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Auctions vs Negotiations under Corruption: Evidence from Land Sales in China

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Auctions vs Negotiations under Corruption: Evidence from Land Sales in China*

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Abstract

This study investigates whether corruption differentially affects contracting through auctions and negotiations. Using data on Chinese land-market transactions, where corruption is known to be present, we first show that, on average, it exerts similar effects on transactions carried out via auctions and negotiation. However, this finding masks important heterogeneity – auctions featuring healthy competition are less affected by corruption, and significantly less so than negotiation. We then develop a simple model of bidding under the possibility of corruption that rationalizes our findings.

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1 Introduction

Government institutions, municipalities, and other state agencies often seek partners for work on projects or to whom to sell (or lease) public assets. They choose the partners with whom to contract using various transfer mechanisms, such as auctions and negotiations. A number of papers have explored the relative performance of these mechanisms, however, none have considered possible differences in their degree of vulnerability to corruption, and their effectiveness under corruption remains largely unexplored. For instance, the impact of corruption under negotiation and auction might vary because of transparency differences between the two mechanisms. Given the significant concerns about corruption that have been pointed out in such settings (Fisman and Golden (2017), OECD (2016), OECD (2010), Bajari et al. (2008)), understanding whether the impact of corruption is felt differently across transfer mechanisms is important.

In this paper we compare the impact of corruption on auctions and negotiations, using data on land transfers in China.[1] In China, only local governments can grant the right to land-use, and they earn all revenues from the land transfer. These can be substantial, accounting for 10% to 35% of local government revenue between 2004 and 2017. Certain features of this market make it an ideal environment for our study. A number of recent papers (e.g., Chen and Kung (2018), Ting and Muluan (2012), Cai et al. (2013)) have provided evidence suggesting the widespread presence of corruption in this market, with provincial- and municipal-level officials collaborating to lease land at lower prices to corrupt firms. Additionally, auctions and negotiations are the only two methods used for land allocation. Importantly, the use of auctions or negotiations is governed by regulations, so local government officials do not have authority to decide which mechanism to employ, thereby eliminating potential endogeneity concerns that would arise were officials responsible for choosing transfer methods.

In this setting, we make three important contributions. First, we document that, on average, corruption exerts similar effects on transactions carried out through auctions and negotiations. This result is surprising given the differences in transparency between the two regimes alluded to

[1] The data are observational, and described in further detail below.

above. Second, we demonstrate that this finding masks important heterogeneity. It turns out that auctions featuring healthy competition are less affected by corruption and significantly less so than negotiations. Finally, in order to rationalize our empirical findings we develop a simple model of bidding under the possibility of corruption, that allows for varying degrees of competition and that illustrates that entry of potential competitors constrains the actions of corrupt bidders.

Negotiation for land leases in China typically takes place as follows: at a predetermined time and location, a single designated firm engages in a bargaining process with government agents regarding land prices, without prior knowledge of the reserve price (as detailed in Section 2). When both parties reach an agreement on a price greater than or equal to the reserve, the government is obligated to transfer the land at the negotiated price.[2] However, as noted on the *Chinese Government Network*,[3] negotiations for land leases are susceptible to human manipulation, and firms with strong connections or those that have paid rent-seeking costs can acquire valuable land at significantly reduced prices, resulting in a substantial loss of state-owned land assets (Wang, 2008). Consequently, corrupt officials and firms can easily exploit the lack of transparency under negotiation and secure a price that is either just above or equal to the reserve price.

Auctions for land leases are more complex. The principal auction format used in the land market in China involves a two-stage setup. To participate in the auctions, firms must submit an application, and then obtain government approval by paying a cash deposit and submitting required documents. In the first stage, approved firms sequentially submit ascending bids, and then, upon completion of this stage, can continue with the second stage, which operates as an English auction starting from the highest price submitted in the first stage. Cai et al. (2013) describe mechanisms, supported by empirical evidence, illustrating how corruption works in two-stage auctions. They find that corrupt officials assist firms by: (i) offering special favors, such as improved site cleanup, enhanced infrastructure, or flexible development constraints, which increase the firms' valuations or reduce their project costs, and (ii) granting early entry approval, enabling corrupt firms to bid ahead of non-corrupt competitors in the first stage. An early bid in this context signals to rivals

[2]Details regarding the negotiation process can be found in 'Regulations on the Negotiation of State-owned Land Use Rights' in Chinese at `https://www.gov.cn/gongbao/content/2003/content_62406.htm`. Article 12 outlines the requirements and the conditions for a negotiation. A translated version can be found in Appendix A.1.

[3]The official website of the Chinese government.

that the auction is "arranged," potentially deterring clean bidders from participating due to the known advantages of corrupt firms. If these advantages are substantial and entry costs are high, clean bidders may forgo entry, allowing corrupt bidders to win land-lease auctions at the reserve price.

Our empirical strategy involves comparing the differential effect of corruption on outcomes in two-stage auctions and negotiations, using data from Chinese land transactions between 2004 and 2016. Building on the work of Chen and Kung (2018), we identify corrupt firms as those closely connected with high-ranking officials in China. We then estimate the impact of corruption by assessing how much it reduces the price for corrupt bidders (i.e., the percentage difference in price paid by corrupt winners compared to non-corrupt winners), while controlling for land value and firm characteristics. In this context, we find that, on average, price discounts in auctions are in line with those achieved under negotiations, amounting to approximately 57.08%. This outcome is unexpected considering the distinctions in transparency between the two transaction methods. The rest of our analysis is devoted to understanding this result.

Unlike for negotiations that feature only a single designated firm, auction outcomes depend on the number of participants and therefore the level of potential competition. Moreover, the literature has shown that competition can influence corruption (Bliss and Tella, 1997, Ades and Tella, 1999). Consequently, in addition to the average effect, we are also interested in how the impact of corruption varies with the extent of potential competition. Lacking a direct measure of potential competition, we develop proxies based on the timing of land transfers and demand- and supply-side variation. Using transaction-level data, we identify potential bidders for each auction by city, land-use type, and transactions within 365 days post-auction. This approach enables us to compute the *Herfindahl-Hirschman Index* (HHI) of land purchases to measure demand-side competition for both transaction and market levels. Additionally, we define *substitutability* as the availability of a similar parcel auctioned on the same day in the same city, capturing supply-side competition.[4] Segmenting auctions into competitive and non-competitive groups using HHI and substitutability, we find that negotiations and non-competitive auctions yield similar price discounts.

[4]Previous studies document the effects of multiple auctions held in the same date (Gentry et al., 2023, Arsenault Morin et al., 2024).

However, competitive auctions feature price discounts that are 9.61% to 20.46% lower compared to negotiations, depending on how we control for land value and competition.

We extend our baseline analysis to address the possibility that the degree of competition is endogeneously determined. In markets in which corruption is prevalent, potential bidders may be deterred, reducing overall competition and potentially biasing our competition metric. To address this, we use land transaction histories to track competition levels and instances of corruption across markets. This approach allows us to develop control variables that explicitly account for the influence of corruption and to generate an exogenous measure of predicted competition for use in our regressions. Regression analyses use these control variables, along with exogenous measures of competition, show that our results are robust and remain unaffected by endogeneity concerns.

We then investigate why the impact of corruption varies with auction competitiveness. Regulatory constraints make negotiations inherently non-competitive, so competition does not affect corruption in this context. In auctions, however, corruption's influence may depend on competition levels. Higher competition increases the likelihood that clean firms with higher valuations or lower costs can compete with corrupt bidders despite their advantages. These clean bidders are more willing to pay entry costs, forcing corrupt firms to bid higher, reducing price discounts as competition grows. Extending the two-stage model from Cai et al. (2013), simulations confirm that greater competition in two-stage auctions increases participation by clean bidders, leading to lower price discounts.

Our findings contribute to four bodies of literature. First is the literature studying the general performance of various transfer/procurement mechanisms. Comparative studies have examined auctions versus negotiations (e.g., Bulow and Klemperer (1996); Bajari et al. (2009); Gentry and Stroup (2019); Covert and Sweeney (2023); Genesove and Hansen (2023)), different auction formats (e.g., Athey et al. (2008); Roberts and Sweeting (2013)), and auctions against posted prices (e.g., Wang (1998); Hammond (2010); Einav et al. (2018)). However, these papers do not consider the impact of corruption on these transfer methods. In this paper, we analyze how negotiations and auctions are affected by corruption.

Second, we contribute to the literature on the effect of illegal behaviors on sale outcomes. Some studies have focused on corruption in procurement auctions (e.g., Compte et al. (2005); Lengwiler and Wolfstetter (2006); Coviello and Gagliarducci (2017); Decarolis et al. (2020); Hudon and Garzón (2016); Andreyanov et al. (2017); Arsenault-Morin (2023)). Others have concentrated on collusion in procurement auctions (e.g., Porter and Zona (1993); Pesendorfer (2000); Hendricks and Porter (2007); Harrington and Skrzypacz (2011); Aryal and Gabrielli (2013); Clark et al. (2018); Gentry et al. (2018); Seibel and Škoda (2021); Caoui (2022); Kawai and Nakabayashi (2022); Kim and Weinberg (2023)). Unlike these papers that only focus on one transfer method affected by unlawful behavior, we compare the effects brought by illegality on both negotiations and auctions.

