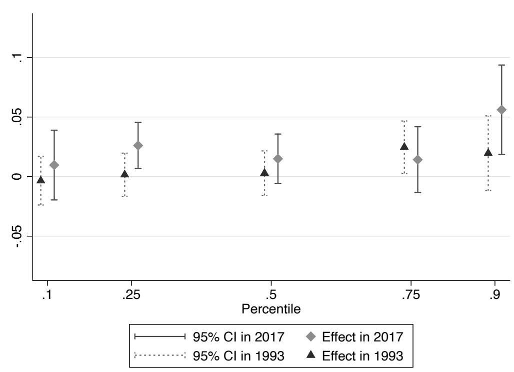
Figure 8: Quantile Regression Analysis on Firm Productivity



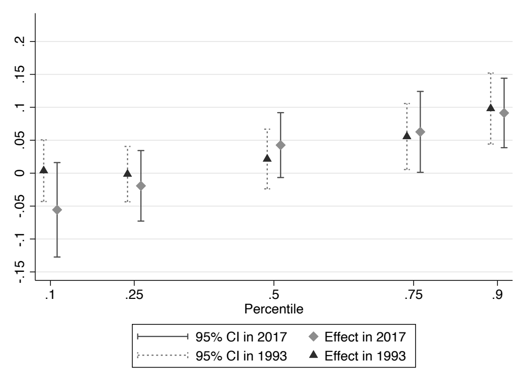
(a) OLS with Controls



(b) Local Randomization with Controls



(c) (a) + Controlling for Stories



(d) (c) + Controlling for Stories

Notes: (a) shows the coefficients when regressing the log of revenue per worker on local lords' estates share, conditional on *Distance from the Center (Castle)*, *Mean of altitude*, *S.D. of Altitude*, and industry fixed effects. Diamonds (triangles) show the results using the sample in 2017 (1993). (b) shows the coefficients when regressing the log of revenue per worker on the local lords' estates zone variable, conditional on *Distance from the Center (Castle)*, *Mean of altitude*, *S.D. of Altitude*, *West of the Yamanote line*, *Earthquake Risk*, and industry fixed effects. (c) and (d) show the results when we add the mean of stories (aboveground) as an additional control variable to the analysis in (a) and (b), respectively.

in urban slums to enhance economic development has been discussed and implemented in practice. Various studies analyze whether such entitlements increase investments in housing (Field, 2005; Field and Torero, 2006; Henderson et al., 2016). Our results imply that entitling property rights may have unintended consequences for productivity through lot fragmentation in rapidly growing cities when such areas need to be transformed into business zones with high-rise buildings, echoing the view in Glaeser (2021).[52]

To obtain a more policy-relevant parameter, we estimate the impact of additional lots in 1872 on the land prices of today using local lords' estates as an instrument. Note that the map in 1872 covers only the relatively central area, which results in a bigger effect than the average effect, as analyzed in Table 5. We find that additional lots in 1872 decrease the land price in 2012 by 0.9–3.4%.[53] Because the standard deviation of the number of lots is about 10, this suggests a substantial negative impact of initial lot fragmentation on the land price. Although this parameter is heterogeneous across cities, it is a benchmark for policymakers in rapidly growing cities in developing countries.

7 Conclusion

In this study, we investigate whether transaction costs in the urban land market generate lot size persistence and hinder efficient land use. We construct a 100 m*100 m-cell-level dataset spanning 150 years and use a plausibly exogenous release of large lots (local lords' estates) to the private market in 1868. Using OLS and local randomization designs, we find that cells used as local lords' estates formerly have larger lots even after 150 years. This lot size persistence is stronger in the core area, implying higher transaction costs there. We also find that previous local lords' estates generate agglomeration benefits in the 2010s: there are more skyscrapers, higher land prices, and productive firms. We further confirm that the effect on firm productivity does not come from the moving, exit, or entry of firms. Meanwhile, before WWII, former local lords' estates had larger lots than other areas but lower land prices. This opposite result on the land price from the 2010s means that previous local lords' estates were too large for optimal land use and discounted due to land split costs. These findings imply that

[52]Similarly, Harari and Wong (2019) and Michaels et al. (2021) show that upgrading amenities in slums may result in lower land prices and shorter buildings by increasing formalization costs.

[53]See Table A.38 for the results, including the results for the other main outcome variables.

the prediction of the Coase theorem without transaction costs is not relevant in the urban land market, particularly in the CBD, and initial lot sizes have substantial impacts on economic activities even after 150 years. City planners in developing countries should take account of these results when entitling property rights to fragmented areas such as slums.

Table 6: Lot Size Persistence, Core vs. Non-core (Local Randomization)

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share (N: 351)			
Local Lords' Estates Zone (Core)	0.405***	0.387***	0.317***
	(0.0727)	(0.0494)	(0.0670)
Local Lords' Estates Zone (Non-core)	0.421***	0.424***	0.393***
	(0.0942)	(0.102)	(0.0990)
Panel A: Number of Lots in 1872 (N: 350)			
Local Lords' Estates Zone (Core)	-15.55***	-13.11***	-12.86***
	(1.689)	(2.088)	(2.039)
Local Lords' Estates Zone (Non-core)	-6.890***	-10.40***	-8.210***
	(2.114)	(2.541)	(2.706)
Panel B: Number of Lots in 2008–2011 (N: 352)			
Local Lords' Estates Zone (Core)	-40.98***	-36.26***	-34.63***
	(5.671)	(5.407)	(6.817)
Local Lords' Estates Zone (Non-core)	3.292	-7.405	-6.375
	(7.120)	(7.601)	(7.711)
Panel C: Number of Buildings in 2011 (N: 351)			
Local Lords' Estates Zone (Core)	-20.90***	-19.06***	-19.65***
	(2.743)	(2.852)	(3.249)
Local Lords' Estates Zone (Non-core)	6.786	-0.00764	0.957
	(5.596)	(5.616)	(5.544)
Panel D: Stories (aboveground) in 2011 (N: 351)			
Local Lords' Estates Zone (Core)	3.685***	3.931***	3.164**
	(0.939)	(1.179)	(1.484)
Local Lords' Estates Zone (Non-core)	-0.214	0.0366	0.560
	(0.542)	(0.774)	(0.698)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 351)			
Local Lords' Estates Zone (Core)	0.199***	0.239***	0.213***
	(0.0647)	(0.0748)	(0.0728)
Local Lords' Estates Zone (Non-core)	-0.0185*	-0.0331	0.0113
	(0.00990)	(0.0382)	(0.0327)
Panel F: Log Land Price in 2012 (N: 341)			
Local Lords' Estates Zone (Core)	0.922***	1.035***	0.827***
	(0.322)	(0.225)	(0.228)
Local Lords' Estates Zone (Non-core)	-0.874***	-0.333	-0.237
	(0.301)	(0.272)	(0.275)
Distance from the Center (Castle)	No	Yes	Yes
West of the Yamanote line	No	Yes	Yes
Mean of Altitude	No	No	Yes
S.D. of Altitude	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
Local Lords' Estates Zone (Core) (*Local Lords' Estates Zone (Non-Core)*) takes a value of one if the central point of the cell is in the local lords' estate zone, and the closest boundary is the solid (dash-dot) line in Figure 1.

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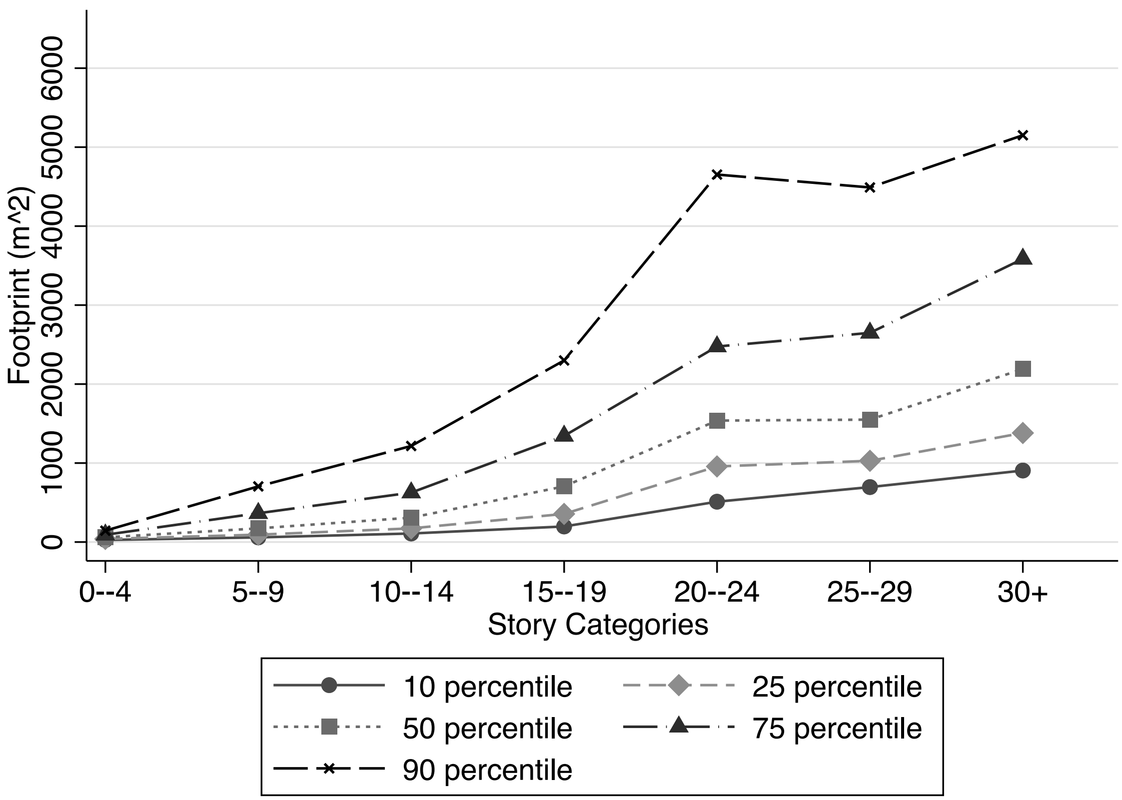
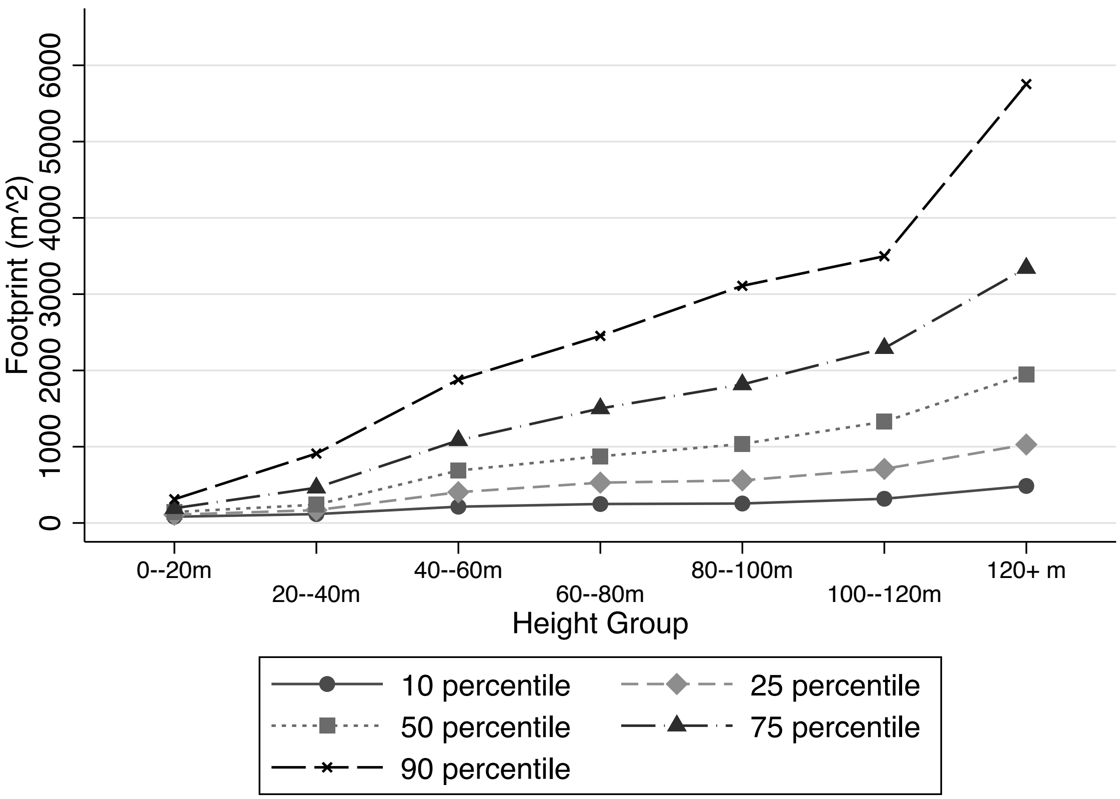
Appendix Not for Publication

Figure A.1: Building Heights and Footprint



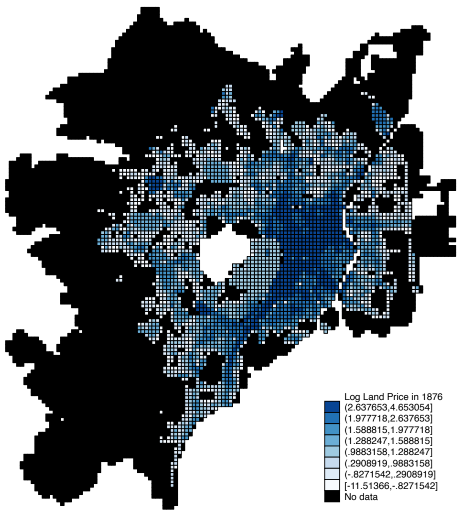
Notes: This graph shows the distribution of footprint of buildings located in Tokyo's 23 wards in 2011 (Tokyo Metropolitan Government, 2011). See the main text for the details of the dataset. We show the percentiles of footprint conditional on the building-story group.

Figure A.2: Building Heights and Footprint in New York

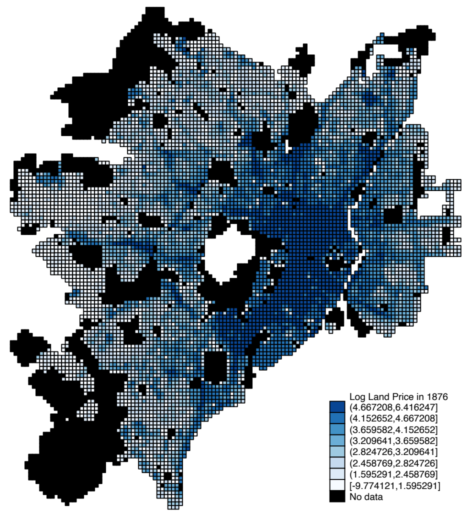


Notes: This graph shows the distribution of footprint of buildings located in New York City (Syracuse and Manhattan) in 2017 (Microsoft, 2017). We show the percentiles of footprint conditional on the building-height groups.

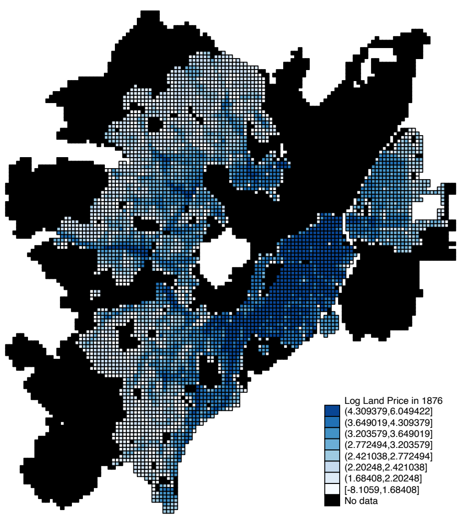
Figure A.3: Coverage and Pattern of Land Price Data



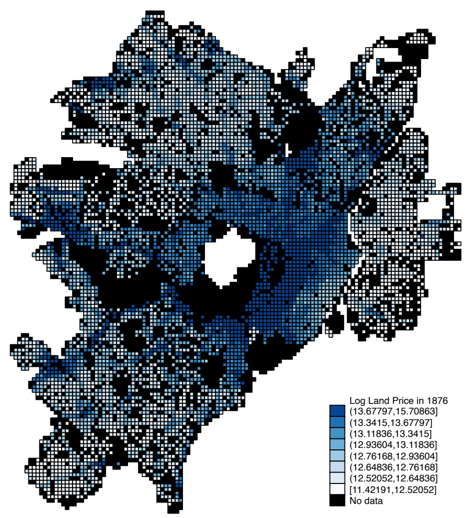
(a) 1876



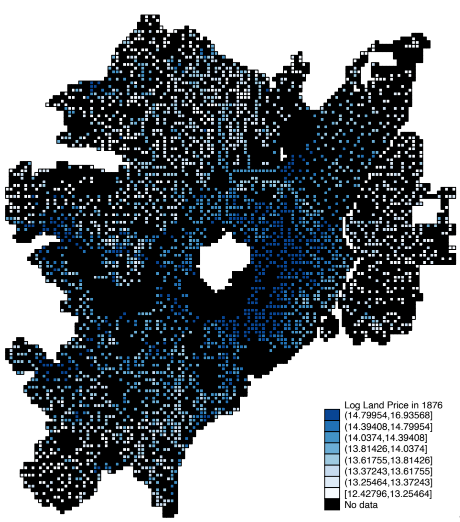
(b) 1912



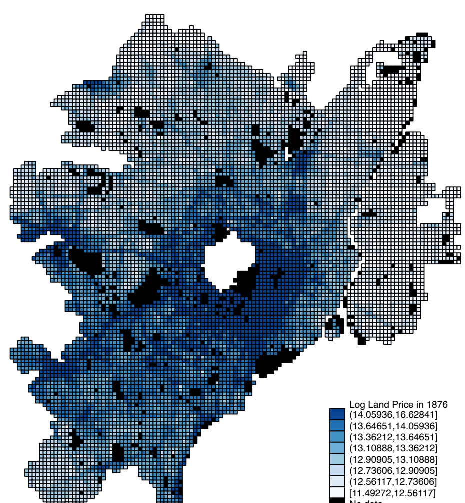
(c) 1931



(d) 1972



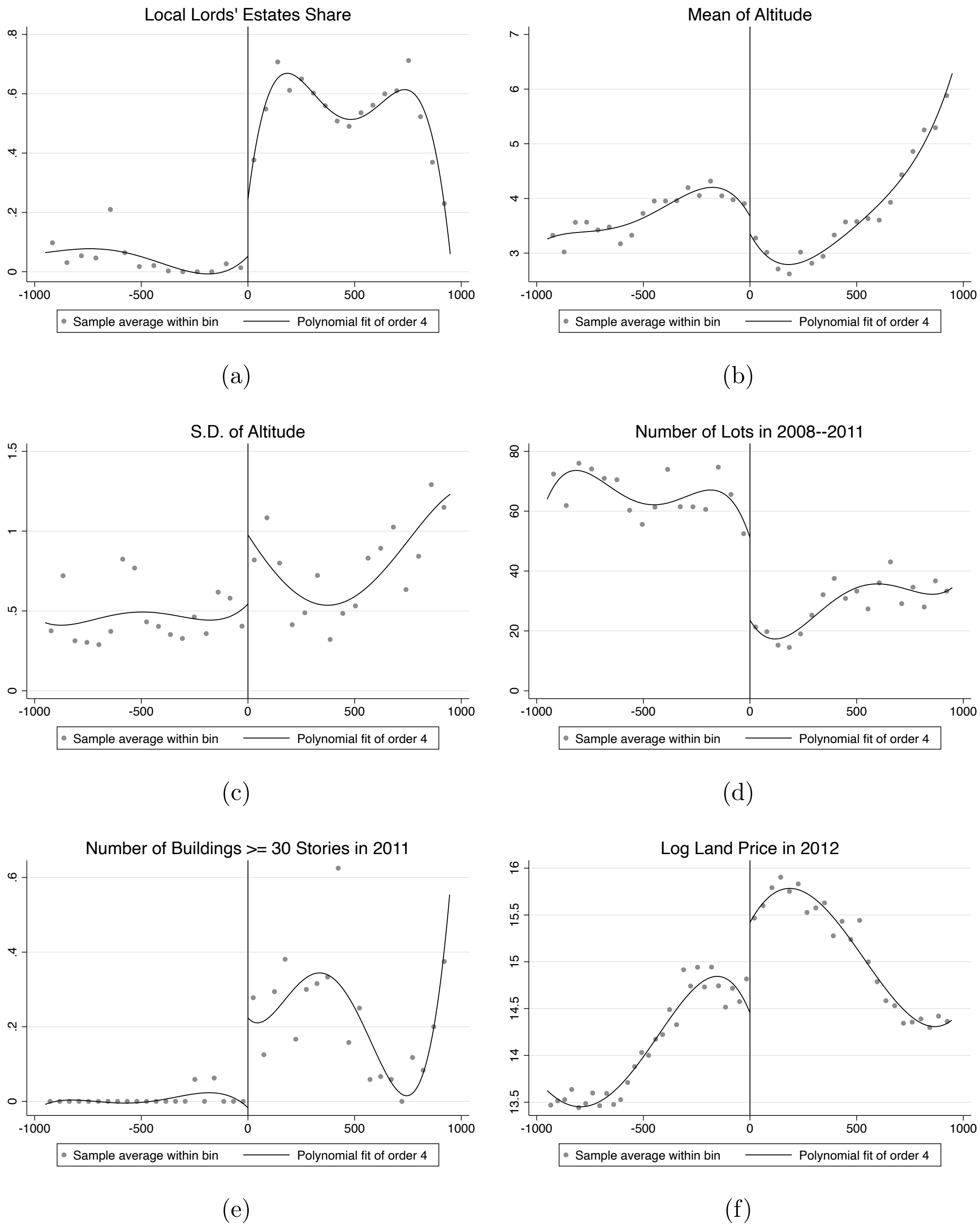
(e) 1983



(f) 2012

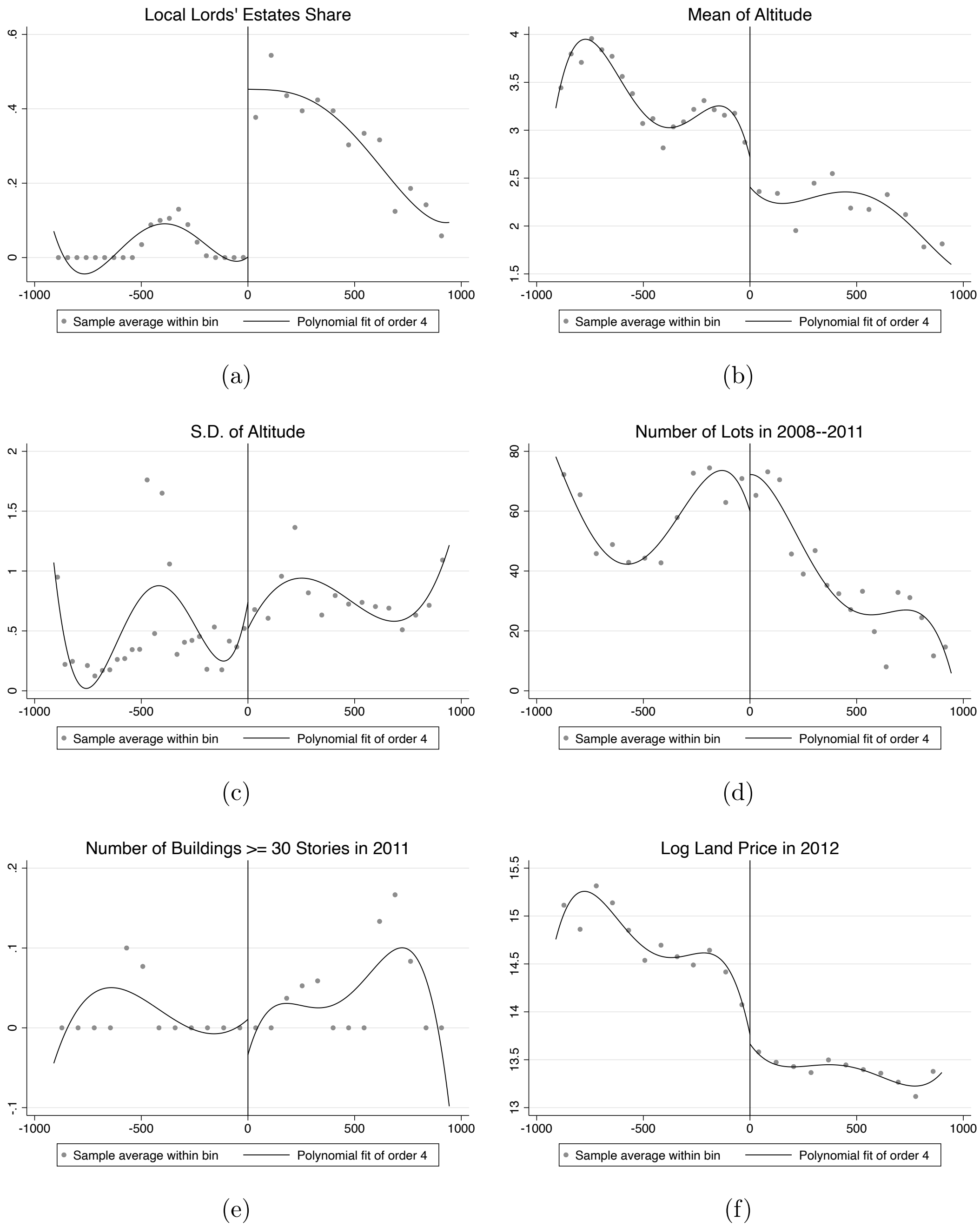
Notes: These maps show the pattern of land price data within our sample defined by the border of old Tokyo city. Black cells indicate missing values.

Figure A.4: Distribution along the Zoning Boundary in the Core Area



Notes: We use all cells within 1 km of the boundary in Figure 1 excluding cells within 50 m of the boundary to avoid mechanical attenuation effects. The x-axis is the distance from the boundary, which is represented by the dash-dot line in Figure 1, taking a positive and negative value in the local lords' estate zone and the commoners' zone, respectively. The points show the average of each outcome variable within each bin. The number of bins is chosen using the mimicking variance evenly spaced method using spacing estimators. The lines show the fourth-order polynomial fit for each zone.

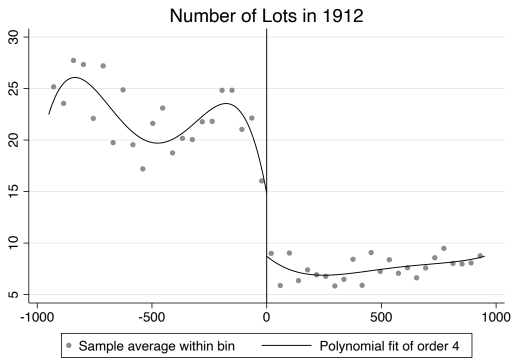
Figure A.5: Distribution along the Zoning Boundary in the Non-core Area



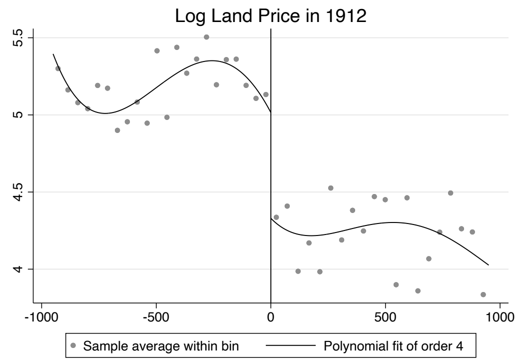
(a) (b) (c) (d) (e) (f)

Notes: We use all cells within 1 km of the boundary in Figure 1 excluding cells within 50 m of the boundary to avoid mechanical attenuation effects. The x-axis is the distance from the boundary, which is shown as the solid line in Figure 1, taking a positive and negative value in the local lords' estate zone and the commoners' zone, respectively. The points show the average of each outcome variable within each bin. The number of bins is chosen using the mimicking variance evenly spaced method using spacing estimators. The lines show the fourth-order polynomial fit for each zone.