In addition, the relationship between corruption and competition has been studied extensively in the literature. Rose-Ackerman (1975) and Thanassoulis (2023) consider corruption/misconduct under different competition frameworks. While some papers underscore a positive association between competition and corruption (e.g., Celentani and Ganuza (2002); Alexeev and Song (2013); Bennett et al. (2013)), and some suggest the opposite (e.g., Shleifer and Vishny (1993); Clarke and Xu (2004); Compte et al. (2005); Hessami (2014)), various studies also describe the ambiguous effect of competition on corruption (e.g., Bliss and Tella (1997); Ades and Tella (1999)). Different from existing literature, we examine how competition directly influences corrupt firms' ability to secure favorable auction deals by providing more granular measures of both competition and corruption.

Several studies have investigated the role of discretion in public procurement, with negotiations often regarded as auctions involving the highest degree of discretion. Coviello et al. (2018) find that discretion increases the probability that the same firm wins repeatedly, and it does not deteriorate the procurement outcomes. Szucs (2024) finds that greater discretion leads to higher prices, selection of less productive contractors, and favoritism toward politically connected firms. However, our analysis shows that discounts for corrupt firms depend more on market competition than on discretion levels. Similarly, Decarolis et al. (2024) find that limiting invited bidders—a discretionary choice—raises the chances of "investigated" firms winning without affecting overall outcomes. In our context, competition plays a pivotal role, even when local governments favor corrupt firms through discretionary actions. In China's land market, officials cannot adjust discretion levels once they select two-stage or English auctions.

Finally, our paper contributes to the literature on the Chinese land market. Cai et al. (2013) develop a model to explain how corruption affects the outcome of two-stage auctions. Chen and Kung (2018) document the effects of corruption on land sale prices in China, but without examining how the impact of corruption varies with the transfer mechanism. More recently, Fang et al. (2022) find that officials tend to award more land to state-owned firms than to private firms after the anti-corruption campaign. In our paper, we examine details of the effect of corruption on auctions and negotiations, particularly noting the heterogeneity of corruption effect on two-stage auctions.

The rest of the paper proceeds as follows. In Section 2, we provide institutional information about the Chinese land market and describe how negotiations and two-stage auctions work. Section 3 describes the data set used in this paper. Section 4 describes our identification strategy for land value, provides empirical results for the price discount comparison, relieves the concern of the possible endogeneity problems, and includes robustness checks. Section 5 reviews the two-stage auction model adapted from Cai et al. (2013), explains how competition affects the price discount in auctions by model simulation and provides policy implications. Section 6 concludes the study.

2 Background

2.1 Negotiations and Auctions in the Chinese Land Market

The Chinese government is the sole statutory owner of land, and regulates all land allocations.[5] According to this system, land can only be leased, and each land parcel is assigned a specific usage type (e.g., industrial, entertainment, etc.) by government authorities. Prior to 1987, the land transfer process exclusively involved "government allocation," where the local government assigned land parcels to specific users without any direct cost, based on applications.[6] Land acquired through government allocation could be utilized indefinitely by land users, but with significant constraints, including a prohibition on subleasing.

As market-oriented economic reforms were launched in China in 1978, the need for a more

[5]The law designates the State as the landowner, with the government acting as its representative.

[6]In some cases, users did bear costs for land improvements, but these costs were inevitable regardless of the land transfer method.

efficient land-allocation system became evident. Therefore, the Chinese government introduced negotiations and auctions to transfer land in 1987. From this point forward, virtually all land transfers were mandated to be conducted through one of these two methods, while government allocation gradually became a method reserved only for specific legal cases defined in 1986. Under this new scheme, the duration of land usage is determined by the local government based on the land's designated type (e.g., 40 years for business land and 50 years for industrial land). Furthermore, the local government retains all land-transfer revenue.

Negotiations are an informal process between a single firm and at least two government officials, lacking competitive dynamics. In response to this, a series of laws pertaining to negotiations were passed between 2002 and 2006. An all-encompassing law, effective from 2006, dictates that negotiations must be employed only under the following three circumstances, with the land user predetermined by regulations:[7]

1. Land users renew their land-use contracts.
2. Land, initially transferred via governmental allocation, necessitates a subsequent transference to the current land user.
3. Under particular circumstances delineated by statutory regulations, some parcels of land ought to be transferred to a predetermined land user through negotiations.[8]

At each negotiation, a single designated firm negotiates the land price with governmental officials, and the parcel can be transferred at any price exceeding the reserve price for negotiations, without prior knowledge of the reserve price. If both parties agree on a price greater than or equal to the reserve, the government transfers the land at the negotiated price.

Besides the three cases just mentioned, all other land transfers must use auctions. These auctions are organized by local governments and are typically announced 20 days in advance of the start date. The announcements include basic land details such as location and reserve price. There

[7] Details of these changes in 2006 are explained in the Appendix A.2.

[8] The details of case 3 will be comprehensively described in Appendix A.3, but to illustrate this particular scenario if urban planning dictates the relocation of a business entity (e.g. due to the construction of a railway on its current premises), the firm is permitted to engage in negotiation with local governmental authorities to secure an alternative land parcel of the same designated usage type as the current one.

exist three formats for auctions within the Chinese land market: (i) English auctions, (ii) first-price auctions, and (iii) two-stage auctions. While the decision to negotiate or use an auction is governed by regulatory guidelines, the choice of auction format is delegated to local officials. Among the three auction types, English auctions constitute 10.26%, and first-price auctions make up 1.42% of all auctions. The predominant auction format, accounting for 88.32% of all auctions, is the two-stage auction. Furthermore, the majority of locations exclusively employ two-stage auctions. Consequently, the primary focus of this paper lies in the exploration of two-stage auctions in comparison to negotiations.[9]

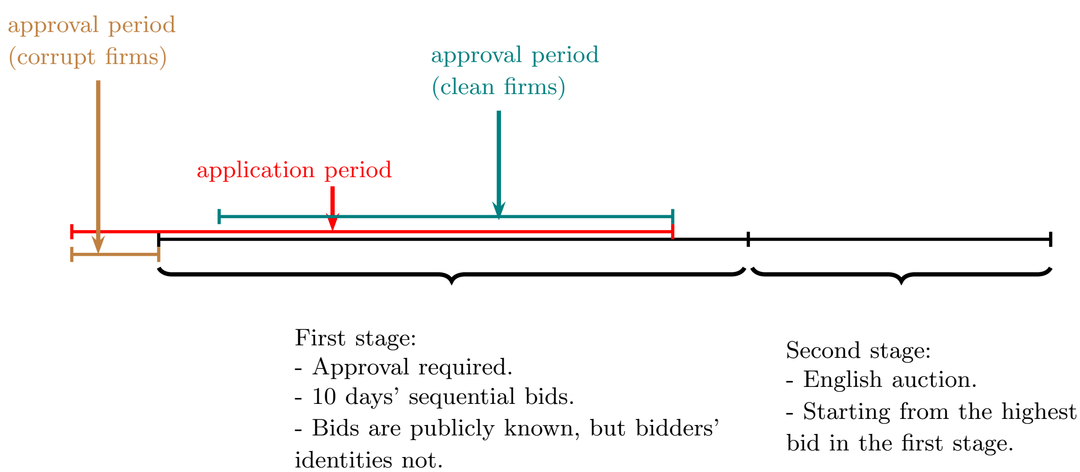

Figure 1: Timeline for Two-stage Auctions

The chronology of a two-stage auction is illustrated in Figure 1. The duration of the first stage is typically disclosed in the auction announcement, spanning a ten-day period (Cai et al., 2013). To submit a bid in the first stage, firms must be approved for participation during a specified application period, as indicated by the red line segment. This application period typically begins a few days prior to the start of the first stage, with the exact commencement varying depending on the specific auction. It usually concludes two days before the end of the first stage. During the application process, firms are required to deposit 10% of the reserve price, a substantial amount given the

[9] Cai et al. (2013) compare English auctions with two-stage auctions, highlighting the latter's higher likelihood of successful sales due to sequential entry in the first stage. This preference may explain why governments often favor two-stage auctions. Detailed information and an extension of our analysis for English auctions are provided in Appendix H.

significant reserve price, and they must also provide the necessary documentation, including the auction application form and their criminal record to confirm that they have not committed any crimes (Cai et al., 2013).

Following review of applications, officials grant entry approval. Once approved, firms can bid in the first stage. Approval for non-corrupt bidders may occur only after the start of the first stage (Cai et al., 2013). The green line segment illustrates the timeframe during which a firm might receive entry approval and submit a bid. Throughout the first stage, approved firms sequentially submit ascending bids, and have the option to submit multiple bids. Submitted bids are promptly made public on the trading board or through the Internet, while the identities of the bidders remain hidden. At the conclusion of the first stage, if no firm opts to continue competing for the land, it is awarded to the highest bidder, that pays its bid. Conversely, if multiple firms are competing for the land at the end of the first stage, these firms automatically progress to the second stage to continue their competition. The second stage is conducted as an English auction, starting from the highest bid of the first stage.

2.2 Corruption in the Chinese Land Market

Chen and Kung (2018) identify *cronyism* as the primary corruption mechanism for land transfers in China. By cronyism we mean the reciprocal exchange of favors between merchants and officials for mutual benefits. Cronyism in this market involves local party officials leasing land at discounted prices to firms controlled by Politburo members' relatives, known as *princeling* firms. They find that princeling firms receive discounts averaging 59.5%, and officials granting these discounts are more likely to be promoted, with promotion likelihood increasing with the size of the discount.