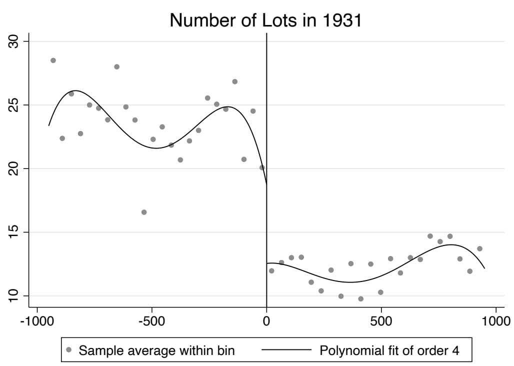
Figure A.6: Number of Lots and Land Prices along Zoning Boundary, from 1912 to the 2010s



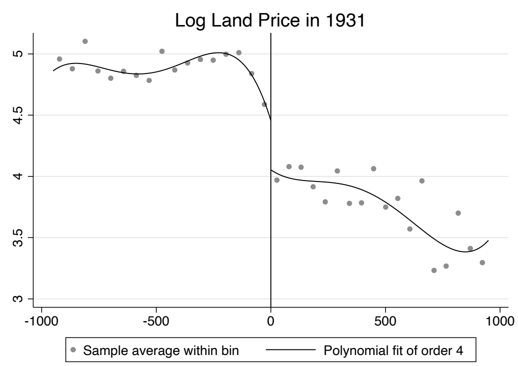
(a)



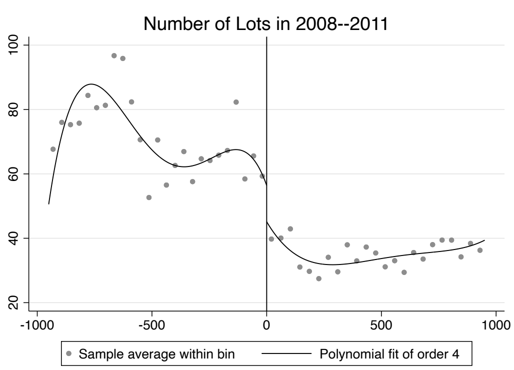
(b)



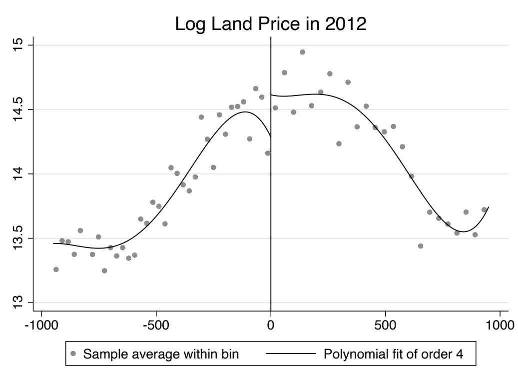
(c)



(d)



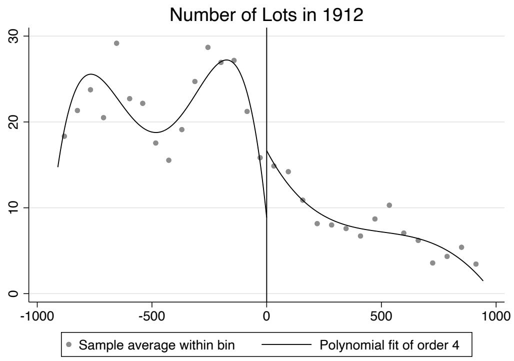
(e)



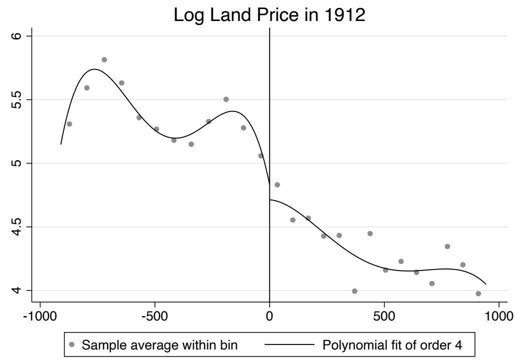
(f)

Notes: We use all cells within 1 km of the boundary in Figure 1 excluding cells within 50 m of the boundary to avoid mechanical attenuation effects. The x-axis is the distance from the boundary, which is shown as the solid line and dash-dot line in Figure 1, taking a positive and negative value in the local lords' estate zone and the commoners' zone, respectively. The points show the average of each outcome variable within each bin. The number of bins is chosen using the mimicking variance evenly spaced method using spacing estimators. The lines show the fourth-order polynomial fit for each zone.

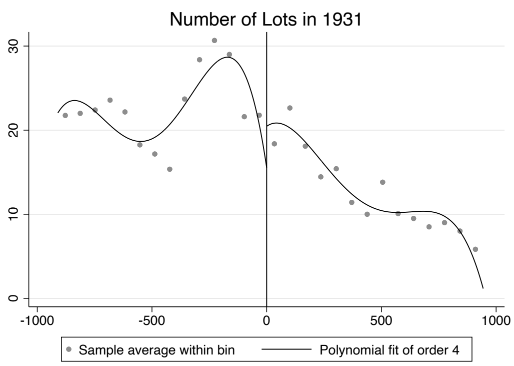
Figure A.7: Number of Lots and Land Prices along Zoning Boundary in the Non-core Area, from 1912 to the 2010s



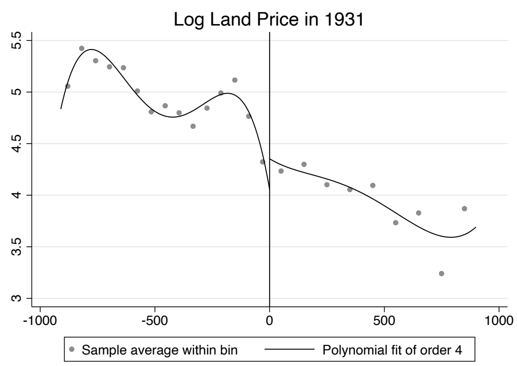
(a)



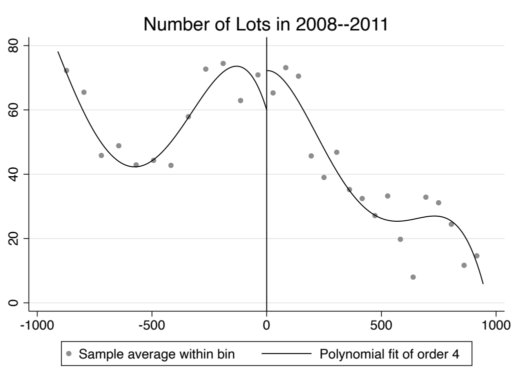
(b)



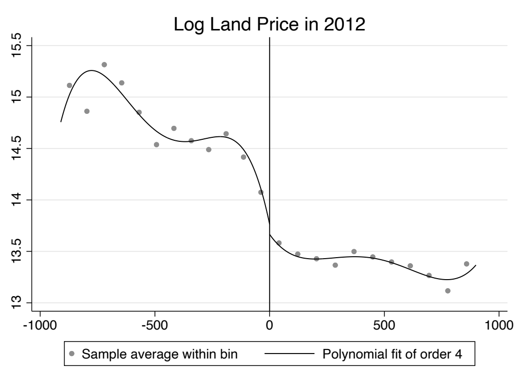
(c)



(d)



(e)

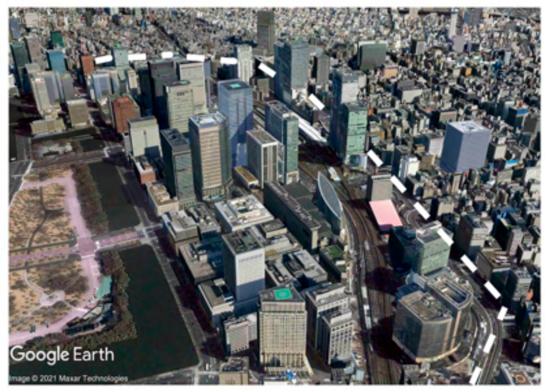


(f)

Notes: We use all cells within 1 km of the boundary in Figure 1 excluding cells within 50 m of the boundary to avoid mechanical attenuation effects. The x-axis is the distance from the boundary, which is shown as the solid line in Figure 1, taking a positive and negative value in the local lords' estate zone and the commoners' zone, respectively. The points show the average of each outcome variable within each bin. The number of bins is chosen using the mimicking variance evenly spaced method using spacing estimators. The lines show the fourth-order polynomial fit for each zone.

Figure A.8: Aerial Image around the Boundary (Core) in 1970 and 2011

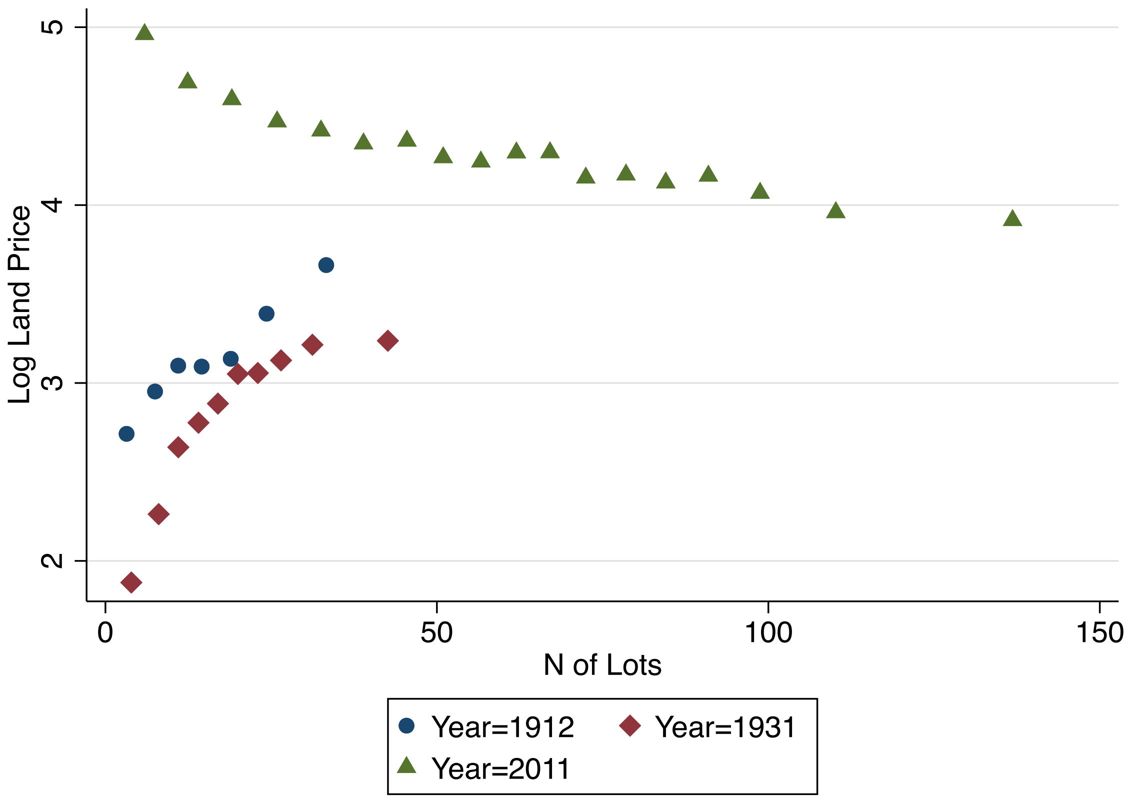
(a) 1970



(b) 2011

Notes: These images are aerial images around the boundary closer to the core area (shown as the white dash lines). The panel (a) is image in 1970 and panel (b) is the aerial image as of Mar/2011 taken from Google Earth.

Figure A.9: Lot Fragmentation and Land Price in 1912, 1931, and 2011



Notes: This graph shows the nonparametric relationships between the log of land price and the number of lots in 1912, 1931, and 2011 using Cattaneo et al. (2022). We subtract nine from the land price in 2011 for a better graphical representation.

Table A.1: Quantile Regression for Building Stories in 2011

	(1)	(2)
Panel A: Log Land Price in 2012 (N: 9542)		
Local Lords' Estates Share	-0.328***	-0.367***
	(0.0882)	(0.0894)
Panel B: Log Land Price in 2012 (N: 9542)		
Local Lords' Estates Share	-0.449***	-0.233***
	(0.0463)	(0.0519)
Panel C: Log Land Price in 2012 (N: 9542)		
Local Lords' Estates Share	-0.485***	-0.263***
	(0.104)	(0.0982)
Panel D: Log Land Price in 2012 (N: 9542)		
Local Lords' Estates Share	0.204	0.292
	(0.196)	(0.210)
Panel E: Log Land Price in 2012 (N: 9542)		
Local Lords' Estates Share	3.813***	3.821***
	(0.619)	(0.598)
Distance from the Center (Castle)	Yes	Yes
Mean of Altitude	No	Yes
S.D. of Altitude	No	Yes

Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.2: Spillover Effects

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1872 (N: 5530)				
Local Lords' Estates Share	-11.82***	-8.401***	-7.854***	-8.236***
	(0.703)	(0.909)	(0.733)	(0.711)
Local Lords' Estates (3*3 Cells)		-0.587***	-0.854***	-0.569***
		(0.199)	(0.209)	(0.191)
Local Lords' Estates (5*5 Cells)			0.0621	-0.184*
			(0.0633)	(0.0997)
Local Lords' Estates (7*7 Cells)				0.111**
				(0.0483)
Panel B: Number of Lots in 2008–2011 (N: 9101)				
Local Lords' Estates Share	-21.44***	-9.885***	-9.172***	-10.29***
	(2.935)	(2.394)	(2.076)	(1.974)
Local Lords' Estates (3*3 Cells)		-1.926***	-2.260***	-1.484**
		(0.592)	(0.744)	(0.661)
Local Lords' Estates (5*5 Cells)			0.0752	-0.549*
			(0.194)	(0.311)
Local Lords' Estates (7*7 Cells)				0.275*
				(0.148)
Panel C: Number of Buildings in 2011 (N: 9542)				
Local Lords' Estates Share	-11.12***	-2.470*	-2.648**	-3.159***
	(1.834)	(1.449)	(1.267)	(1.208)
Local Lords' Estates (3*3 Cells)		-1.453***	-1.369***	-1.008**
		(0.375)	(0.483)	(0.416)
Local Lords' Estates (5*5 Cells)			-0.0189	-0.311
			(0.123)	(0.207)
Local Lords' Estates (7*7 Cells)				0.128
				(0.100)
Panel D: Stories (aboveground) in 2011 (N: 9542)				
Local Lords' Estates Share	0.663*	0.0480	0.0620	0.0772
	(0.389)	(0.301)	(0.258)	(0.244)
Local Lords' Estates (3*3 Cells)		0.103	0.0967	0.0860
		(0.0743)	(0.0839)	(0.0844)
Local Lords' Estates (5*5 Cells)			0.00148	0.0102
			(0.0220)	(0.0379)
Local Lords' Estates (7*7 Cells)				-0.00381
				(0.0166)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 9542)				
Local Lords' Estates Share	0.0364**	0.00352	0.00581	0.00393
	(0.0167)	(0.0163)	(0.0147)	(0.0137)
Local Lords' Estates (3*3 Cells)		0.00553	0.00445	0.00578
		(0.00361)	(0.00412)	(0.00406)
Local Lords' Estates (5*5 Cells)			0.000242	-0.000831
			(0.000915)	(0.00173)
Local Lords' Estates (7*7 Cells)				0.000471
				(0.000734)
Panel F: Log Land Price in 2012 (N: 8971)				
Local Lords' Estates Share	0.262***	-0.227***	-0.0377***	-0.0822
	(0.0749)	(0.0303)	(0.0130)	(.)
Local Lords' Estates (3*3 Cells)		0.0842***	-0.00412	0.0271*
		(0.0165)	(0.0188)	(0.0139)
Local Lords' Estates (5*5 Cells)			0.0199***	-0.00596
			(0.00458)	(0.00804)
Local Lords' Estates (7*7 Cells)				0.0113***
				(0.00386)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
*Local Lords' Estates (3*3 Cells)* is the sum of *Local Lords' Estates* in $3*3-1$ cells surrounding each cell. This means that the point estimate is the effect when one of the cells becomes fully local lords' estates, which is comparable with the point estimate of *Local Lords' Estates*. Other treatment variables are defined similarly.