Accordingly, we adopt the identical list of *princeling* firms as described in Chen and Kung (2018), classifying these firms as corrupt. An auction or negotiation is classified as corrupt if it is won by a corrupt firm, and clean otherwise.[10] Additionally, we assume that each corrupt auction involves only one corrupt firm, as it would be difficult for officials to assist multiple corrupt firms

[10]It is important to note that the dataset does not provide information about the identities of losing bidders. Therefore, we cannot classify auctions as corrupt or clean based on the participation of corrupt firms. If a corrupt firm loses an auction, it remains unclear whether that firm was involved in the bidding process.

in obtaining the same land. We further posit that if alternate forms of corruption exist, their distribution patterns align similarly.

The corruption mechanism that enables price discounts with the help of government officials is described in Cai et al. (2013). In the context of two-stage auctions, corrupt officials assist firms in both winning the auction and securing the land at a low price. This process involves two key steps:

First, officials promise special favors to corrupt firms, which can reduce development costs or increase future revenue. These favors may include improved land clearance, better local infrastructure, or relaxed land development restrictions (Cai et al., 2013). For example, in 2008, a local official in Chongqing, China was found to illegally increase the floor area ratio for certain firms. The floor area ratio—the proportion of construction area to land area—is an important land development restriction. Raising this limit allows real estate firms to build more units, increasing their revenue. Evidence supporting the existence of such special favors is provided in Appendix B.

Second, corrupt firms are granted early approval to participate in the two-stage auction, before non-corrupt firms are approved. As shown in Figure 1, the brown line segment represents this early approval period. Once approved, the corrupt firm quickly submits a bid as the first stage begins (i.e., at the left end of the first-stage line segment), while other bidders can only be approved and submit their bids during the green line segment. Evidence of early approval for corrupt firms is presented in Appendix F. According to Cai et al. (2013), early bids signal to rival bidders that corruption is involved, which can discourage their participation. Non-corrupt firms, recognizing the valuation advantage of their corrupt counterparts, may decide not to incur the costs of participation. These costs include a cash deposit, document preparation, and other transaction expenses such as consulting fees and time. As a result, corrupt firms can bid close to the reserve price, securing the land at the lowest possible price.[11]

In contrast, corruption in land-lease negotiations is more straightforward. According to the *Chinese Government Network*, land-lease negotiations are susceptible to manipulation, as connected firms can acquire land at significantly reduced prices (Wang, 2008). Corrupt officials and firms

[11] Our data also provide evidence of corruption in English auctions. In such auctions, other bidders are uncertain about whether the auction features corruption, knowing only that corruption is a possibility. This belief influences the participation decisions of non-corrupt bidders. Detailed analysis of the effects of corruption on English auctions is provided in Appendix H.

exploit the lack of transparency in negotiations to manipulate the process, agreeing on prices at or near the reserve price.

3 Data

We use the data set published by Chen and Kung (2018) in *Harvard Dataverse*. This dataset includes all land parcels purchased by firms in the Chinese land market between 2004 and 2016. Each transaction corresponds to an observation and encompasses information on variables such as transaction time, land location, land size, assessed land quality on a scale of 1 to 20, land usage type, land price, names of the land buyer, industry of the land buyer, and land transfer methods.

As discussed in the previous section, the dataset also identifies corrupt firms – firms whose founders or shareholders include relatives of Politburo members. The Politburo typically consists of 25 individuals representing the apex of political leadership in China. These members are selected from delegates of the National Congresses of the Communist Party. The timespan considered in this study contains Politburo members from 1997 to 2016, corresponding to the 15^{th} through the 18^{th} National Congresses of the Communist Party. According to Chen and Kung (2018), the individuals considered to be relatives are: son/daughter and son-in-law/daughter-in-law, wife and other in-laws, brother and sister, nephews and nieces. Given that only land buyers are documented, an auction/negotiation is considered to be corrupt if the land buyer is a corrupt firm.

Table 1: Summary Statistics for Different Land Groups

Variables	Negotiations			Two-stage Auctions		
	Corrupt Firms	Non-corrupt Firms	Diff	Corrupt Firms	Non-corrupt Firms	Diff
Average Price	145.03	595.75	-75.66%***	352.27	759.00	-53.59%***
Average Area	0.65	1.87	-65.24%***	3.95	3.24	21.91%***
Average Quality	12.25	13.85	-1.60***	12.77	12.67	0.10
Observations	6,983	198,161		8,433	820,537	

Notes: The unit of price is $Yuan/m^2$, where $Yuan$ is the unit of Chinese currency, and the unit for area is hectare. A larger number in land quality indicates a lower quality land. Diff indicates the difference between corrupt firms and clean firms conditional on the land transfer method. *, **, *** represent the significant levels of 5%, 1% and 0.1%.

This study focuses on land parcels that were transferred through either two-stage auctions or negotiations. Out of 1,034,114 transactions for negotiations and two-stage auctions, 205,144 parcels leased sold through negotiations, while 828,970 were leased through two-stage auctions. Firms identified as corrupt purchased 15,416 land parcels, while the remaining transactions were conducted by non-corrupt firms.

The summary statistics of the dataset, provided in Table 1, show that, on average, land leased through two-stage auctions is larger and has a higher price than land sold through negotiations, while quality is comparable across the two mechanisms. The size discrepancy could be attributed to the fact that corrupt firms, potentially leveraging relationships with government officials, may opt for larger parcels in auctions, while their ability to choose size is restricted in negotiations. Overall, corrupt firms pay 75.66% less than their non-corrupt counterparts when negotiating, and 53.59% less when winning two-stage auctions. These crude statistics suggest that the impact of corruption on negotiation is more pronounced than its impact on auctions. However, this analysis does not yet consider potential differences among the land parcels themselves. To address this, we conduct a careful empirical analysis, comparing the impact of corruption on negotiation and auctions while controlling for factors such as location, size, and other land attributes in the next section.

4 Empirical Analysis

In this section, we will examine the impact of corruption on auctions and negotiations. Before describing in detail the empirical analysis, it is important to introduce several key concepts for our study. First, the effect of corruption is measured by the *price discount* generated by corruption. Conditional on land value and transfer method, this is defined as $D_m = (P_m^{nc} - P_m^c)/P_m^{nc}$, where m denotes the transfer method (auction $m = a$ or negotiation $m = n$). Here, P_m^{nc} and P_m^c refer to land prices of non-corrupt and corrupt land transaction obtained with transfer method m, respectively. To compare the effect of corruption on negotiations and two-stage auctions, we introduce the *price discount differences*, represented by $D_{diff} = D_n - D_a$. With these definitions in hand, we can now assess the differential impact of corruption between these two modes of land transfer.

4.1 Identification Strategy for Land Value

To accurately determine the price discount in two-stage auctions versus negotiations, amidst a variety of unobserved firm and land characteristics, it is necessary to appropriately identify comparable land parcels. We achieve this objective under the assumption that land parcels with similar characteristics, in proximate locations, and sold within the same year, bear a high degree of comparability in terms of land value. We then examine similar land transactions occurring within the same calendar year, within narrowly defined geographic areas, to determine the price discount.

Specifically, we follow the method proposed by Chen and Kung (2018) to identify those corrupt land parcels transferred through either negotiations or two-stage auctions, as well as their non-corrupt counterparts within a 1,500-meter radius in the same year and sold by two-stage auctions or negotiations. As a robustness check, we use a 500-meter radius. Furthermore, in Appendix E.5, we provide regression results with grid fixed effects to account for additional location-specific unobservables.

4.2 The Effect of Corruption on Negotiations and Auctions

To compare the impact of corruption on negotiations and auctions, we employ the following regression model:

$$\begin{aligned} P_{ijft} = &\beta_0 + \beta_1 corrupt_{ijf} + \beta_2 auction_{ijft} + \beta_3 corrupt_{ijf} \times auction_{ijft} \\ &+ \gamma X_{ijft} + \psi W_{ft} + \delta_t + \varepsilon_{ijft}. \end{aligned} \tag{1}$$

The dependent variable, P_{ijft}, is the logarithm of the unit price of land ($Yuan/m^2$) for parcel i in city j leased by firm f at time t. The variable $corrupt_{ijf}$ serves as an indicator, taking on a value of one if a corrupt firm is the lessee. The indicator variable $auction_{ijft}$ equals one if the land transacts via auction. β_3, the coefficient of the interaction term $auction_{ijft} \times corrupt_{ijf}$, is the coefficient of interest, which denotes the price discount difference. X_{ijft} contains land characteristics, including log of land size, land quality metric reported by officials, city-year-land usage fixed effects and indicators for whether a land parcel is new land (i.e., land which has not previously been leased at the time it is transferred). W_{ft} captures land-buyers' features at the time of lease, including firm-size indicators, firm experience in auctions and in negotiation (as measured by the number of auctions/negotiations in which they have been acquired), an interaction term between negotiation and firm size (to account for the possibility that larger firms may have better negotiation skills), industry indicators, and an indicator for whether the land buyer is state-owned. δ_t captures month fixed effects.