Table A.3: Different Thresholds for Conley Standard Errors

	Allowing Correlation Within					
	300 m		500 m		1000 m	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Number of Lots in 1872 (N: 5530)						
Local Lords' Estates Share	-11.92***	-12.10***	-11.92***	-12.10***	-11.92***	-12.10***
	(0.722)	(0.746)	(0.939)	(0.949)	(1.245)	(1.135)
Panel B: Number of Lots in 2008–2011 (N: 9101)						
Local Lords' Estates Share	-23.30***	-19.75***	-23.30***	-19.75***	-23.30***	-19.75***
	(2.970)	(3.031)	(3.460)	(3.671)	(3.641)	(3.952)
Panel C: Number of Buildings in 2011 (N: 9542)						
Local Lords' Estates Share	-12.91***	-10.37***	-12.91***	-10.37***	-12.91***	-10.37***
	(1.847)	(1.860)	(2.155)	(2.252)	(2.261)	(2.511)
Panel D: Stories (aboveground) in 2011 (N: 9542)						
Local Lords' Estates Share	0.526	0.757**	0.526	0.757**	0.526	0.757**
	(0.378)	(0.339)	(0.434)	(0.371)	(0.461)	(0.354)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 9542)						
Local Lords' Estates Share	0.0369**	0.0369**	0.0369**	0.0369**	0.0369**	0.0369**
	(0.0160)	(0.0156)	(0.0165)	(0.0160)	(0.0180)	(0.0163)
Panel F: Log Land Price in 2012 (N: 8971)						
Local Lords' Estates Share	0.299***	0.165***	0.299***	0.165**	0.299***	0.165**
	(0.0713)	(0.0590)	(0.0880)	(0.0723)	(0.0934)	(0.0721)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Altitude	No	Yes	No	Yes	No	Yes
S.D. of Altitude	No	Yes	No	Yes	No	Yes
Lon and Lat Controls	No	Yes	No	Yes	No	Yes
Earthquake Risk	No	Yes	No	Yes	No	Yes

Standard errors are in parentheses. We allow a within-300 m, 300 m, or 1000 m correlation in error terms in columns (1)–(2), (3)–(4), or (5)–(6), respectively. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. See Table 1 for the definitions of the variables.

Table A.4: Alternative Specification of the Treatment Variable: Lot Size of Local Lords' Estates

	(1)	(2)	(3)
Panel A: Number of Lots in 1872 (N: 5530)			
Local Lords' Estates Lot Area (Max)	-0.00127***	-0.00126***	-0.00129***
	(0.0000760)	(0.0000742)	(0.0000781)
Panel B: Number of Lots in 2008–2011 (N: 9101)			
Local Lords' Estates Lot Area (Max)	-0.00249***	-0.00227***	-0.00214***
	(0.000313)	(0.000310)	(0.000320)
Panel C: Number of Buildings in 2011 (N: 9542)			
Local Lords' Estates Lot Area (Max)	-0.00134***	-0.00113***	-0.00109***
	(0.000196)	(0.000197)	(0.000199)
Panel D: Stories (aboveground) in 2011 (N: 9542)			
Local Lords' Estates Lot Area (Max)	0.0000407	0.0000568	0.0000729*
	(0.0000409)	(0.0000425)	(0.0000373)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 9542)			
Local Lords' Estates Lot Area (Max)	0.00000362**	0.00000357**	0.00000375**
	(0.00000169)	(0.00000177)	(0.00000166)
Panel F: Log Land Price in 2012 (N: 8971)			
Local Lords' Estates Lot Area (Max)	0.0000278***	0.0000232***	0.0000153**
	(0.00000728)	(0.00000765)	(0.00000601)
Distance from the Center (Castle)	Yes	Yes	Yes
Mean of Altitude	No	Yes	Yes
S.D. of Altitude	No	Yes	Yes
Lon and Lat Controls	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables. *Local Lords' Estates Lot Area (Max)* is the max of lot area (km^2) of local lords' estates in each cell. This takes zero if a cell has no local lords' estates.

Table A.5: Coefficient Stability in Main Results

	(1)	(2)	(3)
Panel I: Number of Lots in 1872			
Local Lords' Estates Share	-11.92***	-11.82***	-12.10***
	(0.722)	(0.703)	(0.746)
Bias-Adjusted Beta	-16.37	-11.03	-12.20
Panel B: Number of Lots in 2008–2011			
Local Lords' Estates Share	-23.30***	-21.44***	-19.75***
	(2.970)	(2.935)	(3.031)
Bias-Adjusted Beta	-19.38	-18.20	-16.56
Panel C: Number of Buildings in 2011			
Local Lords' Estates Share	-12.91***	-11.12***	-10.37***
	(1.847)	(1.834)	(1.860)
Bias-Adjusted Beta	-10.41	-8.420	-7.557
Panel D: Stories (aboveground) in 2011			
Local Lords' Estates Share	0.526	0.663*	0.757**
	(0.378)	(0.389)	(0.339)
Bias-Adjusted Beta	0.242	0.418	0.533
Panel E: Number of Buildings >= 30 Stories in 2011			
Local Lords' Estates Share	0.0369**	0.0364**	0.0369**
	(0.0160)	(0.0167)	(0.0156)
Bias-Adjusted Beta	0.0299	0.0299	0.0327
Panel F: Log Land Price in 2012			
Local Lords' Estates Share	0.299***	0.262***	0.165***
	(0.0713)	(0.0749)	(0.0590)
Bias-Adjusted Beta	0.197	0.148	0.0122
Distance from the Center (Castle)	Yes	Yes	Yes
Mean of Altitude	No	Yes	Yes
S.D. of Altitude	No	Yes	Yes
Lon and Lat Controls	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
The first row shows the coefficients using specifications in columns (2) and (3) of Table 3. The second row shows the bias-adjusted coefficient by considering potential unobserved confounders, as proposed by Oster (2019). As suggested in this study, we set $\delta = 1$ and $R^2_{max} = 1.3\tilde{R}^2$, where $\tilde{R}^2$ is R^2 in the regression models in each column as plausible parameters. In case there are multiple solutions for the bias-adjusted beta, we show the one closest to the original beta.

Table A.6: Main Results Using a Consistent Sample

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1872 (N: 5033)				
Local Lords' Estates Share	-12.41***	-12.27***	-12.61***	-12.70***
	(0.731)	(0.710)	(0.745)	(0.747)
Panel B: Number of Lots in 2008–2011 (N: 5033)				
Local Lords' Estates Share	-14.86***	-13.26***	-10.38***	-10.50***
	(3.715)	(3.619)	(3.342)	(3.349)
Panel C: Number of Buildings in 2011 (N: 5033)				
Local Lords' Estates Share	-8.999***	-7.844***	-2.753	-2.826
	(2.563)	(2.445)	(2.047)	(2.055)
Panel D: Stories (aboveground) in 2011 (N: 5033)				
Local Lords' Estates Share	1.982***	2.185***	1.437***	1.389***
	(0.583)	(0.558)	(0.481)	(0.458)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 5033)				
Local Lords' Estates Share	0.0888***	0.0898***	0.0737***	0.0715***
	(0.0272)	(0.0273)	(0.0256)	(0.0244)
Panel F: Log Land Price in 2012 (N: 5033)				
Local Lords' Estates Share	0.402***	0.412***	0.124*	0.110
	(0.0997)	(0.0993)	(0.0751)	(0.0705)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	No	Yes	Yes	Yes
S.D. of Altitude	No	Yes	Yes	Yes
Lon and Lat Controls	No	No	Yes	Yes
Earthquake Risk	No	No	No	Yes

Standard errors are shown in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of variables.
We conduct a similar analysis to Table 3 by using a consistent sample across the panels.

Table A.7: Regression Discontinuity Design with Polynomials

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share (N: 1269)			
Local Lords' Estates Zone	0.368***	0.397***	0.453***
	(0.0834)	(0.0739)	(0.0607)
Panel A: Number of Lots in 1872 (N: 1350)			
Local Lords' Estates Zone	-9.432***	-9.222***	-11.00***
	(2.517)	(2.597)	(2.058)
Panel B: Number of Lots in 2008–2011 (N: 1293)			
Local Lords' Estates Zone	-15.62	-14.55	-19.47***
	(10.16)	(9.436)	(7.281)
Panel C: Number of Buildings in 2011 (N: 1296)			
Local Lords' Estates Zone	-5.651	-4.487	-7.740*
	(6.110)	(5.757)	(4.334)
Panel D: Stories (aboveground) in 2011 (N: 1296)			
Local Lords' Estates Zone	2.159*	1.854*	2.729***
	(1.252)	(0.993)	(0.990)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 1296)			
Local Lords' Estates Zone	0.126*	0.112**	0.127**
	(0.0663)	(0.0556)	(0.0545)
Panel F: Log Land Price in 2012 (N: 1135)			
Local Lords' Estates Zone	0.194	0.0858	0.208
	(0.408)	(0.388)	(0.309)
Distance from the Boundary (1st-3rd)	Yes	Yes	Yes
Distance from the Boundary (4th)	No	Yes	No
Distance from the Center (Castle)	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
We use cells within 1000 m of the boundary (dash-dot line and solid line in Figure 1).

Table A.8: Coefficient Stability in Main Results (Local Randomization)

	(1)	(2)
Panel I: Local Lords' Estates Share		
Local Lords' Estates Zone	0.402***	0.351***
	(0.0547)	(0.0592)
Bias-Adjusted Beta	0.486	0.585
Panel A: Number of Lots in 1872		
Local Lords' Estates Zone	-11.97***	-10.79***
	(1.777)	(2.059)
Bias-Adjusted Beta	-11.72	-8.173
Panel B: Number of Lots in 2008–2011		
Local Lords' Estates Zone	-24.29***	-22.22***
	(5.781)	(6.297)
Bias-Adjusted Beta	-24.61	-21.04
Panel C: Number of Buildings in 2011		
Local Lords' Estates Zone	-11.16***	-10.60***
	(3.866)	(3.656)
Bias-Adjusted Beta	-11.66	-10.93
Panel D: Stories (aboveground) in 2011		
Local Lords' Estates Zone	2.317***	2.020**
	(0.715)	(0.873)
Bias-Adjusted Beta	2.432	1.917
Panel E: Number of Buildings >= 30 Stories in 2011		
Local Lords' Estates Zone	0.126**	0.124***
	(0.0512)	(0.0469)
Bias-Adjusted Beta	0.137	0.132
Panel F: Log Land Price in 2012		
Local Lords' Estates Zone	0.443*	0.343*
	(0.244)	(0.202)
Bias-Adjusted Beta	0.536	0.422
Distance from the Center (Castle)	Yes	Yes
West of the Yamanote line	Yes	Yes
Mean of Altitude	No	Yes
S.D. of Altitude	No	Yes
Earthquake Risk	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
The first row shows the coefficients using specifications in columns (2)–(3) of Table 4. The second row shows the bias-adjusted coefficient by considering potential unobserved confounders, as proposed by Oster (2019). As suggested in this study, we set $\delta = 1$ and $R^2_{max} = 1.3\tilde{R}^2$, where $\tilde{R}^2$ is R^2 in the regression models in each column, as plausible parameters. In case there are multiple solutions for the bias-adjusted beta, we show the one closest to the original beta.

Table A.9: The Donut Hole Approach (Local Randomization)

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share (N: 329)			
Local Lords' Estates Zone	0.520***	0.523***	0.473***
	(0.0582)	(0.0643)	(0.0701)
Panel A: Number of Lots in 1872 (N: 336)			
Local Lords' Estates Zone	-16.80***	-16.71***	-15.43***
	(1.789)	(1.872)	(2.127)
Panel B: Number of Lots in 2008–2011 (N: 334)			
Local Lords' Estates Zone	-33.10***	-36.21***	-33.23***
	(8.376)	(6.551)	(7.772)
Panel C: Number of Buildings in 2011 (N: 332)			
Local Lords' Estates Zone	-14.10***	-17.43***	-16.57***
	(5.265)	(4.870)	(4.909)
Panel D: Stories (aboveground) in 2011 (N: 332)			
Local Lords' Estates Zone	2.365**	2.643*	2.951*
	(1.045)	(1.390)	(1.529)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 332)			
Local Lords' Estates Zone	0.124**	0.150**	0.186***
	(0.0520)	(0.0691)	(0.0621)
Panel F: Log Land Price in 2012 (N: 319)			
Local Lords' Estates Zone	0.211	0.451	0.407
	(0.408)	(0.364)	(0.309)
Distance from the Center (Castle)	No	Yes	Yes
West of the Yamanote line	No	Yes	Yes
Mean of Altitude	No	No	Yes
S.D. of Altitude	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
We use cells whose centroid is 100–350 m from the boundary unlike in the other local randomization design.

Table A.10: Alternative Definition of the Core Area Using The Five Major Stations (OLS, Core vs. Non-core)

	Distance from Major Stations			
	≤4 km		>4 km	
	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1872				
Local Lords' Estates Share	-12.17***	-12.57***	-3.713	-9.581***
	(0.715)	(0.758)	(2.460)	(2.858)
Panel B: Number of Lots in 2008–2011				
Local Lords' Estates Share	-23.11***	-21.36***	9.665	2.657
	(2.965)	(3.076)	(10.43)	(6.986)
Panel C: Number of Buildings in 2011				
Local Lords' Estates Share	-11.70***	-10.30***	7.672	7.858
	(1.849)	(1.889)	(7.791)	(5.188)
Panel D: Stories (aboveground) in 2011				
Local Lords' Estates Share	0.632	0.729**	0.302	-0.128
	(0.401)	(0.357)	(0.660)	(0.673)
Panel E: Number of Buildings >= 30 Stories in 2011				
Local Lords' Estates Share	0.0375**	0.0392**	0.00730	0.00813
	(0.0174)	(0.0165)	(0.0186)	(0.0182)
Panel F: Log Land Price in 2012				
Local Lords' Estates Share	0.262***	0.165***	-0.00123	0.00690
	(0.0779)	(0.0623)	(0.0451)	(0.0451)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes
Lon and Lat Controls	No	Yes	No	Yes
Earthquake Risk	No	Yes	No	Yes
N in Panel A	4942	4942	588	588
N in Panel B	7972	7972	1129	1129
N in Panel C	8241	8241	1301	1301
N in Panel D	8241	8241	1301	1301
N in Panel E	8241	8241	1301	1301
N in Panel F	7730	7730	1241	1241

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
In columns (1) and (2), we use only cells within 4 km from the five major terminal stations (Tokyo, Shinjuku, Shibuya, Ikebukuro, and Shinagawa). In columns (3) and (4), we use the other samples. The maximum of the distance from these major stations is 7.8 km.

Table A.11: Time-varying Effects of Local Lords' Estates

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1876				
Local Lords' Estates Share	-11.17***	-11.02***	-11.12***	-11.15***
	(0.680)	(0.648)	(0.699)	(0.698)
Panel B: Number of Lots in 1912				
Local Lords' Estates Share	-12.56***	-12.27***	-12.64***	-12.65***
	(0.585)	(0.572)	(0.610)	(0.610)
Panel C: Number of Lots in 1931				
Local Lords' Estates Share	-9.566***	-9.328***	-9.692***	-9.703***
	(0.975)	(0.952)	(0.986)	(0.988)
Panel D: Log Land Price in 1876				
Local Lords' Estates Share	-0.325*	-0.280	-0.377*	-0.401*
	(0.196)	(0.207)	(0.218)	(0.217)
Panel E: Log Land Price in 1912				
Local Lords' Estates Share	-0.502***	-0.312***	-0.524***	-0.526***
	(0.133)	(0.113)	(0.113)	(0.114)
Panel F: Log Land Price in 1931				
Local Lords' Estates Share	-0.757***	-0.568***	-0.737***	-0.754***
	(0.151)	(0.129)	(0.123)	(0.121)
Panel G: Log Land Rental Price in 1931				
Local Lords' Estates Share	-0.502***	-0.330***	-0.417***	-0.426***
	(0.109)	(0.0934)	(0.0899)	(0.0892)
Panel H: Log Land Price in 1972				
Local Lords' Estates Share	-0.116**	-0.0988**	-0.0714	-0.0780*
	(0.0504)	(0.0491)	(0.0451)	(0.0431)
Panel I: Log Land Price in 1983				
Local Lords' Estates Share	-0.00297	0.0117	-0.0176	-0.0243
	(0.0605)	(0.0600)	(0.0512)	(0.0476)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	No	Yes	Yes	Yes
S.D. of Altitude	No	Yes	Yes	Yes
Lon and Lat Controls	No	No	Yes	Yes
Earthquake Risk	No	No	No	Yes
N in Panel A	5316	5316	5316	5316
N in Panel B	8133	8133	8133	8133
N in Panel C	7830	7830	7830	7830
N in Panel D	3644	3644	3644	3644
N in Panel E	7122	7122	7122	7122
N in Panel F	4711	4711	4711	4711
N in Panel G	7024	7024	7024	7024
N in Panel H	6071	6071	6071	6071
N in Panel I	3276	3276	3276	3276

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
Log Land Rental Price in 1931 is used to assess *Log Land Price in 1931*, and *Log Land Rental Price in 1931* is available, with greater coverage in Seizusha, ed (1931-1935).

Table A.12: Time-varying Effects of Local Lords' Estates (Local Randomization)

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share			
Local Lords' Estates Zone	0.411***	0.402***	0.351***
	(0.0579)	(0.0547)	(0.0592)
Panel A: Number of Lots in 1876			
Local Lords' Estates Zone	-12.31***	-11.94***	-10.86***
	(1.912)	(1.741)	(2.043)
Panel B: Number of Lots in 1912			
Local Lords' Estates Zone	-11.27***	-11.03***	-9.991***
	(2.033)	(1.781)	(2.095)
Panel C: Number of Lots in 1931			
Local Lords' Estates Zone	-9.522***	-10.55***	-9.672***
	(2.543)	(1.737)	(2.021)
Panel D: Log Land Price in 1876			
Local Lords' Estates Zone	-0.894***	-0.876***	-0.728***
	(0.236)	(0.226)	(0.237)
Panel E: Log Land Price in 1912			
Local Lords' Estates Zone	-0.838***	-0.873***	-0.709***
	(0.211)	(0.241)	(0.242)
Panel F: Log Land Price in 1931			
Local Lords' Estates Zone	-0.697***	-0.604***	-0.487**
	(0.188)	(0.228)	(0.234)
Panel G: Log Land Rental Price in 1931			
Local Lords' Estates Zone	-0.462***	-0.331**	-0.342*
	(0.151)	(0.152)	(0.180)
Panel H: Log Land Price in 1972			
Local Lords' Estates Zone	-0.274	0.0525	-0.0439
	(0.224)	(0.146)	(0.157)
Panel I: Log Land Price in 1983			
Local Lords' Estates Zone	-0.121	0.148	0.103
	(0.214)	(0.134)	(0.144)
Distance from the Center (Castle)	No	Yes	Yes
West of the Yamanote line	No	Yes	Yes
Mean of Altitude	No	No	Yes
S.D. of Altitude	No	No	Yes
Earthquake Risk	No	No	Yes
N in Panel I	351	351	351
N in Panel A	348	348	348
N in Panel B	343	343	343
N in Panel C	347	347	347
N in Panel D	319	319	319
N in Panel E	294	294	294
N in Panel F	268	268	268
N in Panel G	299	299	299
N in Panel H	279	279	279
N in Panel I	157	157	157

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
Log Land Rental Price in 1931 is used to assess *Log Land Price in 1931*, and *Log Land Rental Price in 1931* is available, with greater coverage in Seizusha, ed (1931-1935).

Table A.13: Time-varying Effects of Local Lords' Estates Using a Consistent Sample

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1876				
Local Lords' Estates Share	-11.66***	-11.45***	-11.62***	-11.70***
	(0.708)	(0.681)	(0.723)	(0.728)
Panel B: Number of Lots in 1912				
Local Lords' Estates Share	-13.40***	-13.34***	-13.51***	-13.59***
	(0.783)	(0.767)	(0.785)	(0.785)
Panel C: Number of Lots in 1931				
Local Lords' Estates Share	-7.958***	-7.872***	-7.723***	-7.776***
	(1.348)	(1.275)	(1.339)	(1.338)
Panel D: Log Land Price in 1876				
Local Lords' Estates Share	-0.303	-0.338	-0.469**	-0.499**
	(0.204)	(0.206)	(0.219)	(0.218)
Panel E: Log Land Price in 1912				
Local Lords' Estates Share	-0.653***	-0.506***	-0.650***	-0.660***
	(0.146)	(0.124)	(0.127)	(0.127)
Panel F: Log Land Price in 1931				
Local Lords' Estates Share	-0.707***	-0.588***	-0.743***	-0.769***
	(0.173)	(0.147)	(0.138)	(0.137)
Panel G: Log Land Rental Price in 1931				
Local Lords' Estates Share	-0.431***	-0.326***	-0.428***	-0.435***
	(0.114)	(0.0996)	(0.101)	(0.100)
Panel H: Log Land Price in 1972				
Local Lords' Estates Share	-0.0607	-0.0243	-0.123**	-0.129***
	(0.0665)	(0.0589)	(0.0517)	(0.0489)
Panel I: Log Land Price in 1983				
Local Lords' Estates Share	0.0741	0.0982	-0.0775	-0.0860*
	(0.0775)	(0.0706)	(0.0546)	(0.0508)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	No	Yes	Yes	Yes
S.D. of Altitude	No	Yes	Yes	Yes
Lon and Lat Controls	No	No	Yes	Yes
Earthquake Risk	No	No	No	Yes
N in Panel A	4788	4788	4788	4788
N in Panel B	4927	4927	4927	4927
N in Panel C	4978	4978	4978	4978
N in Panel D	3437	3437	3437	3437
N in Panel E	4581	4581	4581	4581
N in Panel F	3384	3384	3384	3384
N in Panel G	4680	4680	4680	4680
N in Panel H	3464	3464	3464	3464
N in Panel I	1918	1918	1918	1918

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
Log Land Rental Price in 1931 is used to assess *Log Land Price in 1931*, and *Log Land Rental Price in 1931* is available, with greater coverage in Seizusha, ed (1931-1935).
We restrict the sample to that used in Table A.6, which does not have missing values for lot in 1872 and price, lot, and buildings in the 2010s.

Table A.14: Controlling for Public Infrastructure (OLS)

	(1)	(2)	(3)	(4)	(5)
Panel A: Number of Lots in 1872					
Local Lords' Estates Share	-12.10***	-12.39***	-11.95***	-11.76***	-12.02***
	(0.746)	(0.740)	(0.710)	(0.734)	(0.709)
Panel B: Number of Lots in 2008–2011					
Local Lords' Estates Share	-19.75***	-14.68***	-14.06***	-18.99***	-10.28***
	(3.031)	(2.736)	(2.513)	(2.971)	(2.118)
Panel C: Number of Buildings in 2011					
Local Lords' Estates Share	-10.37***	-6.537***	-6.901***	-10.46***	-4.457***
	(1.860)	(1.624)	(1.571)	(1.851)	(1.391)
Panel D: Stories (aboveground) in 2011					
Local Lords' Estates Share	0.757**	0.750**	1.049***	0.824**	0.929***
	(0.339)	(0.323)	(0.330)	(0.330)	(0.306)
Panel E: Number of Buildings >= 30 Stories in 2011					
Local Lords' Estates Share	0.0369**	0.0394**	0.0419***	0.0362**	0.0404**
	(0.0156)	(0.0160)	(0.0159)	(0.0157)	(0.0159)
Panel F: Log Land Price in 2012					
Local Lords' Estates Share	0.165***	0.106**	0.175***	0.177***	0.128***
	(0.0590)	(0.0507)	(0.0588)	(0.0550)	(0.0479)
Road Width	No	Yes	No	No	Yes
Hospital, University, and Parks Share	No	No	Yes	No	Yes
Distance to Nearest Station in 2018 and 1950	No	No	No	Yes	Yes
Distance from the Center (Castle)	Yes	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes	Yes
Lon and Lat Controls	Yes	Yes	Yes	Yes	Yes
Earthquake Risk	Yes	Yes	Yes	Yes	Yes
N in Panel A	5530	5137	5530	5530	5137
N in Panel B	9101	8527	9101	9101	8527
N in Panel C	9542	9003	9542	9542	9003
N in Panel D	9542	9003	9542	9542	9003
N in Panel E	9542	9003	9542	9542	9003
N in Panel F	8971	8909	8971	8971	8909

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

See Table 1 for the definitions of the variables. *Road Width* is the average road width. *Hospital, University, and Parks Share* is the share of land used as hospitals or universities, or parks. *Distance to Nearest Station in 2018 and 1950* is the distance to the nearest station in 2018 and 1950 (including tram stations).

Table A.15: Controlling for Public Infrastructure (Local Randomization)

	(1)	(2)	(3)	(4)	(5)
Panel I: Local Lords' Estates Share					
Local Lords' Estates Zone	0.351***	0.318***	0.355***	0.347***	0.313***
	(0.0592)	(0.0642)	(0.0572)	(0.0555)	(0.0604)
Panel A: Number of Lots in 1872					
Local Lords' Estates Zone	-10.79***	-9.935***	-10.76***	-10.69***	-9.602***
	(2.059)	(2.042)	(2.040)	(2.165)	(2.099)
Panel B: Number of Lots in 2008–2011					
Local Lords' Estates Zone	-22.22***	-16.16***	-22.03***	-22.48***	-15.80***
	(6.297)	(5.523)	(6.256)	(5.649)	(5.022)
Panel C: Number of Buildings in 2011					
Local Lords' Estates Zone	-10.60***	-7.362**	-10.52***	-11.11***	-7.559***
	(3.656)	(3.154)	(3.622)	(3.246)	(2.825)
Panel D: Stories (aboveground) in 2011					
Local Lords' Estates Zone	2.020**	1.897**	2.048**	1.975**	1.797**
	(0.873)	(0.766)	(0.890)	(0.852)	(0.727)
Panel E: Number of Buildings >= 30 Stories in 2011					
Local Lords' Estates Zone	0.124***	0.120***	0.126***	0.117**	0.112**
	(0.0469)	(0.0462)	(0.0473)	(0.0479)	(0.0454)
Panel F: Log Land Price in 2012					
Local Lords' Estates Zone	0.343*	0.173	0.354*	0.366*	0.199
	(0.202)	(0.168)	(0.201)	(0.193)	(0.166)
Panel G: Log Land Price in 2012					
Local Lords' Estates Zone (Core)	0.827***	0.544**	0.836***	0.700***	0.428**
	(0.228)	(0.212)	(0.233)	(0.215)	(0.194)
Local Lords' Estates Zone (Non-core)	-0.237	-0.227	-0.225	-0.0477	-0.0603
	(0.275)	(0.264)	(0.268)	(0.274)	(0.250)
Road Width	No	Yes	No	No	Yes
Hospital, University, and Parks Share	No	No	Yes	No	Yes
Distance to Nearest Station in 2018 and 1950	No	No	No	Yes	Yes
Distance from the Center (Castle)	Yes	Yes	Yes	Yes	Yes
West of the Yamanote line	Yes	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes	Yes
Earthquake Risk	Yes	Yes	Yes	Yes	Yes
N in Panel I	351	338	351	351	338
N in Panel A	350	336	350	350	336
N in Panel B	352	338	352	352	338
N in Panel C	351	338	351	351	338
N in Panel D	351	338	351	351	338
N in Panel E	351	338	351	351	338
N in Panel F	341	336	341	341	336
N in Panel G	341	336	341	341	336

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

See Table 1 for the definitions of the variables. *Road Width* is the average road width. *Hospital, University, and Parks Share* is the share of land used as hospitals or universities, or parks. *Distance to Nearest Station in 2018 and 1950* is the distance to the nearest station in 2018 and 1950 (including tram stations).

Table A.16: Controlling for Block Size or FAR (OLS)

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1872				
Local Lords' Estates Share	-12.10***	-10.93***	-12.54***	-12.08***
	(0.746)	(0.753)	(0.750)	(0.725)
Panel B: Number of Lots in 2008–2011				
Local Lords' Estates Share	-19.75***	-12.79***	-16.01***	-12.78***
	(3.031)	(2.929)	(2.901)	(2.701)
Panel C: Number of Buildings in 2011				
Local Lords' Estates Share	-10.37***	-5.857***	-8.092***	-5.890***
	(1.860)	(1.735)	(1.680)	(1.546)
Panel D: Stories (aboveground) in 2011				
Local Lords' Estates Share	0.757**	1.005***	0.937***	0.983***
	(0.339)	(0.338)	(0.295)	(0.293)
Panel E: Number of Buildings >= 30 Stories in 2011				
Local Lords' Estates Share	0.0369**	0.0387**	0.0432***	0.0426***
	(0.0156)	(0.0160)	(0.0163)	(0.0162)
Panel F: Log Land Price in 2012				
Local Lords' Estates Share	0.165***	0.146**	0.152***	0.137***
	(0.0590)	(0.0588)	(0.0483)	(0.0480)
Block Size	No	Yes	No	Yes
FAR Regulation	No	No	Yes	Yes
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes
Lon and Lat Controls	Yes	Yes	Yes	Yes
Earthquake Risk	Yes	Yes	Yes	Yes
N in Panel A	5530	5529	5134	5133
N in Panel B	9101	9095	8521	8518
N in Panel C	9542	9541	9001	9000
N in Panel D	9542	9541	9001	9000
N in Panel E	9542	9541	9001	9000
N in Panel F	8971	8968	8909	8906

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.17: Controlling for Block Size or FAR (Local Randomization)