Table 2: The Effects of Corruption on Land Prices

VARIABLES	(1) ln(price)	(2) ln(price)	(3) ln(price)
corrupt	-0.836***	-0.864***	-0.821***
	(0.038)	(0.055)	(0.049)
auction	0.483***	0.469***	0.432***
	(0.060)	(0.060)	(0.061)
corrupt × auction	0.064	0.023	0.053
	(0.061)	(0.062)	(0.050)
City×Usage×Year FE	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Radius	No	1,500 m	500 m
Observations	1,000,665	239,011	137,097
No. of Cluster	30	29	29
R-squared	0.6989	0.7521	0.7788

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

Results are reported in Table 2. Column (1) presents results using the full sample, while columns (2) and (3) use samples with a 1,500-meter-radius and a 500-meter-radius respectively. Land price may be correlated within provinces, since the promotion of provincial leaders is directly determined by Politburo members, whose relatives' firms are potentially corrupt. Therefore, standard errors are clustered at the province and firm level. Furthermore, to ensure comparability among land parcels within the same city, land usage, and sold in the same month and year, we utilize a comprehensive control strategy involving city-year-usage fixed effects, month fixed effects, and three-digit industry fixed effects.[12]

[12]Both the radius-range and grid fixed effects approaches effectively address unobservable factors without rely-

The findings in the first two rows suggest that corruption lowers prices regardless of transfer mechanism, and that auctions result in higher prices than negotiations. However, the third row implies that the effect of corruption on auctions is, on average, not significantly different from the effect on negotiations. This implies a general equivalence in price discounts from corruption between negotiation and auctions.[13]

4.3 Competition and Corruption

One of the primary distinctions between auctions and negotiations is that auctions are inherently competitive, while negotiations are not. As discussed in Bliss and Tella (1997) and Ades and Tella (1999), analysis of the link between corruption and competition reveals an ambiguous relationship. Therefore, the differential effect of corruption on auctions and negotiations may well depend on the degree of competition in the auctions.

To assess the impact of competition, it is crucial to establish a metric that captures the degree of potential competition. In the absence of a direct measure, we define proxy metrics based on the timing of land transfers and variation on both the demand and supply sides. First, for the demand-side measure, we approximate the set of potential bidders for a given auction by leveraging transaction timing. Specifically, we construct a proxy based on the set of winners in transactions completed within 365 days following each auction, categorized by city and land-use type. For instance, for a commercial land auction held on March 20, 2010, in Shanghai, the relevant market is defined based on all commercial land transactions finalized in Shanghai within the subsequent 365 days. This approach assumes that transactions occurring after an auction capture the interest of potential bidders who might also consider competing for similar land.

To capture aggregate effects, we define each auction's market based on a combination of city, year, and land-use type and compute average competition measures across all transactions within

ing on the Nearest Neighbor and Propensity Score Matching methods employed by Genesove and Hansen (2023). These methods produce comparable land matches to those generated by matching techniques, while simultaneously accounting for all observable land attributes and incorporating fixed effects to capture unobservable variations across locations and over time.

[13]We provide additional evidence in Appendix C demonstrating that the presented findings remain consistent, regardless of changes in central government appointments, or central inspections.

Table 3: Distribution of HHI by transactions

mean	sd	min	25^{th}	50^{th}	75^{th}	max
0.181	0.295	0.002	0.017	0.051	0.166	1

Notes: sd is the standard deviation. 25^{th} , 50^{th}, 75^{th} represent the 25^{th} percentile, the 50^{th} percentile and the 75^{th} percentile respectively. min and max are the minimum and maximum value of HHI.

that market. This method approximates the competitive dynamics bidders consider when deciding whether to participate, providing a comprehensive view of potential competition in each market.

Table 4: Distribution of HHI by markets

number of markets	mean	sd	min	25^{th}	50^{th}	75^{th}	max
24,728	0.596	0.355	0.005	0.249	0.583	1	1

Notes: sd is the standard deviation. 25^{th} , 50^{th}, 75^{th} represent the 25^{th} percentile, the 50^{th} percentile and the 75^{th} percentile respectively. min and max are the minimum and maximum value of HHI.

Using the defined set of transactions and markets for each transaction as described above, we compute the *Herfindahl-Hirschman Index* (HHI) of land purchases to measure the level of competition across all auctions and markets.[14] The HHI ranges from 0 to 1, with higher values indicating a more concentrated market. The mean HHI across all transactions is 0.181, and the full distribution is detailed in Table 3. Notably, 9.98% of HHI values are equal to 1, indicating that the pool of potential bidders is highly limited in some markets. At the market level, the HHI distribution, summarized in Table 4, has a mean of 0.596, with 34.9% of markets showing an HHI of 1.[15]

Second, we leverage the fact that the availability of land for transfer and the timing of transactions are entirely determined by local governments, enabling us to construct a competition measure based on supply-side factors. To quantify potential competition for a specific parcel, we define a measure of *substitutability*, which captures the availability of other parcels within the same city, designated for the same use, and auctioned on the same day. In two-stage auctions, the sequential nature of participation allows potential bidders to observe the level of competitiveness in a given

[14]For example, consider a market with three auctions: if one firm purchases a single land parcel and another firm purchases two parcels, the HHI for this market is calculated as $(\frac{1}{3})^2 + (\frac{2}{3})^2 \approx 0.56$.

[15]As a robustness check, we also followed the approach of Hendricks et al. (2003) to estimate the number of potential bidders by counting the number of auction winners and using this to assess the level of competition for auctions. Additional details are discussed in Appendix E.5, and the results are robust to this alternative competition measure.

auction. The presence of multiple similar parcels auctioned simultaneously inherently reduces competition for each individual auction. In our dataset, approximately 11% of two-stage land transfers occur as standalone transactions on a given date, while 89% involve at least one additional land transfer on the same day.

4.4 Heterogeneous Effect of Corruption by Level of Competition

This section presents the estimation results examining how the impact of corruption changes with varying levels of potential competition. To classify auctions as competitive, we define an indicator variable, $competitive_{ijft}$, based on the 50^{th} percentile of both transaction-level and market-level HHI values and land substitution indicator. The variable $competitive_{ijft}$ equals one if the auction for parcel i in city j at time t is categorized as competitive according to the associated HHI or *substitutability* measures. We then incorporate this indicator variable into the framework of Equation 1, extending the analysis as follows:

$$\begin{aligned} P_{ijft} = {} & \beta_0 + \beta_1 corrupt_{ijf} + \beta_2 auction_{ijft} + \beta_3 corrupt_{ijf} \times auction_{ijft} \\ & + \beta_4 corrupt_{ijf} \times auction_{ijft} \times competitive_{ijt} + \beta_5 auction_{ijft} \times competitive_{ijt} \\ & + \beta_6 corrupt_{ijf} \times competitive_{ijt} + \gamma X_{ijft} + \psi W_{ft} + \delta_t + \varepsilon_{ijft}. \end{aligned} \tag{2}$$

β_4, the coefficient of the interaction term $corrupt_{ijf} \times auction_{ijft} \times competitive_{ijt}$ allows us to estimate the price discount difference between auctions and negotiations (D_{diff}) under different competition structures. Other interactions, $auction_{ijft} \times competitive_{ijt}$ and $corrupt_{ijf} \times competitive_{ijt}$, allow us to control for and examine the effect of competition on all auctions and corruption cases, so that we can examine how corruption changes with varying levels of potential competition.

4.4.1 Demand-side competition measures

We begin by discussing findings based on the demand-side measure of potential competition. The results are presented in Table 5. The median of transaction- and market-level HHI are used to categorize an auction as competitive. Columns (1)-(3) focus on the transaction-level competition measure, where the median HHI is 0.05. Columns (4)-(6) examine the effect of corruption using market-level competition measure and median HHI level is 0.10 in the analysis.[16]

Table 5: Price Discount Difference - The Effect of Competition

	Transaction-Level			Market-Level		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ln(price)	ln(price)	ln(price)	ln(price)	ln(price)	ln(price)
corrupt	-0.818***	-0.904***	-0.857***	-0.828***	-0.888***	-0.837***
	(0.045)	(0.061)	(0.053)	(0.036)	(0.055)	(0.046)
auction	0.483***	0.477***	0.431***	0.474***	0.463***	0.410***
	(0.052)	(0.054)	(0.055)	(0.050)	(0.054)	(0.060)
corrupt×auction	-0.015	-0.042	-0.010	-0.024	-0.062	-0.043
	(0.066)	(0.067)	(0.059)	(0.056)	(0.058)	(0.048)
corrupt×auction×comp	0.193**	0.190***	0.135*	0.261**	0.307***	0.280***
	(0.055)	(0.052)	(0.050)	(0.077)	(0.075)	(0.073)
auction×comp	-0.005	0.017	0.018	0.018	0.059	0.079
	(0.006)	(0.009)	(0.010)	(0.043)	(0.049)	(0.050)
corrupt×comp	-0.047	-0.016	-0.006	-0.054	-0.106	-0.105
	(0.035)	(0.028)	(0.027)	(0.069)	(0.061)	(0.059)
City×Usage×Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Radius	No	1,500 m	500 m	No	1,500 m	500 m
Observations	976,829	283,168	162,780	976,829	283,168	162,780
R-squared	0.699	0.745	0.774	0.699	0.746	0.774

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

Each set of regressions includes one using the full sample, one using the 1,500-meter-radius sample, and another using the 500-meter-radius sample. Across all demand-side competition measures and land control methods, greater competition is found to significantly reduce price discounts granted to corrupt firms as indicated by the significant estimations in the forth row of the Table 5. Our analysis reveals that the varying effect of competition is primarily significant in cases involving corrupt winners. Furthermore, we demonstrate in Appendix E.3 that the magnitude of these effects increases and remains significant under conditions of heightened competition. While the results in Table 5 indicate no significant impact of greater competition on auction transactions overall, a more

[16]Note that 50^{th} percentile among transaction level is lower than market level because of the fact that there are more transactions in more competitive markets.

granular investigation presented in Appendix E.3 shows that greater competition is associated with increased prices in auctions.

4.4.2 Supply-side competition measure

Second, we explore the differential effect of the availability of substitutable land auctioned on the same day. As explained above, the presence of substitutable land potentially reduces the level of competition firms face in an individual auction, since there are more competing alternatives.