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share			
Local Lords' Estates Zone	0.351***	0.361***	0.299***
	(0.0592)	(0.0589)	(0.0619)
Panel A: Number of Lots in 1872			
Local Lords' Estates Zone	-10.79***	-10.90***	-10.13***
	(2.059)	(2.083)	(2.058)
Panel B: Number of Lots in 2008–2011			
Local Lords' Estates Zone	-22.22***	-21.60***	-18.52***
	(6.297)	(6.234)	(6.298)
Panel C: Number of Buildings in 2011			
Local Lords' Estates Zone	-10.60***	-10.43***	-8.680**
	(3.656)	(3.645)	(3.433)
Panel D: Stories (aboveground) in 2011			
Local Lords' Estates Zone	2.020**	2.082**	2.038**
	(0.873)	(0.862)	(0.837)
Panel E: Number of Buildings >= 30 Stories in 2011			
Local Lords' Estates Zone	0.124***	0.120***	0.121**
	(0.0469)	(0.0456)	(0.0476)
Panel F: Log Land Price in 2012			
Local Lords' Estates Zone	0.343*	0.323	0.177
	(0.202)	(0.203)	(0.136)
Panel G: Log Land Price in 2012			
Local Lords' Estates Zone (Core)	0.827***	0.806***	0.464**
	(0.228)	(0.236)	(0.186)
Local Lords' Estates Zone (Non-core)	-0.237	-0.241	-0.141
	(0.275)	(0.278)	(0.175)
Block Size	No	Yes	No
FAR Regulation	No	No	Yes
Distance from the Center (Castle)	Yes	Yes	Yes
West of the Yamanote line	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes
Earthquake Risk	Yes	Yes	Yes
N in Panel I	351	351	338
N in Panel A	350	350	336
N in Panel B	352	352	338
N in Panel C	351	351	338
N in Panel D	351	351	338
N in Panel E	351	351	338
N in Panel F	341	341	336
N in Panel G	341	341	336

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.18: Excluding Area Not Used for Housing of the Samurai Class before 1868 (OLS)

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1872 (N: 3967)				
Local Lords' Estates Share	-11.62***	-11.54***	-11.70***	-11.71***
	(0.653)	(0.644)	(0.651)	(0.651)
Panel B: Number of Lots in 2008–2011 (N: 5844)				
Local Lords' Estates Share	-26.09***	-24.49***	-23.15***	-23.01***
	(2.922)	(2.864)	(2.863)	(2.903)
Panel C: Number of Buildings in 2011 (N: 5828)				
Local Lords' Estates Share	-14.60***	-13.43***	-11.55***	-11.46***
	(1.853)	(1.824)	(1.785)	(1.815)
Panel D: Stories (aboveground) in 2011 (N: 5828)				
Local Lords' Estates Share	0.912**	1.041***	0.777**	0.713**
	(0.392)	(0.385)	(0.342)	(0.327)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 5828)				
Local Lords' Estates Share	0.0455***	0.0474***	0.0397***	0.0373***
	(0.0164)	(0.0165)	(0.0152)	(0.0144)
Panel F: Log Land Price in 2012 (N: 5427)				
Local Lords' Estates Share	0.384***	0.374***	0.217***	0.194***
	(0.0711)	(0.0738)	(0.0563)	(0.0507)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	No	Yes	Yes	Yes
S.D. of Altitude	No	Yes	Yes	Yes
Lon and Lat Controls	No	No	Yes	Yes
Earthquake Risk	No	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
We exclude the cells without any local lords' estates or bureaucrats' houses from the analysis.

Table A.19: Controlling for Initial Land Price in 1876 (OLS)

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1872 (N: 3618)				
Local Lords' Estates Share	-13.58***	-13.35***	-13.91***	-13.61***
	(0.798)	(0.780)	(0.820)	(0.814)
Panel B: Number of Lots in 2008–2011 (N: 3614)				
Local Lords' Estates Share	-17.11***	-16.71***	-16.98***	-16.35***
	(4.343)	(4.353)	(4.223)	(4.338)
Panel C: Number of Buildings in 2011 (N: 3605)				
Local Lords' Estates Share	-8.147***	-8.085***	-5.656**	-5.519**
	(2.665)	(2.672)	(2.721)	(2.766)
Panel D: Stories (aboveground) in 2011 (N: 3605)				
Local Lords' Estates Share	1.707***	1.725***	1.139***	1.160***
	(0.468)	(0.469)	(0.431)	(0.433)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 3605)				
Local Lords' Estates Share	0.0772***	0.0765***	0.0595***	0.0581***
	(0.0215)	(0.0214)	(0.0207)	(0.0208)
Panel F: Log Land Price in 2012 (N: 3467)				
Local Lords' Estates Share	0.287**	0.291***	0.0678	0.0707
	(0.112)	(0.111)	(0.0881)	(0.0856)
Log Land Price in 1876	No	Yes	No	Yes
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes
Lon and Lat Controls	No	No	Yes	Yes
Earthquake Risk	No	No	Yes	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.20: Controlling for Initial Land Price in 1876 (Local Randomization)

	(1)	(2)	(3)	(4)
Panel I: Local Lords' Estates Share (N: 319)				
Local Lords' Estates Zone	0.456***	0.410***	0.390***	0.384***
	(0.0510)	(0.0678)	(0.0432)	(0.0512)
Panel A: Number of Lots in 1872 (N: 319)				
Local Lords' Estates Zone	-11.83***	-7.893***	-10.85***	-8.676***
	(1.933)	(1.762)	(2.064)	(2.178)
Panel B: Number of Lots in 2008–2011 (N: 319)				
Local Lords' Estates Zone	-20.79***	-10.45	-20.91***	-16.02***
	(7.725)	(7.195)	(6.244)	(5.774)
Panel C: Number of Buildings in 2011 (N: 319)				
Local Lords' Estates Zone	-8.383*	-2.782	-10.15***	-7.905**
	(4.844)	(4.812)	(3.582)	(3.447)
Panel D: Stories (aboveground) in 2011 (N: 319)				
Local Lords' Estates Zone	1.925**	1.038	1.745***	1.342**
	(0.803)	(0.729)	(0.665)	(0.611)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 319)				
Local Lords' Estates Zone	0.123**	0.0654*	0.137***	0.0962**
	(0.0519)	(0.0367)	(0.0468)	(0.0377)
Panel F: Log Land Price in 2012 (N: 309)				
Local Lords' Estates Zone	0.141	-0.0743	0.397**	0.412**
	(0.356)	(0.338)	(0.184)	(0.189)
Log Land Price in 1876	No	Yes	No	Yes
Distance from the Center (Castle)	No	No	Yes	Yes
West of the Yamanote line	No	No	Yes	Yes
Mean of Altitude	No	No	Yes	Yes
S.D. of Altitude	No	No	Yes	Yes
Earthquake Risk	No	No	Yes	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.21: Controlling for Destruction during WWII (OLS, Core vs. Non-core)

	Inside vs Outside the Circle (*Yamanote*) Line					
	300 m		1000 m		2000 m	
	Inside	Outside	Inside	Outside	Inside	Outside
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Number of Lots in 1872						
Local Lords' Estates Share	-10.97***	-11.16***	-11.48***	-9.281***	-11.47***	-7.279***
	(0.760)	(1.407)	(0.759)	(1.553)	(0.742)	(1.566)
Panel B: Number of Lots in 2008–2011						
Local Lords' Estates Share	-20.05***	-0.853	-18.06***	0.809	-17.02***	2.249
	(2.910)	(6.277)	(2.942)	(5.064)	(2.885)	(6.813)
Panel C: Number of Buildings in 2011						
Local Lords' Estates Share	-9.876***	1.631	-8.212***	2.133	-7.664***	6.011
	(1.833)	(4.642)	(1.876)	(4.243)	(1.841)	(5.838)
Panel D: Stories (aboveground) in 2011						
Local Lords' Estates Share	1.009***	-0.357	0.767**	0.402	0.669*	0.0756
	(0.351)	(0.609)	(0.353)	(0.677)	(0.343)	(0.889)
Panel E: Number of Buildings >= 30 Stories in 2011						
Local Lords' Estates Share	0.0448***	-0.00643	0.0410**	0.0117	0.0363**	0.0431
	(0.0170)	(0.0204)	(0.0166)	(0.0234)	(0.0160)	(0.0275)
Panel F: Log Land Price in 2012						
Local Lords' Estates Share	0.220***	-0.161**	0.141**	-0.00401	0.134**	-0.0674
	(0.0528)	(0.0778)	(0.0598)	(0.0491)	(0.0602)	(0.0449)
WWII Destruction Share	Yes	Yes	Yes	Yes	Yes	Yes
Distance from the Center (Castle)	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes	Yes	Yes
Lon and Lat Controls	Yes	Yes	Yes	Yes	Yes	Yes
Earthquake Risk	Yes	Yes	Yes	Yes	Yes	Yes
N in Panel A	3555	1975	4045	1485	4702	828
N in Panel B	6137	2964	7160	1941	7977	1124
N in Panel C	6144	3398	7333	2209	8315	1227
N in Panel D	6144	3398	7333	2209	8315	1227
N in Panel E	6144	3398	7333	2209	8315	1227
N in Panel F	5704	3267	6855	2116	7811	1160

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.22: Controlling for Destruction during WWII (Local Randomization, Core vs. Non-core)

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share (N: 351)			
Local Lords' Estates Zone (Core)	0.400***	0.379***	0.317***
	(0.0740)	(0.0560)	(0.0718)
Local Lords' Estates Zone (Non-core)	0.418***	0.420***	0.393***
	(0.0966)	(0.103)	(0.100)
Panel A: Number of Lots in 1872 (N: 350)			
Local Lords' Estates Zone (Core)	-13.77***	-10.92***	-10.97***
	(1.351)	(1.955)	(1.791)
Local Lords' Estates Zone (Non-core)	-5.923***	-9.415***	-7.354***
	(2.019)	(2.328)	(2.346)
Panel B: Number of Lots in 2008–2011 (N: 352)			
Local Lords' Estates Zone (Core)	-40.04***	-35.08***	-33.55***
	(6.403)	(5.877)	(6.919)
Local Lords' Estates Zone (Non-core)	3.812	-6.879	-5.884
	(7.729)	(8.051)	(8.041)
Panel C: Number of Buildings in 2011 (N: 351)			
Local Lords' Estates Zone (Core)	-20.70***	-18.90***	-19.38***
	(3.238)	(3.139)	(3.542)
Local Lords' Estates Zone (Non-core)	6.893	0.0635	1.083
	(5.586)	(5.544)	(5.476)
Panel D: Stories (aboveground) in 2011 (N: 351)			
Local Lords' Estates Zone (Core)	3.306***	3.526***	2.840*
	(1.048)	(1.299)	(1.577)
Local Lords' Estates Zone (Non-core)	-0.423	-0.142	0.415
	(0.634)	(0.835)	(0.754)
Panel E: Number of Buildings >= 30 Stories in 2011 (N: 351)			
Local Lords' Estates Zone (Core)	0.174***	0.214***	0.192***
	(0.0591)	(0.0703)	(0.0704)
Local Lords' Estates Zone (Non-core)	-0.0320*	-0.0439	0.00214
	(0.0191)	(0.0407)	(0.0354)
Panel F: Log Land Price in 2012 (N: 341)			
Local Lords' Estates Zone (Core)	0.933***	1.087***	0.888***
	(0.326)	(0.235)	(0.248)
Local Lords' Estates Zone (Non-core)	-0.868***	-0.311	-0.210
	(0.301)	(0.271)	(0.272)
WWII Destruction	Yes	Yes	Yes
Distance from the Center (Castle)	No	Yes	Yes
West of the Yamanote line	No	Yes	Yes
Mean of Altitude	No	No	Yes
S.D. of Altitude	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.23: Controlling for Destruction during WWII (OLS, Before vs. After WWII)

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1912 (N: 8133)				
Local Lords' Estates Share	-12.27***	-11.20***	-12.65***	-11.87***
	(0.572)	(0.563)	(0.610)	(0.589)
Panel B: Number of Lots in 1931 (N: 7830)				
Local Lords' Estates Share	-9.328***	-7.960***	-9.703***	-8.511***
	(0.952)	(0.937)	(0.988)	(0.948)
Panel C: Log Land Price in 1912 (N: 7122)				
Local Lords' Estates Share	-0.312***	-0.332***	-0.526***	-0.526***
	(0.113)	(0.113)	(0.114)	(0.113)
Panel D: Log Land Price in 1931 (N: 4711)				
Local Lords' Estates Share	-0.568***	-0.553***	-0.754***	-0.717***
	(0.129)	(0.131)	(0.121)	(0.124)
Panel E: Log Land Rental Price in 1931 (N: 7024)				
Local Lords' Estates Share	-0.330***	-0.319***	-0.426***	-0.410***
	(0.0934)	(0.0942)	(0.0892)	(0.0902)
Panel F: Log Land Price in 1972 (N: 6071)				
Local Lords' Estates Share	-0.0988**	-0.112**	-0.0780*	-0.0783*
	(0.0491)	(0.0472)	(0.0431)	(0.0422)
Panel G: Log Land Price in 1983 (N: 3276)				
Local Lords' Estates Share	0.0117	-0.0164	-0.0243	-0.0299
	(0.0600)	(0.0583)	(0.0476)	(0.0473)
Panel H: Log Land Price in 2012 (N: 8971)				
Local Lords' Estates Share	0.262***	0.221***	0.165***	0.156***
	(0.0749)	(0.0723)	(0.0590)	(0.0577)
WWII Destruction Share	No	Yes	No	Yes
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes
Lon and Lat Controls	No	No	Yes	Yes
Earthquake Risk	No	No	Yes	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.24: Controlling for Destruction during WWII (Local Randomization, Before vs. After WWII)

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1912 (N: 343)				
Local Lords' Estates Zone	-11.03***	-8.972***	-9.991***	-8.201***
	(1.781)	(1.605)	(2.095)	(1.802)
Panel B: Number of Lots in 1931 (N: 347)				
Local Lords' Estates Zone	-10.55***	-9.112***	-9.672***	-8.386***
	(1.737)	(1.901)	(2.021)	(2.085)
Panel C: Log Land Price in 1912 (N: 294)				
Local Lords' Estates Zone	-0.873***	-0.839***	-0.709***	-0.698***
	(0.241)	(0.250)	(0.242)	(0.254)
Panel D: Log Land Price in 1931 (N: 268)				
Local Lords' Estates Zone	-0.604***	-0.563**	-0.487**	-0.443*
	(0.228)	(0.245)	(0.234)	(0.245)
Panel E: Log Land Rental Price in 1931 (N: 299)				
Local Lords' Estates Zone	-0.331**	-0.261	-0.342*	-0.271
	(0.152)	(0.162)	(0.180)	(0.183)
Panel F: Log Land Price in 1972 (N: 279)				
Local Lords' Estates Zone	0.0525	0.0639	-0.0439	-0.00818
	(0.146)	(0.135)	(0.157)	(0.154)
Panel G: Log Land Price in 1983 (N: 157)				
Local Lords' Estates Zone	0.148	0.141	0.103	0.117
	(0.134)	(0.133)	(0.144)	(0.152)
Panel H: Log Land Price in 2012 (N: 341)				
Local Lords' Estates Zone	0.443*	0.428*	0.343*	0.361*
	(0.244)	(0.221)	(0.202)	(0.197)
WWII Destruction	No	Yes	No	Yes
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
West of the Yamanote line	Yes	Yes	Yes	Yes
Mean of Altitude	No	No	Yes	Yes
S.D. of Altitude	No	No	Yes	Yes
Earthquake Risk	No	No	Yes	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.25: Controlling for Land Use/Ownership in 1931 (OLS, Before vs. After WWII)

	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1912 (N: 7319)				
Local Lords' Estates Share	-12.85***	-12.56***	-12.75***	-12.45***
	(0.604)	(0.613)	(0.630)	(0.633)
Panel B: Number of Lots in 1931 (N: 7830)				
Local Lords' Estates Share	-9.749***	-9.704***	-9.112***	-9.104***
	(0.995)	(1.010)	(1.040)	(1.067)
Panel C: Log Land Price in 1912 (N: 6552)				
Local Lords' Estates Share	-0.614***	-0.626***	-0.560***	-0.592***
	(0.118)	(0.118)	(0.115)	(0.119)
Panel D: Log Land Price in 1931 (N: 4711)				
Local Lords' Estates Share	-0.813***	-0.839***	-0.711***	-0.788***
	(0.122)	(0.121)	(0.121)	(0.120)
Panel E: Log Land Rental Price in 1931 (N: 7024)				
Local Lords' Estates Share	-0.501***	-0.514***	-0.398***	-0.494***
	(0.0906)	(0.0912)	(0.0893)	(0.0912)
Panel F: Log Land Price in 1972 (N: 5080)				
Local Lords' Estates Share	-0.0670	-0.0661	-0.0660	-0.0622
	(0.0429)	(0.0428)	(0.0420)	(0.0439)
Panel G: Log Land Price in 1983 (N: 2770)				
Local Lords' Estates Share	-0.0218	-0.0164	-0.0196	-0.0111
	(0.0475)	(0.0477)	(0.0463)	(0.0486)
Panel H: Log Land Price in 2012 (N: 7332)				
Local Lords' Estates Share	0.148**	0.149**	0.145**	0.155**
	(0.0590)	(0.0590)	(0.0593)	(0.0614)
Remaining Estates Share in 1931	Yes	No	No	Yes
Other Lords' Land Share in 1931	No	Yes	No	Yes
Military Use Share in 1931	No	No	Yes	Yes
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes
Lon and Lat Controls	Yes	Yes	Yes	Yes
Earthquake Risk	Yes	Yes	Yes	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables. *Remaining Estates Share in 1931* is the share of land used as an estate for the descendants of local lords in 1931. *Other Lords' Land Share in 1931* is the share of land owned by the descendants of local lords, not as their estate, in 1931. *Military Use Share in 1931* is the share of land used for military purposes in 1931.

Table A.26: Controlling for Land Use/Ownership in 1931 (Local Randomization, Before vs. After WWII)

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share (N: 347)			
Local Lords' Estates Zone	0.396***	0.378***	0.331***
	(0.0593)	(0.0554)	(0.0618)
Panel A: Number of Lots in 1912 (N: 339)			
Local Lords' Estates Zone	-11.18***	-10.66***	-9.681***
	(2.089)	(1.866)	(2.152)
Panel B: Number of Lots in 1931 (N: 347)			
Local Lords' Estates Zone	-9.823***	-10.67***	-9.798***
	(2.602)	(1.805)	(2.096)
Panel C: Log Land Price in 1912 (N: 293)			
Local Lords' Estates Zone	-0.786***	-0.777***	-0.622**
	(0.220)	(0.254)	(0.251)
Panel D: Log Land Price in 1931 (N: 268)			
Local Lords' Estates Zone	-0.737***	-0.647***	-0.532**
	(0.194)	(0.235)	(0.239)
Panel E: Log Land Rental Price in 1931 (N: 299)			
Local Lords' Estates Zone	-0.493***	-0.353**	-0.362**
	(0.156)	(0.158)	(0.182)
Panel F: Log Land Price in 1972 (N: 279)			
Local Lords' Estates Zone	-0.250	0.0736	-0.0298
	(0.236)	(0.149)	(0.156)
Panel G: Log Land Price in 1983 (N: 157)			
Local Lords' Estates Zone	-0.0896	0.167	0.114
	(0.224)	(0.138)	(0.146)
Panel H: Log Land Price in 2012 (N: 339)			
Local Lords' Estates Zone	0.213	0.481**	0.365*
	(0.334)	(0.241)	(0.202)
Remaining Estates Share in 1931	Yes	Yes	Yes
Distance from the Center (Castle)	No	Yes	Yes
West of the Yamanote line	No	Yes	Yes
Mean of Altitude	No	No	Yes
S.D. of Altitude	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables. *Remaining Estates Share in 1931* is the share of land used as an estate for the descendants of local lords in 1931.
There was no other lords' land other than their estate or military land in 1931 in this sample.

Table A.27: Controlling for Land Use/Ownership in 1931 (OLS, Core vs. Non-core)

	Inside vs Outside the Circle (*Yamanote*) Line					
	300 m		1000 m		2000 m	
	Inside	Outside	Inside	Outside	Inside	Outside
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Number of Lots in 1872						
Local Lords' Estates Share	-12.26***	-10.55***	-12.90***	-8.521***	-12.77***	-6.259***
	(0.834)	(1.388)	(0.768)	(1.388)	(0.754)	(1.720)
Panel B: Number of Lots in 2008–2011						
Local Lords' Estates Share	-24.41***	-1.509	-22.39***	-3.290	-20.98***	1.219
	(3.221)	(5.004)	(3.234)	(4.941)	(3.151)	(7.067)
Panel C: Number of Buildings in 2011						
Local Lords' Estates Share	-12.47***	0.664	-10.85***	-1.273	-10.21***	6.184
	(2.031)	(3.864)	(2.073)	(4.070)	(2.025)	(5.836)
Panel D: Stories (aboveground) in 2011						
Local Lords' Estates Share	1.131***	0.277	1.042***	0.635	0.985***	-0.114
	(0.384)	(0.566)	(0.382)	(0.623)	(0.362)	(0.847)
Panel E: Number of Buildings >= 30 Stories in 2011						
Local Lords' Estates Share	0.0523***	0.0149	0.0526***	0.0231	0.0481***	0.0344
	(0.0190)	(0.0160)	(0.0187)	(0.0177)	(0.0177)	(0.0220)
Panel F: Log Land Price in 2012						
Local Lords' Estates Share	0.227***	-0.128*	0.162**	0.0115	0.152**	-0.0693*
	(0.0578)	(0.0685)	(0.0648)	(0.0465)	(0.0634)	(0.0392)
Remaining Estates Share in 1931	Yes	No	Yes	No	Yes	No
Other Lords' Land Share in 1931	Yes	Yes	Yes	Yes	Yes	Yes
Military Use Share in 1931	Yes	Yes	Yes	Yes	Yes	No
Distance from the Center (Castle)	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes	Yes	Yes
Lon and Lat Controls	Yes	Yes	Yes	Yes	Yes	Yes
Earthquake Risk	Yes	Yes	Yes	Yes	Yes	Yes
N in Panel A	3366	1926	3822	1470	4470	822
N in Panel B	5269	2514	5955	1828	6700	1083
N in Panel C	5237	2489	5922	1804	6663	1063
N in Panel D	5237	2489	5922	1804	6663	1063
N in Panel E	5237	2489	5922	1804	6663	1063
N in Panel F	4925	2407	5596	1736	6314	1018

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables. *Remaining Estates Share in 1931* is the share of land used as an estate for the descendants of local lords in 1931. *Other Lords' Land Share in 1931* is the share of land owned by the descendants of local lords, not as their estate, in 1931. *Military Use Share in 1931* is the share of land used for military purposes in 1931.
Military Use Share in 1931 takes zero in column (6), and *Other Lords' Land Share in 1931* takes zero in columns (4) and (6).

Table A.28: Controlling for Land Use/Ownership in 1931 (Local Randomization, Core vs. Non-core)

	(1)	(2)	(3)
Panel I: Local Lords' Estates Share (N: 347)			
Local Lords' Estates Zone (Core)	0.405***	0.384***	0.318***
	(0.0745)	(0.0521)	(0.0671)
Local Lords' Estates Zone (Non-core)	0.380***	0.369***	0.347***
	(0.0945)	(0.101)	(0.101)
Panel A: Number of Lots in 1912 (N: 339)			
Local Lords' Estates Zone (Core)	-15.17***	-12.68***	-12.76***
	(1.738)	(1.926)	(1.866)
Local Lords' Estates Zone (Non-core)	-4.710**	-7.785***	-5.969**
	(1.829)	(2.701)	(2.852)
Panel B: Number of Lots in 1931 (N: 347)			
Local Lords' Estates Zone (Core)	-14.53***	-12.63***	-12.51***
	(2.761)	(2.435)	(2.805)
Local Lords' Estates Zone (Non-core)	-1.602	-7.658**	-6.140**
	(2.592)	(3.176)	(2.907)
Panel C: Log Land Price in 1912 (N: 293)			
Local Lords' Estates Zone (Core)	-1.160***	-0.980**	-0.778**
	(0.350)	(0.388)	(0.391)
Local Lords' Estates Zone (Non-core)	-0.399***	-0.516*	-0.447*
	(0.135)	(0.280)	(0.231)
Panel D: Log Land Price in 1931 (N: 268)			
Local Lords' Estates Zone (Core)	-1.040***	-1.060***	-1.093***
	(0.298)	(0.342)	(0.321)
Local Lords' Estates Zone (Non-core)	-0.457***	-0.332	-0.0690
	(0.148)	(0.214)	(0.156)
Panel E: Log Land Rental Price in 1931 (N: 299)			
Local Lords' Estates Zone (Core)	-0.590***	-0.435*	-0.526**
	(0.224)	(0.239)	(0.254)
Local Lords' Estates Zone (Non-core)	-0.389**	-0.249	-0.182
	(0.171)	(0.181)	(0.185)
Panel F: Log Land Price in 2012 (N: 339)			
Local Lords' Estates Zone (Core)	0.906***	1.030***	0.819***
	(0.323)	(0.227)	(0.230)
Local Lords' Estates Zone (Non-core)	-0.911***	-0.317	-0.219
	(0.302)	(0.278)	(0.277)
Remaining Estates Share in 1931	Yes	Yes	Yes
Distance from the Center (Castle)	No	Yes	Yes
West of the Yamanote line	No	Yes	Yes
Mean of Altitude	No	No	Yes
S.D. of Altitude	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables. *Remaining Estates Share in 1931* is the share of land used as an estate for the descendants of local lords in 1931.
There was no other lords' land other than their estate or military land in 1931 in this sample.

Table A.29: Quantile Regressions on Firm Productivity with Public Infrastructure (OLS Sample)

	Log Revenue / Worker				
	Percentiles				
	10	25	50	75	90
	(1)	(2)	(3)	(4)	(5)
Results in 2017					
Panel A: Geographical Controls, Industry Fixed Effects, and Public Amenities					
Local Lords' Estates Share	0.0284	0.0425***	0.0385***	0.0458***	0.0789***
	(0.0189)	(0.0123)	(0.0127)	(0.0165)	(0.0212)
Panel B: Panel A with Controlling for Stories					
Local Lords' Estates Share	0.0127	0.0333***	0.0197	0.0202	0.0546**
	(0.0178)	(0.0118)	(0.0134)	(0.0166)	(0.0218)
Results in 1993					
Panel C: Geographical Controls, Industry Fixed Effects, and Public Amenities					
Local Lords' Estates Share	0.00176	0.00760	0.0108	0.0330**	0.0338*
	(0.0146)	(0.0126)	(0.0116)	(0.0139)	(0.0186)
Panel D: Panel C with Controlling for Stories					
Local Lords' Estates Share	-0.000635	0.00508	0.00380	0.0235*	0.0130
	(0.0134)	(0.0126)	(0.0116)	(0.0140)	(0.0194)

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
In Panels A and C, we control for the geographical variables used in the main specification, *Distance from the Center (Castle)*, *Mean of Altitude*, *S.D. of Altitude*, two-digit-level industry fixed effects, and *Road Width*, *Hospital, University, and Parks Share*, and *Distance to Nearest Station in 2018 and 1950.* We add the mean of stories (aboveground) as an additional control in Panels B and D.
The number of observations (firms) in Panels A–C (Panels D–F) is 79471 (84617).

Table A.30: Quantile Regressions on Firm Productivity with Public Infrastructure (Local Randomization)

	Log Revenue / Worker				
	Percentiles				
	10	25	50	75	90
	(1)	(2)	(3)	(4)	(5)
Results in 2017					
Panel A: Geographical Controls, Industry Fixed Effects, and Public Amenities					
Local Lords' Estates Zone	-0.0222	0.0450	0.0742**	0.122***	0.153***
	(0.0458)	(0.0314)	(0.0306)	(0.0342)	(0.0451)
Panel B: Panel A with Controlling for Stories					
Local Lords' Estates Zone	-0.0584	-0.00774	0.0354	0.0528	0.113***
	(0.0479)	(0.0309)	(0.0323)	(0.0389)	(0.0390)
Results in 1993					
Panel C: Geographical Controls, Industry Fixed Effects, and Public Amenities					
Local Lords' Estates Zone	-0.0217	-0.00380	0.0148	0.0471	0.0752**
	(0.0306)	(0.0231)	(0.0319)	(0.0312)	(0.0360)
Panel D: Panel C with Controlling for Stories					
Local Lords' Estates Zone	-0.0195	-0.00761	0.0229	0.0566*	0.0808**
	(0.0332)	(0.0254)	(0.0303)	(0.0306)	(0.0316)

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. In Panels A and C, we control for the geographical variables used in the main specification, *Distance from the Center (Castle)*, *Mean of Altitude*, *S.D. of Altitude*, *West of the Yamanote Line*, *Earthquake Risk*, two-digit-level industry fixed effects, *Road Width*, *Hospital, University, and Parks Share*, and *Distance to Nearest Station in 2018 and 1950.* We add the mean of stories (aboveground) as an additional control in Panels B and D.
The number of observations (firms) in Panels A and B (Panels C and D) is 7397 (8137).

Table A.31: Selection Channel

	(1)	(2)	(3)
Panel A: Sorting of Movers			
	Δ Local Lords' Estates		
Log Revenue per Worker in 1993	0.00134	0.00317	
(0.00335)	(0.00395)		
Industry FEs	No	Yes	
Observation (Firm)	12309	12309	
Panel B: Entrant (Outcome: Entrant Dummy)			
	Sample: Full in 2017		
Local Lords' Estates Share	0.00699	0.00188	
	(0.0156)	(0.0152)	
Log Revenue per Worker in 2017	-0.0581***	-0.0247***	-0.0243***
	(0.00365)	(0.00363)	(0.00366)
Local Lords' Estates Share * Log Revenue per Worker in 2017	0.00858*	0.00633	0.00254
	(0.00450)	(0.00437)	(0.00483)
Geographical Controls (* Log Revenue per Worker in 2017)	Yes	Yes	Yes
Industry FEs	No	Yes	Yes
Local Lords' Estates Share * Industry FEs	No	No	Yes
Observation (Firm)	76510	76510	76510
Panel C: Exiter (Outcome: Exiter Dummy)			
	Sample: Full in 1993		
Local Lords' Estates Share	-0.00596	-0.0104	
	(0.0178)	(0.0177)	
Log Revenue per Worker in 1993	-0.0130***	-0.0176***	-0.0172***
	(0.00378)	(0.00385)	(0.00388)
Local Lords' Estates Share * Log Revenue per Worker in 1993	0.00553	0.00696	0.00386
	(0.00477)	(0.00473)	(0.00534)
Geographical Controls (* Log Revenue per Worker in 1993)	Yes	Yes	Yes
Industry FEs	No	Yes	Yes
Local Lords' Estates Share * Industry FEs	No	No	Yes
Observation (Firm)	85307	85307	85307

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Δ indicates the variable in 2017 minus 1993. Panel A uses firms that change their cells within our sample area. In Panel B (C), the outcome variable is a dummy variable that takes the value one if a firm exists only in 2017 (1993). *Geographical Controls* contain *Distance from the Center (Castle)*, *Mean of Altitude*, and *S.D. of Altitude*.