Table 6: Price Discount Difference - The Effect of Land Substitution

VARIABLES	(1) ln(price)	(2) ln(price)	(3) ln(price)
corrupt	-0.738***	-0.870***	-0.856***
	(0.107)	(0.108)	(0.092)
auction	0.480***	0.482***	0.438***
	(0.052)	(0.053)	(0.055)
corrupt×auction	-0.087	-0.039	0.017
	(0.112)	(0.108)	(0.087)
corrupt×auction×comp	0.477***	0.327**	0.249*
	(0.112)	(0.112)	(0.097)
auction×comp	0.016	0.025	0.006
	(0.011)	(0.014)	(0.015)
corrupt×comp	-0.103	-0.038	0.001
	(0.093)	(0.090)	(0.079)
City×Usage×Year FE	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Radius	No	1,500 m	500 m
Observations	976,829	283,168	162,780
R-squared	0.699	0.745	0.774

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects."comp" in the fourth column refers to auctions of land parcels that have no substitutable alternatives.

As shown in the third row of the Table 6, the availability of substitutable land in auctions enables corrupt firms to sustain similar price discounts between auctions and negotiations. In contrast, when land is auctioned without substitutable alternatives, as shown in the forth row of the Table 6 increased competition leads to a substantial reduction in price discounts of auctions across all land control methods examined in the analysis. As was the case for the demand-side competition measure, we further explore how our findings regarding auction transactions vary with heightened competition in Appendix E.3.

4.4.3 Economic implications of results

Potential competition measures obtained from demand- and supply-side variation indicate that the effect of corruption on transaction prices decreases significantly in competitive markets. While results are similar for price discounts between negotiations and non-competitive land auctions or auctions without substitutable alternatives, significance in the coefficient of $corrupt \times auction \times comp$ highlights meaningful differences in price discounts between negotiations and competitive auctions. For instance, columns (2) and (5) in Table 5 report price discount differences of 5.71% and 6.14%, respectively, between negotiations and competitive auctions.[17] Similarly, column (2) in Table 6 indicates a 11.9% price discount difference between negotiations and competitive auctions. These findings document that while corrupt firms may obtain similar price discounts in negotiations and auctions, the price discounts they achieve decrease as auctions become more competitive.

The estimation results presented in Tables 5 and 6 highlight that variation in competition play a dominant role in explaining price discount differences. While Appendix E.3 demonstrates that heightened competition significantly influences auction prices and price discount differences, in line with our specification, we primarily focus on the effect of the interaction term $corrupt \times auction \times comp$ for the rest of the paper. This term primarily captures the price discount differences between negotiations and auctions in competitive transactions.

4.5 Potential Threats to Identification

In this section, we examine potential threats to identification related to endogeneity concerns stemming from our empirical strategy. In particular, we discuss (i) the potential endogeneity of competition, and (ii) the potential endogeneity of the transfer method selection.

[17] The price discount difference between negotiations and competitive auctions is calculated as $(1 - e^{\beta_1}) - (1 - e^{\beta_1+\beta_3+\beta_4+\beta_6})$. The price discount difference between negotiations and non-competitive auctions is calculated as $(1 - e^{\beta_1}) - (1 - e^{\beta_1+\beta_3})$.

4.5.1 Potential endogeneity of competition

Up to this point, we have treated the competition level measures we constructed as exogenous to the extent of corruption and prior market activities. However, markets with a higher prevalence of corrupt firms may discourage potential bidders, thereby lowering overall market competition. Additionally, potential bidders can observe the actions of others during previous land transfers and adjust their participation strategies accordingly. This raises the possibility that greater competition levels may naturally occur in markets with less severe corruption. As a result, the competition metrics we developed might be inherently influenced by corruption, raising concerns about endogeneity in our empirical analysis.

Table 7: Controlling for the history of competition and corruption activities

	Including Controls			Predicting Competition		
	Trans.	Market	Land Subs.	Trans.	Market	Land Subs.
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	lnprice	lnprice	lnprice	lnprice	lnprice	lnprice
corrupt	-0.909***	-0.911***	-0.905***	-0.910***	-0.910***	-0.905***
	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)
auction	0.486***	0.486***	0.485***	0.485***	0.485***	0.485***
	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)
corrupt×auction	-0.041	-0.046	-0.006	-0.038	-0.036	-0.004
	(0.066)	(0.062)	(0.066)	(0.064)	(0.065)	(0.068)
cor.×auc.×comp	0.187***	0.212***	0.308***			
	(0.047)	(0.030)	(0.063)			
cor.×auc.×comp-pre				0.179***	0.185***	0.364***
				(0.029)	(0.042)	(0.075)
Market History Controls	Yes	Yes	Yes	No	No	No
City×Usage×Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Radius	1500m					
Observations	283,168	283,168	283,168	283,168	283,168	283,168
R-squared	0.746	0.746	0.746	0.745	0.745	0.745

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

To address this concern, we construct measures that account for the historical presence of corruption and competition in the market: (i) the number of corruption cases, (ii) the HHI measure based on previous land transfer activities, (iii) the number of transactions, and (iv) the number of distinct winners. We construct these measures in two time frames: within 20 and 365 days prior to the transaction date. The 20-day window captures the influence of corruption and competition during the announcement and sequential entry phases of the two-stage auctions. Meanwhile, the 365-day window accounts for potential longer-term effects of corruption and market competition on current transactions. Since transaction histories are publicly available, these constructed variables allow us to use similar historical market structure information as potential bidders and to incorporate it in our empirical analysis.

Using the constructed measures of historical corruption activities and market competition, we first incorporate them as additional control variables in our regression analysis. Columns (1)–(3) of Table 7 show the estimation results after including these measures. Compared to the estimates in Tables 5 and 6, the significance and magnitude of our findings remain unchanged.

To further address concerns that corruption may influence market competition, we analyze the determinants of competition structure using historical transaction data available to bidders at the time of the auctions. We then predict the ex-ante competition level for both the demand and supply sides.[18] Columns (4)–(6) of Table 7 present the estimation results based on the predicted competition measures, confirming that our findings are not influenced by unobservable components of the market structure.

4.5.2 Potential endogeneity of transfer-method selection

While the selection of transfer methods between negotiation and auction is regulated by central government rules, local officials might possess the authority to arrange documentation to make certain transfers eligible for negotiation. Additionally, the choice between two-stage and English auctions lies within the discretion of local governments. Focusing exclusively on two-stage auctions could obscure significant heterogeneity. Thus, in this section we investigate whether local officials have unobservable incentives to favor particular mechanisms or not.

Since our analysis primarily centers on corrupt firms linked to political party officials, the incen-

[18]Details of this estimation are provided in Appendix D.2.

Table 8: Local Party Leader's Promotion

	Provincial party secretaries				
	Ordered Probit		Binary	Ordered Probit	
	(1)	(2)	(3)	(4)	(5)
VARIABLES	promote	promote	promote	promote	promote
corrupt	0.560*	0.712**	0.120**		
	(0.237)	(0.267)	(0.042)		
negotiation (%)	0.916	2.733	-0.029	3.544	2.846
	(2.654)	(3.032)	(0.456)	(3.120)	(3.054)
two-stage (%)	0.788	2.239	-0.175	3.151	2.610
	(2.700)	(3.075)	(0.461)	(3.155)	(3.092)
english (%)	2.635	3.271	-0.059	4.283	3.623
	(2.774)	(3.115)	(0.464)	(3.232)	(3.158)
discount				0.840***	
				(0.181)	
lnarea					0.313***
					(0.088)
Year	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes
Other Controls	No	Yes	Yes	Yes	Yes
Observations	371	361	361	363	363
R-squared			0.374		

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. The ordinal measure of political turnover is categorized into four levels: termination (0), retirement (1), lateral transfer or continuation in office (2), and promotion (3). The binary measure is represented by a dummy variable, which takes the value of 1 if the official is promoted in year t, and 0 otherwise. Control variables in the analysis include tax revenue growth, the logarithm of GDP per capita, the logarithm of population size, average years of education, age, and the square of age. Robust standard errors are provided in parentheses.

tive for preferential treatment often stems from the goal of securing promotions. Building on the framework of Chen and Kung (2018), we investigate the factors influencing local officials' promotion decisions. To do so, we use the province-year panel data where the promotion status of provincial party secretaries is indicated. Additionally, we include the proportion of selected transfer methods favoring corrupt firms as an additional variable, along with an indicator of whether the provincial party secretary transferred a land parcel to a politically connected firm during that year, the total size of the land, the price discount granted to politically connected corrupt firms, and various economic performance indicators. Column (1) of Table 8 examines how the promotion probability of a provincial party secretary changes when they assist corrupt firms in acquiring land, without controlling for other variables. In Column (2), we include additional control variables. Next, we convert the dependent variable into a binary indicator to only reflect whether the party secretary was promoted, as shown in Column (3). Columns (4) and (5) explore how the probability of promotion changes when provincial secretaries provide larger price discounts to corrupt firms or allocate more land area to them, respectively.

In summary, Table 8 reveals that the chosen transfer methods do not yield any advantageous promotion outcomes for local party leaders.[19] Consequently, there is no statistical evidence to suggest that local officials have the authority to manipulate documentation to qualify certain transfers for negotiation or to exploit their discretionary power by favoring two-stage auctions over English auctions.

4.6 Robustness

We perform several robustness checks to validate the direction and significance of our findings.