Table A.32: Selection Channel (Local Randomization)

	(1)	(2)	(3)
Panel A: Sorting of Movers			
	Δ Local Lords' Estates Zone		
Log Revenue per Worker in 1993	-0.0202**	-0.0268**	
	(0.00929)	(0.0115)	
Industry FEs	No	Yes	
Observation (Firm)	1341	1341	
Panel B: Entrant (Outcome: Entrant Dummy)			
	Sample: Full in 2017		
Local Lords' Estates Zone	-0.0479	-0.0272	
	(0.0462)	(0.0454)	
Log Revenue per Worker in 2017	-0.0516***	-0.0221***	-0.0187***
	(0.00502)	(0.00538)	(0.00560)
Local Lords' Estates Zone * Log Revenue per Worker in 2017	0.0325**	0.0245**	0.00986
	(0.0126)	(0.0125)	(0.0136)
Geographical Controls (* Log Revenue per Worker in 2017)	Yes	Yes	Yes
Industry FEs	No	Yes	Yes
Local Lords' Estates * Industry FEs	No	No	Yes
Observation (Firm)	7491	7491	7491
Panel C: Exiter (Outcome: Exiter Dummy)			
	Sample: Full in 1993		
Local Lords' Estates Zone	-0.0647	-0.0659	
	(0.0544)	(0.0544)	
Log Revenue per Worker in 2017	-0.0157***	-0.0183***	-0.0178***
(0.00474)	(0.00529)	(0.00545)	
Local Lords' Estates Zone * Log Revenue per Worker in 1993	0.0107	0.0129	0.00859
	(0.0142)	(0.0142)	(0.0169)
Geographical Controls (* Log Revenue per Worker in 1993)	Yes	Yes	Yes
Industry FEs	No	Yes	Yes
Local Lords' Estates * Industry FEs	No	No	Yes
Observation (Firm)	8206	8206	8206

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Δ indicates the variable in 2017 minus 1993. For stories, we use the number of stories aboveground in 2011 and 1991, respectively. Panel A uses firms that change their located cells within our sample area for the local randomization analysis. In Panel B (C), the outcome variable is a dummy variable that takes the value one if a firm exists only in 2017 (1993). *Geographical Controls* contains *Distance from the Center (Castle)*, *West of the Yamanote Line*, *Mean of Altitude* and *S.D. of Altitude*.

Table A.33: The Effect on Buildings in These Recent 25 Years (OLS)

	(1)	(2)	(3)	(4)
Panel A: Number of Buildings in 1986 (N: 9566)				
Local Lords' Estates Share	-14.34***	-12.20***	-11.38***	-11.38***
	(1.889)	(1.830)	(1.901)	(1.895)
Panel B: Number of Buildings in 2001 (N: 9566)				
Local Lords' Estates Share	-13.59***	-11.59***	-11.07***	-11.04***
	(1.900)	(1.870)	(1.922)	(1.919)
Panel C: Number of Buildings in 2011 (N: 9542)				
Local Lords' Estates Share	-12.91***	-11.12***	-10.41***	-10.37***
	(1.847)	(1.834)	(1.859)	(1.860)
Panel D: Stories (including underground) in 1986 (N: 9566)				
Local Lords' Estates Share	0.0421	0.0601	0.210	0.181
	(0.210)	(0.218)	(0.205)	(0.202)
Panel E: Stories (including underground) in 2001 (N: 9566)				
Local Lords' Estates Share	0.143	0.231	0.463	0.428
	(0.310)	(0.323)	(0.292)	(0.287)
Panel F: Stories (including underground) in 2011 (N: 9542)				
Local Lords' Estates Share	0.600	0.736*	0.918**	0.857**
	(0.413)	(0.427)	(0.385)	(0.369)
Panel G: Number of Buildings >= 30 Stories (including underground) in 1986 (N: 9327)				
Local Lords' Estates Share	0.0113*	0.0104*	0.0127**	0.0122**
	(0.00579)	(0.00590)	(0.00588)	(0.00568)
Panel H: Number of Buildings >= 30 Stories (including underground) in 2001 (N: 9473)				
Local Lords' Estates Share	0.0275**	0.0263**	0.0300***	0.0297***
	(0.0113)	(0.0115)	(0.0113)	(0.0113)
Panel I: Number of Buildings >= 30 Stories (including underground) in 2011 (N: 9542)				
Local Lords' Estates Share	0.0382**	0.0373**	0.0400**	0.0381**
	(0.0173)	(0.0182)	(0.0175)	(0.0167)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	No	Yes	Yes	Yes
S.D. of Altitude	No	Yes	Yes	Yes
Lon and Lat Controls	No	No	Yes	Yes
Earthquake Risk	No	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.34: The Effect on Buildings in These Recent 25 Years (Local Randomization)

	(1)	(2)	(3)
Panel I: Number of Buildings in 1986 (N: 351)			
Local Lords' Estates Zone	-8.519*	-9.445**	-9.462**
	(4.932)	(4.047)	(3.819)
Panel A: Number of Buildings in 2001 (N: 352)			
Local Lords' Estates Zone	-11.74**	-12.63***	-12.36***
	(4.549)	(3.902)	(3.832)
Panel B: Number of Buildings in 2011 (N: 351)			
Local Lords' Estates Zone	-10.06**	-11.16***	-10.60***
	(4.446)	(3.866)	(3.656)
Panel C: Stories (including underground) in 1986 (N: 351)			
Local Lords' Estates Zone	0.697	0.640	0.273
	(0.748)	(0.658)	(0.594)
Panel D: Stories (including underground) in 2001 (N: 352)			
Local Lords' Estates Zone	1.539*	1.319	0.495
	(0.919)	(0.858)	(0.700)
Panel E: Stories (including underground) in 2011 (N: 351)			
Local Lords' Estates Zone	2.605***	2.819***	2.361**
	(0.891)	(0.847)	(1.025)
Panel F: Number of Buildings >= 30 Stories (including underground) in 1986 (N: 348)			
Local Lords' Estates Zone	0.0207	0.00649	-0.00830
	(0.0202)	(0.00974)	(0.00756)
Panel G: Number of Buildings >= 30 Stories (including underground) in 2001 (N: 349)			
Local Lords' Estates Zone	0.0420*	0.0353*	0.0177
	(0.0242)	(0.0190)	(0.0164)
Panel H: Number of Buildings >= 30 Stories (including underground) in 2011 (N: 351)			
Local Lords' Estates Zone	0.124**	0.144**	0.140***
	(0.0498)	(0.0601)	(0.0538)
Distance from the Center (Castle)	No	Yes	Yes
West of the Yamanote line	No	Yes	Yes
Mean of Altitude	No	No	Yes
S.D. of Altitude	No	No	Yes
Earthquake Risk	No	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.

Table A.35: Business and Residential Zones

	Business Zones		Residential Zones	
	(1)	(2)	(3)	(4)
Panel A: Number of Lots in 1872				
Local Lords' Estates Share	-15.68***	-14.79***	-12.07***	-12.14***
	(1.142)	(1.134)	(1.162)	(1.322)
Panel B: Number of Lots in 2008–2011				
Local Lords' Estates Share	-29.06***	-25.44***	-24.55***	-18.51***
	(4.891)	(4.933)	(4.478)	(4.817)
Panel C: Number of Buildings in 2011				
Local Lords' Estates Share	-13.00***	-11.00***	-17.52***	-15.16***
	(2.869)	(2.926)	(3.092)	(3.054)
Panel D: Stories (aboveground) in 2011				
Local Lords' Estates Share	3.756***	4.047***	0.539	0.693
	(1.109)	(0.979)	(0.424)	(0.452)
Panel E: Number of Buildings >= 30 Stories in 2011				
Local Lords' Estates Share	0.138***	0.151***	0.0156	0.00965
	(0.0517)	(0.0476)	(0.0169)	(0.0205)
Panel F: Log Land Price in 2012				
Local Lords' Estates Share	0.141	0.0561	0.349***	0.178***
	(0.178)	(0.135)	(0.0531)	(0.0355)
Distance from the Center (Castle)	Yes	Yes	Yes	Yes
Mean of Altitude	Yes	Yes	Yes	Yes
S.D. of Altitude	Yes	Yes	Yes	Yes
Lon and Lat Controls	No	Yes	No	Yes
Earthquake Risk	No	Yes	No	Yes
N in Panel A	726	726	572	572
N in Panel B	1006	1006	1519	1519
N in Panel C	1018	1018	1738	1738
N in Panel D	1018	1018	1738	1738
N in Panel E	1018	1018	1738	1738
N in Panel F	954	954	1720	1720

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
See Table 1 for the definitions of the variables.
Columns (1) and (2) (columns (3) and (4)) use only cells for which more than half the area is used for business (residential) purposes.

Table A.36: Quantile Regressions on Firm Productivity (OLS Sample)

	Log Revenue / Worker				
	Percentiles				
	10	25	50	75	90
	(1)	(2)	(3)	(4)	(5)
Results in 2017					
Panel A: Baseline Results with Geographical Controls					
Local Lords' Estates Share	0.0259	0.00181	-0.0152	0.00860	0.0457
	(0.0209)	(0.0151)	(0.0170)	(0.0209)	(0.0296)
Panel B: Panel A with Industry Fixed Effects					
Local Lords' Estates Share	0.0279	0.0419***	0.0377***	0.0470***	0.0903***
	(0.0175)	(0.0120)	(0.0126)	(0.0158)	(0.0242)
Panel C: Panel B with Controlling for Stories					
Local Lords' Estates Share	0.00969	0.0261**	0.0150	0.0142	0.0561**
	(0.0178)	(0.0118)	(0.0126)	(0.0168)	(0.0228)
Results in 1993					
Panel D: Baseline Results with Geographical Controls					
Local Lords' Estates Share	0.000590	-0.0301*	-0.0273*	-0.00120	-0.00410
	(0.0186)	(0.0166)	(0.0156)	(0.0179)	(0.0301)
Panel E: Panel D with Industry Fixed Effects					
Local Lords' Estates Share	-0.00284	0.00268	0.00707	0.0258*	0.0313*
	(0.0140)	(0.0117)	(0.0117)	(0.0136)	(0.0180)
Panel F: Panel E with Controlling for Stories					
Local Lords' Estates Share	-0.00346	0.00157	0.00289	0.0247*	0.0196
	(0.0124)	(0.0110)	(0.0114)	(0.0134)	(0.0191)

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
In Panels A and C, we control for the geographical variables used in the main specification, *Distance from the Center (Castle)*, *Mean of Altitude*, and *S.D. of Altitude*. In Panels B and D, we also include two-digit-level industry fixed effects, corresponding to Figure 8(a). We add the mean of stories (aboveground) as an additional control in Panels C and F, corresponding to Figure 8(c).
The number of observations (firms) in Panels A–C (Panels D–F) is 80473 (85310).

Table A.37: Quantile Regressions on Firm Productivity (Local Randomization)

	Log Revenue / Worker				
	Percentiles				
	10	25	50	75	90
	(1)	(2)	(3)	(4)	(5)
Results in 2017					
Panel A: Baseline Results with Geographical Controls					
Local Lords' Estates Zone	0.00462	0.0702**	0.0741*	0.122**	0.137*
	(0.0457)	(0.0350)	(0.0436)	(0.0534)	(0.0812)
Panel B: Panel A with Industry Fixed Effects					
Local Lords' Estates Zone	0.0255	0.0702**	0.125***	0.151***	0.178***
	(0.0418)	(0.0296)	(0.0277)	(0.0344)	(0.0329)
Panel C: Panel B with Controlling for Stories					
Local Lords' Estates Zone	-0.0640	-0.0205	0.0421	0.0644*	0.0908***
	(0.0466)	(0.0325)	(0.0297)	(0.0373)	(0.0342)
Results in 1993					
Panel D: Baseline Results with Geographical Controls					
Local Lords' Estates Zone	0.000386	-0.0265	-0.0664	-0.0857*	0.0204
	(0.0360)	(0.0368)	(0.0420)	(0.0468)	(0.0802)
Panel E: Panel D with Industry Fixed Effects					
Local Lords' Estates Zone	0.0177	0.0128	0.0312	0.0647**	0.0923**
	(0.0307)	(0.0239)	(0.0282)	(0.0287)	(0.0376)
Panel F: Panel E with Controlling for Stories					
Local Lords' Estates Zone	0.00374	-0.00148	0.0215	0.0556*	0.0981***
	(0.0285)	(0.0256)	(0.0276)	(0.0305)	(0.0328)

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
In Panels A and C, we control for the geographical variables used in the main specification, *Distance from the Center (Castle)*, *Mean of Altitude*, *S.D. of Altitude*, *West of the Yamanote Line*, and *Earthquake Risk*. In Panels B and D, we also include two-digit-level industry fixed effects, corresponding to Figure 8(b). We add the mean of stories (aboveground) as an additional control in Panels C and F, corresponding to Figure 8(d).
The number of observations (firms) in Panels A, B, and C (Panels D, E, and F) is 7491 (8206).

Table A.38: Using the Number of Lots in 1872 as the Treatment Variable

	(1)	(2)
Panel A: Number of Lots in 2008–2011 (N: 5477)		
Number of Lots in 1872	1.590***	1.341***
	(0.275)	(0.276)
Panel B: Number of Buildings in 2011 (N: 5407)		
Number of Lots in 1872	0.867***	0.491***
	(0.175)	(0.172)
Panel C: Stories (aboveground) in 2011 (N: 5407)		
Number of Lots in 1872	-0.147***	-0.0875**
	(0.0444)	(0.0372)
Panel D: Number of Buildings >= 30 Stories in 2011 (N: 5407)		
Number of Lots in 1872	-0.00617***	-0.00472***
	(0.00202)	(0.00180)
Panel E: Log Land Price in 2012 (N: 5078)		
Number of Lots in 1872	-0.0343***	-0.00924*
	(0.00801)	(0.00556)
Distance from the Center (Castle)	Yes	Yes
Mean of Altitude	Yes	Yes
S.D. of Altitude	Yes	Yes
Lon and Lat Controls	No	Yes
Earthquake Risk	No	Yes

Standard errors are in parentheses. We allow a within-300 m correlation in the error terms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

See Table 1 for the definitions of the variables. We use *Local Lords' Estates Share* as an instrumental variable.