4.6.1. Selected sample. Since our data only include transfer outcomes, we can only observe successful land transfers to the corrupt firms. As a result, instances of corrupt firm involvement in our dataset may not be random, potentially introducing selection bias into our findings. To address the potential impact of observing only successful corrupt transactions, we implement a Heckman-style selection model (Heckman, 1979). Appendix E.1 presents the effects of two-stage auctions on the log of unit land prices for corrupt winners, both with and without the *Inverse Mills Ratio.* The results indicate no significant evidence that selection bias meaningfully affects our analysis.

4.6.2. Splitting the sample to non-competitive and competitive markets. In addition to interacting competition measures with $corrupt \times auction$, we also investigate the effects of competition on price discount differences by splitting the sample into competitive and non-competitive categories. Table E.3 presents the regression results by splitting sample into two competitive market structure. Across all three measures, the findings align closely with those presented in the earlier tables, confirming the robustness of our results.

4.6.3. The effect of greater competition. We investigate HHI threshold values to distinguish between competitive and non-competitive two-stage auctions. As the threshold value decreases, the

[19] In China, provincial party secretaries and governors are both regarded as provincial leaders. However, Chen and Kung (2018) notes that only the promotion of provincial party secretaries is tied to corruption.

average competition level for competitive two-stage auctions rises, and the difference in corruption's impact between competitive auctions and negotiations becomes more pronounced. For instance, Table E.4 highlights the effects when focusing on the 25th percentile of the most competitive markets, revealing stronger results. Additionally, we categorize auctions by competitiveness levels using the 10th percentile of our HHI competition measures. Table E.5 details the effect of increased competition on unit prices for transfers conducted through auctions. Consistent with the auction literature, greater competition leads to higher prices. Moreover, in highly competitive markets, corrupt firms tend to pay a higher price, with this price increasing alongside competition intensity. Additional details of these analyses can be found in Appendix E.3.

4.6.4. Alternative demand-side competition measures. We apply the methodology proposed by Hendricks et al. (2003) to estimate the number of potential bidders for each auction, providing a new perspective on auction competitiveness. Unlike the HHI, which considers firm winning frequency, this measure assigns equal weight to all firms. Additionally, we test the robustness of our findings by using a different time frame, constructing the HHI with transaction data from 180 days instead of 365 days. We also explore the effects of non-competitive markets by excluding markets with no competition. Our results remain consistent with this alternative competition measure, and further details of these analyses are presented in Appendix E.4.

4.6.5. Land value controls. We adopted grid-year fixed effects approach similar to the one used by Covert and Sweeney (2023) for controlling land value. In this context, grid-year fixed effects enable us to account for potential variations in land value across grids that could potentially bias the estimation of the price discount resulting from varying parcel counts across grid-year pairs. Under these modified methodologies, we consistently replicated our original findings. Estimation results and details are available in Appendix E.5.

4.6.6. Two-stage vs English auctions. Recall that, depending on province and cities, a local government could choose between auction types (i.e., two-stage auctions and ii. English auctions) as explained in Section 2. As a result, our empirical findings could have been impacted by the auction selection mechanism of the local government. In Section 4.5.2, we demonstrate that there is no empirical evidence suggesting the discretionary use of two-stage auctions to favor them over English auctions. To further address these concerns, we present estimation results from locations where only two-stage auctions are used for transactions. Reassuringly, these results remain consistent with our initial findings. Detailed analyses can be found in Appendix E.6.

4.6.7. Switching costs. Certain land transfers involve firms negotiating leases for parcels already in use. In such cases, firms may offer higher prices during negotiations to avoid incurring switching costs associated with relocating to a different parcel if an agreement with the government cannot be reached. This dynamic could bias the comparative analysis of corruption's impact on negotiations versus auctions. To address this concern, we limit our sample to land parcels that were not previously used. Appendix E.7 presents the results, which remain consistent with our earlier findings.

4.6.8. Residential and commercial lands. In certain instances, auctions for non-residential and non-commercial land (e.g., industrial land) may involve a screening process where the government selects firms to compete. To avoid potential bias in our results, we conducted a robustness check by focusing exclusively on residential and commercial land. The results, presented in Appendix E.8, are consistent with our main findings.

5 Model

Our empirical analysis provides evidence that the differential effect of corruption on auctions and negotiations depends on the level of competitiveness in auctions. We argue that this outcome arises as heightened competition in auctions makes it more likely that some non-corrupt firms will draw costs that allow them to compete against corrupt bidders, despite their cost advantage. As a result, these non-corrupt bidders will enter the auction, and corrupt firms will need to respond with higher prices if they hope to win, implying that price discounts in auctions will decrease as competition increases. In this section we extend the two-stage model developed in Cai et al. (2013) and provide support for this argument through model simulation. We also investigate the interaction between determinants of the price discount and competition, and provide some policy implications.

5.1 Model Set-Up

Suppose a plot of land l in $1, \ldots, L$, with $L \geq 1$, is to be transferred through a two-stage auction. Let there be N potential bidders, with n bidders choosing to participate (bid) after paying an entry cost C.[20] The two-stage auction is assumed to be an independent private value auction and all potential bidders are risk neutral. Bidder i's land valuation, V_i, is randomly drawn from a cumulative distribution function $F(V)$ on $[0, \bar{V}]$, with associated density function $f(V)$. V_i's are identically and independently distributed. If bidder i wins the auction with a bid of B_i, its profit is $\pi_i = V_i - B_i - C$.

During the first stage, each potential bidder knows their land valuation and decides whether to pay the entry cost to participate in the auction. Although in practice bidding is sequential in the first stage, we follow Cai et al. (2013) and assume for simplicity that first, one potential bidder makes an entry decision and bids, and second, all other potential bidders make their entry decisions simultaneously. If more than one firm has entered in the first stage, the winner will be determined through an English auction in a second stage.

5.2 Entry and Bidding in Non-corrupt Auctions

We begin by examining auctions that do not feature a corrupt bidder. In the initial stage of such an auction, a randomly selected bidder, denoted as bidder 1, decides whether to enter by submitting a bid $\tilde{B}_1(V_1)$. The entry decisions of all other potential bidders are simultaneous, and if there is more than one entrant, the auction transforms into an English auction. Bidder 1's bidding function, $\tilde{B}_1(\cdot)$, is symmetric and known to all bidders; rivals can infer bidder 1's valuation and base their entry decisions on it. In a separating, signaling equilibrium, $\tilde{B}_1(\cdot)$ is an increasing function that truthfully discloses bidder 1's land valuation, preventing any deceptive behavior where bidder 1 pretends to have a different land valuation.[21]

Bidder 1 chooses to participate in the first stage of the two-stage auction using $\tilde{B}_1(\cdot)$ when its

[20] For firms, the entry cost for a two-stage auction includes (1) the payment of a cash deposit, (2) the preparation of auction application documents, and (3) certain transaction costs, such as consulting fees and time.

[21] This setup is a generalization of the jump-bid literature (Daniel and Hirshleifer, 2018), which considers only two bidders.

valuation falls within the $[\tilde{V}, \bar{V}]$ interval, where $\tilde{V} > r + C$. There are three scenarios based on bidder 1's valuation (V_1) that need to be considered: (i) $V_1 < \tilde{V}$, (ii) $V_1 = \tilde{V}$, and (iii) $V_1 > \tilde{V}$.

First, if V_1 is less than $\tilde{V}$, bidder 1 chooses not to participate in the auction. The other $N-1$ bidders play the same game as in an English auction. In a symmetric equilibrium of an English auction with entry cost C, a potential bidder will decide to enter the auction if and only if its valuation is above a certain value $\hat{V}_{ns} > r + C$. A bidder with valuation exactly equal to $\hat{V}_{ns}$, earns a profit of $\hat{V}_{ns} - r$, only if it is the sole bidder, an event occurring with probability $F(\hat{V}_{ns})^{(N-2)}$. Therefore, the non-sequential entry threshold $\hat{V}_{ns}$ satisfies the following equation:

$$F(\hat{V}_{ns})^{N-2}(\hat{V}_{ns} - r) = C.$$

Second, if bidder 1's valuation exactly equals $\tilde{V}$, it bids the reserve price r, which is the lowest possible signal a bidder can use to reveal its valuation $\tilde{V}$ (Riley, 1979). The other $N-1$ potential bidders then infer bidder 1's valuation to be $\tilde{V}$ when they observe it bid r, and, as a result, now consider the reserve price to be $\tilde{V}$, which is the highest price up to which bidder 1 can bid in the English auction. They enter only if their valuation is above $\hat{V}_s(\tilde{V})$, where $\hat{V}_s$ is a mapping from reserve price to entry threshold value when entry is sequential. The entry threshold for these rival potential bidders will be $\hat{V}_s$, determined by the following equation:

$$F(\hat{V}_s(\tilde{V}))^{(N-2)}(\hat{V}_s(\tilde{V}) - \tilde{V}) = C.$$

The left-hand-side of this equation represents the expected payoff from participating in an English auction for bidders whose valuation exactly matches $\hat{V}_s(\tilde{V})$, which must equal the participation cost C. Note that $\hat{V}_s(\tilde{V})$ is greater than $\tilde{V}$ plus C. Since any potential-bidder entry after bidder 1 means bidder 1's bid will be dominated in the English auction, bidder 1 can win a two-stage auction only if all other potential bidders choose not to participate in the auction with probability $F(\hat{V}_s(\tilde{V}))^{(N-1)}$. Consequently, $\tilde{V}$ should meet the condition specified in the following equation:

$$F(\hat{V}_s(\tilde{V}))^{(N-1)}(\tilde{V}-r)=C.$$

Finally, if bidder 1's valuation is greater than $\tilde{V}$, then, in equilibrium, bidder 1 bids $\tilde{B}_1(V_1)$, which is greater than reserve price r. The other $N-1$ potential bidders enter the auction if their valuations are larger than a threshold value $\hat{V}_s(V_1)$, which now satisfies the following equation:

$$F(\hat{V}_s(V_1))^{(N-2)}(\hat{V}_s(V_1)-V_1)=C.$$

In this setting, bidder 1 determines its bid to maximize its expected payoff using the bid function:

$$U(V_1,\overrightarrow{V_1},B)=F(\hat{V}_s(\overrightarrow{V_1}))^{(N-1)}(V_1-B)-C,$$

where $\overrightarrow{V_1}$ is other potential bidders' beliefs regarding V_1. The payoff function rises with bidder 1's true valuation V_1 and the belief of the other potential bidders $\overrightarrow{V_1}$, but falls with bidder 1's bid B. In equilibrium, bidder 1 is incentivized to "truthfully" bid with its equilibrium bid $\tilde{B}(V_1)$ and we can demonstrate that this adherence to truthfulness satisfies the single crossing condition by following Cai et al. (2013). Therefore, lower-valued bidders have no incentive to misrepresent their valuations. In a truth-telling equilibrium, $\frac{d\tilde{B}_1}{dV_1}=0$ at $\overrightarrow{V_1}$=V_1. This implies:

$$\frac{d\tilde{B}_1}{dV_1}=\left(\frac{(N-1)f(\hat{V}_s(V_1))(V_1-B)}{F(\hat{V}_s(V_1))}\right)\left(\frac{F(\hat{V}_s(V_1))}{F(\hat{V}_S(V_1))+(N-2)f(\hat{V}_S(V_1))(\hat{V}_S(V_1)-V_1)}\right).$$

In conjunction with $\tilde{B}_1(\tilde{V})=r$, this equation characterizes the strictly increasing signaling schedule.

5.3 Entry and Bidding in Corrupt Auctions

Now, consider the scenario where the two-stage auction is corrupt. The corrupt bidder is assumed to receive special favors from government officials for land development, thereby increasing its land valuation by κ. The corrupt bidder is also able to submit its bids at time 0 of the first stage, thereby signaling that the auction in question features a corrupt bidder. Given that entry into the auctions is costly and the fact that the corrupt bidder's land valuation is augmented by κ, other potential bidders may be discouraged from entering the auction, depending on their valuation draws. Consequently, the corrupt firm may acquire the land at the price they offered at time 0 of the first stage, and, as a result, it typically submits bids the reserve price r to increase rents from winning the auction.

We consider the following situation. The corrupt firm is the first one to make the entry decision, with $\tilde{V}_c$ as its threshold value. Once a bidder enters the auction at time 0 with a bid at the reserve price, all other potential bidders realize that early entrant is a corrupt bidder with an additional land valuation κ. Rival potential bidders concurrently make entry decisions and choose to enter the auction if their land valuation exceeds a threshold value $\tilde{V}_{nc}$, such that the entry of non-corrupt potential bidders with valuations lower than $\tilde{V}_{nc}$ is deterred. $\tilde{V}_{nc}$ and $\tilde{V}_c$ must satisfy the following equations:

$$F(\tilde{V}_{nc})^{N-2}\left(\frac{F(\tilde{V}_{nc}-\kappa)-F(\tilde{V}_c)}{1-F(\tilde{V}_c)}\right)E[(\tilde{V}_{nc}-V_c-\kappa)|V_c\in[\tilde{V}_c,\tilde{V}_{nc}-\kappa]]=C, \tag{3}$$

and

$$F(\tilde{V}_c)^{N-1}(\tilde{V}_c+\kappa-r)+\sum_{m=1}^{N-1}\tilde{\omega}_m=C, \tag{4}$$

where $\tilde{\omega}_m$ denotes the corrupt bidder's expected payoff when its land valuation is $\tilde{V}_c+\kappa$, and there exist m other active entrants. These two equations state that given $\tilde{V}_c$, the non-corrupt firm with valuation $\tilde{V}_{nc}$ is indifferent between entering the auction or not; given $\tilde{V}_{nc}$, the corrupt firm with valuation $\tilde{V}_c$ is indifferent about engaging in auctions or abstaining from bidding. Specifically, Equation 3 suggests that given $\tilde{V}_c$, the expected payoff for the non-corrupt firm with $\tilde{V}_{nc}$ from entering the auction equals C. The product of the first two terms on the left-hand side indicates the winning probability for the non-corrupt firm, while the final term on the left-hand side reflects the expected payoff. The left-hand side of Equation 4 represents the corrupt firm's expected payoff from entering the auction when its land valuation is $\tilde{V}_c$, and the right-hand side reflects the cost of auction entry. If the corrupt bidder decides not to enter the auction due to its land valuation V_c

being less than $\tilde{V}_c$, all other potential bidders simultaneously make their entry decisions based on the threshold value $\hat{V}_{ns}$, which has been solved above.

One related and pertinent question is whether other non-corrupt firms might employ a so-called *snapping* strategy as described in Cai et al. (2013), where the non-corrupt firms pretend to be corrupt and bid the reserve price at the initial moment of the first stage. Although this case is eliminated by the model's construction and the timeline for entry approval, in Appendix G, we expand on the work of Cai et al. (2013) on snapping to illustrate that as long as the special favor, κ, garnered by the corrupt bidder is big enough or as long as non-corrupt firms have relatively low land valuations, this snapping strategy is unlikely to be adopted by non-corrupt firms. This is because the non-corrupt firm anticipates a probable outbid by the corrupt bidder, which would render its entry cost wasted.

5.4 The number of potential entrants and price discounts

We discuss empirical patterns in Section 4.3, illustrating that the price discount in auctions decreases as the auction becomes more competitive. In this section, we conduct a comprehensive analysis of land prices and the number of entrants using entry and bidding strategies in both the corruption and non-corruption cases, as covered in Sections 5.2 and 5.3.

Our primary objective and the key extension to the two-stage auction model presented in Cai et al. (2013) is to analyze land prices and the number of entrants as functions of the number of potential bidders. By connecting the number of potential bidders with market competition, it becomes crucial to investigate the effects of this measure on land prices and the number of actual bidders in both the corruption and non-corruption scenarios.

Even though we consider a rather simplified version of the two-stage auction model, it is not possible to derive closed-form expressions for the price discount and the number of entrants as functions of the number of potential bidders. As a result, we employ simulations to illustrate the effect of competition on corruption, which is expressed as the price discount in our setting.

In our simulations, we assume that firm valuations are drawn from a uniform distribution, $U[0, 1]$ for simplicity and employ different parameters for reserve price, entry cost, and special favor for corrupt bidders. Reserve price (r) is incrementally adjusted from 0.01 to 0.2 in steps of 0.01. Paralleling the conventional practice in two-stage auctions, where the cash deposit typically represents 10% of the reserve price, we set the average entry cost to be 10% of the reserve price, and therefore entry cost (C) is increased from 0.001 to 0.02 with an increment of 0.001. Although the special favor for corrupt bidder (κ) remains unobservable in practice, an approximate estimation of its magnitude is feasible.

By constructing an additional variable, *Corrupt Firm Interest Level*, to quantify the extent of a corrupt firm's interest in a land parcel, the results in Appendix B, shown in Table B.1, reveal that a one-unit increase in this interest level raises the land price by an average of 2.29 times, provided the two-stage auction is ultimately won by a non-corrupt bidder. The average *Corrupt Firm Interest Level* in our dataset is 0.37, suggesting that, on average, κ accounts for approximately 85% of the land price. Using another dataset of 7,484 two-stage auctions across 13 Chinese cities from 2008 to 2015, which includes reserve price data, we find that the average premium ratio (the ratio of the land transfer price to the reserve price) is 1.23. This implies that κ is approximately 1.03 times the reserve price.[22] For the sake of simplicity and clarity, on average, we maintain an equivalence between κ and the reserve price r in the simulation so that we can better capture the possibility of higher κ. As a result, κ is incrementally adjusted from 0.01 to 0.2 in steps of 0.01.

To illustrate the results from particular simulation, we start by examining a particular scenario with $r = 0.1$, $\kappa = 0.1$, and $C = 0.01$, where these values represent the mean value of parameters within the range employed in our simulations. Panel (a) in Figure 2 illustrates how the number of entrants in corrupt (blue) and non-corrupt auctions (orange) varies with the number of potential bidders. For instance, the orange point corresponding to 10 potential bidders represents the average number of entrants from 10,000 non-corrupt auction simulations. It demonstrates that as the number of potential bidders increases, both corrupt and non-corrupt auctions have an increasing number of entrants. Panel (b) of Figure 2 demonstrates how the price discount changes for different numbers of potential bidders. For each simulation, based on the number of potential bidders, a price discount is calculated through both corrupt and non-corrupt auctions. The points in panel

[22] $1.23 \times 85\% \approx 103\%$

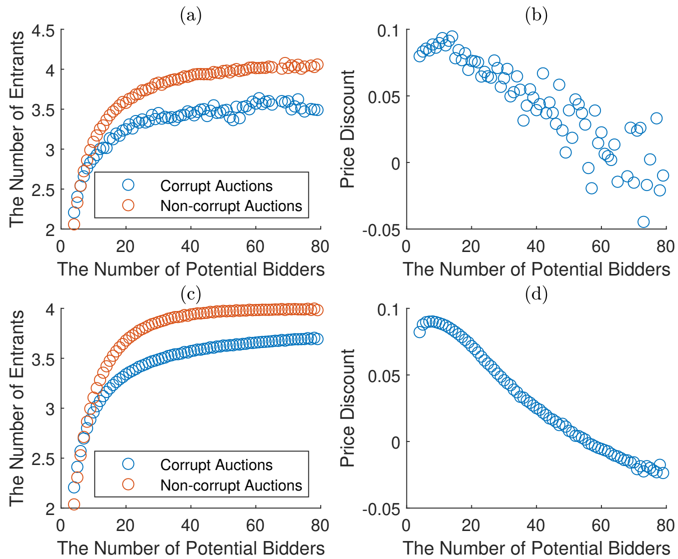

Figure 2: Change of the Number of Entrants and the Price Discount

The horizontal axes of four panels are the number of potential bidders. The vertical axes in panel (a) and (c) are the number of entrants. The blue points represent the number of entrants in corrupt two-stage auctions, and the orange points represent the number of entrants in non-corrupt two-stage auctions. The vertical axes in the panel (b) and (d) are the price discount of two-stage auctions.

(b) of Figure 2 represent the average price discount across 10,000 simulations corresponding to N potential bidders. This panel generally illustrates a decreasing trend in the price discount with an increase in the number of potential bidders.[23]

All simulations yield a total of 8,000 unique combinations of reserve price, entry cost, and special favor. For each combination, we calculate the average number of entrants and the corresponding average price discount for different quantities of potential bidders, as depicted in panels (a) and (b) of Figure 2. Subsequently, we compute the average number of entrants and price discount across these 8,000 distinct combinations for each respective count of potential bidders. The results are exhibited in panels (c) and (d) of Figure 2, demonstrating that even when different values of r, κ, and C are employed, as the number of potential bidders in the auctions increases, the number of

[23]In certain situations, corrupt firms fail to win the land, leading to the exclusion of the corresponding simulations (i.e., the two-stage auction where the corrupt firm enters and the corresponding non-corrupt two-stage auction.) when generating Figure 2 because we can only observe whether a corrupt firm wins an auction in our dataset, and discarding these cases makes our simulation results comparable to our empirical results.

entrants in both corrupt and non-corrupt auctions also increases, and the price discount shows a decreasing trend.

5.5 Policy insights

In this section, we utilize our model and simulations to provide policy insights for government institutions, municipalities, and other state agencies facing potential corruption issues in selecting partners for projects or deciding whom to sell (or lease) public assets to. These organizations wield the power to determine the reserve price r and the entry cost C. Moreover, both of these factors are more easily recognized by the public than the special favor κ.

To further investigate how r and C affect the auction price discount, we first examine how the price discount changes as C increases while keeping the reserve price r constant. We select reserve prices of 0.04, 0.06, 0.08, and 0.1, and for each reserve price level, evaluate the impact of four different entry cost levels: 5% of r, 10% of r, 15% of r, and 20% of r. The results of this analysis are presented in Figure 3.

Given a value of r, as the entry cost C accounts for a lower share of r, the price discount decreases because non-corrupt firms expect a smaller loss when they make the entry decision in a corrupt auction so that they tend to compete with corrupt firms. Thus, a lower C can reduce the effect of corruption in auctions. Moreover, as r increases, the price discount for different C is less convergent as there are more potential bidders. For example, when r is 0.04, the price discount for the 5% C is similar to that of the 20% C when the number of potential bidders is greater than 40, but when r is 0.1, the differences of the price discounts between 5% C and 20% C is still distinguishable when the number of potential bidders is large. This suggests that the difference of the price discounts caused by C is more difficult to be offset by a greater competition level as r becomes larger.

To further explore how r affects the price discount, we present our results from Figure 3 by the group of C, and the outcomes are shown in the Figure 4. Conditional on the level of C, we show the price discount under different values of r. When the number of potential bidders is not very large, the price discount with different values of r is very similar given a constant share of C. However, a

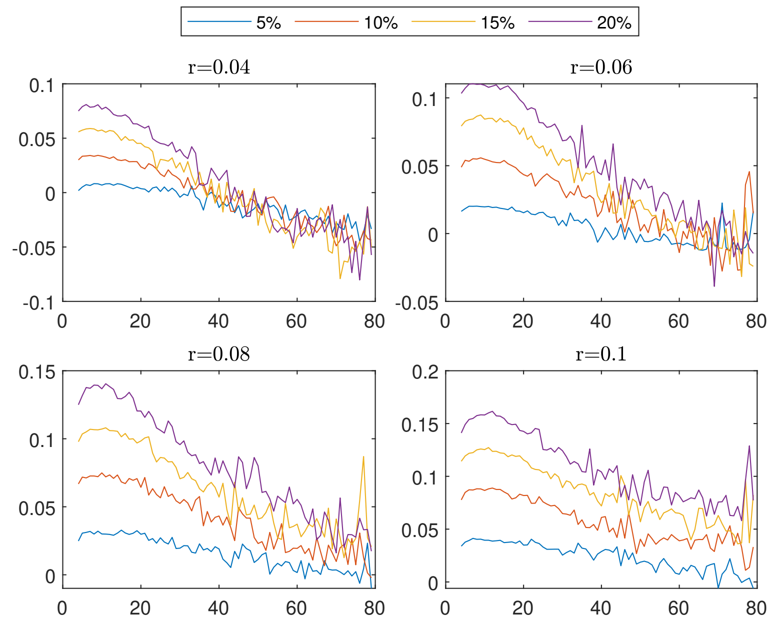

Figure 3: The Change of the Price Discount for Different C

The horizontal axes present the number of potential bidders, and the vertical axes are the price discount. r equals to 0.04, 0.06, 0.08, and 0.1 in the upper left panel, upper right panel, lower left panel, and lower right panel respectively. In each panel, the price discount is depicted under 5% of r, 10% of r, 15% of r and 20% of r. For the purpose of displaying price discounts clearly, I used fitted cubic splines.

lower value of r induces a faster decrease as there are more potential bidders. This implies that as r decreases, the role of competition in reducing corruption becomes increasingly evident. As a result, this leads to a divergence of the price discount, and the price discounts begin to be distinguishable from around 30 potential bidders based on the Figure 4.

In summary, both the entry cost C and the reserve price r result in increased price discounts due to their role in constraining competition during auctions. However, the extent of the impact of entry cost C and reserve price r on competition is contingent upon the ratios of these parameters. Consequently, policymakers can boost competition and mitigate the influence of corruption on transfer prices by regulating auction rules.

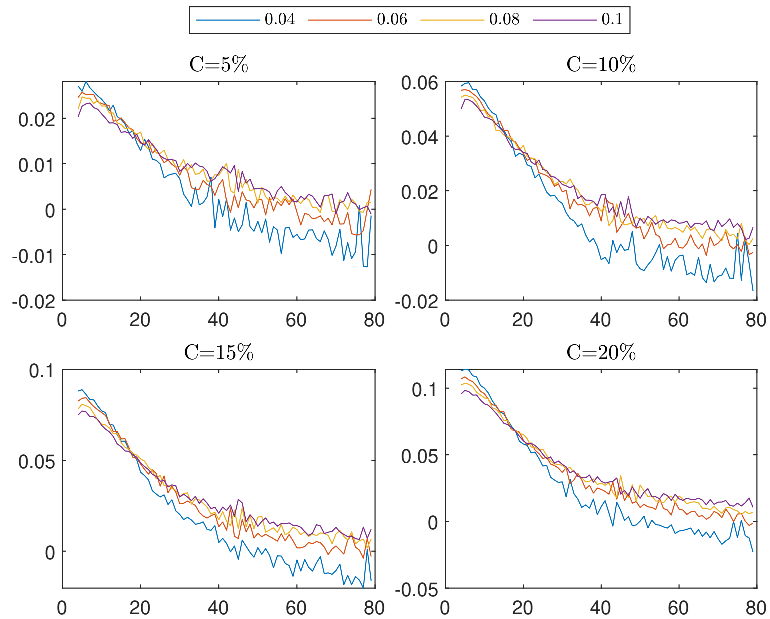

Figure 4: The Change of the Price Discount for Different r

The horizontal axes present the number of potential bidders, and the vertical axes are the price discount. The share of C equals to 5% of r, 10% of r, 15% of r and 20% of r in the upper left panel, upper right panel, lower left panel, and lower right panel respectively. In each panel, the price discount is depicted for r being 0.04, 0.06, 0.08, and 0.1. For the purpose of displaying price discounts clearly, I used fitted cubic splines.

6 Conclusion and Discussion

This paper investigates the differential effects of corruption on the two primary land transfer methods in China's land market: negotiations and two-stage auctions. On a broad scale, corruption exerts similar impacts on both negotiations and auctions. However, this observation obscures the role of competition in the comparison. Negotiations involve a single land buyer, constituting a non-competitive process. Conversely, two-stage auctions are inherently competitive. While corrupt firms might exploit relationships with corrupt officials to deter non-corrupt firms from participating in two-stage auctions, thereby obtaining land at "discounted prices," the price discounts obtained by corrupt firms diminish as competition intensifies because more non-corrupt firms choose to compete for the land. Consequently, the differential effects of corruption between auctions and negotiations hinge on varying competitive levels within auctions. This study discerns that negotiations and non-competitive two-stage auctions exhibit similar price discounts, with the price discount in negotiations surpassing that in competitive two-stage auctions by approximately 9.61% - 20.46%.

These findings underscore the pivotal role of competition in modulating the impact of corruption. One insight gleaned is that governments can mitigate the effects of corruption by proactively enhancing competition in the transfer mechanism. Pertaining to negotiations, though circumstances for them vary, governments could contemplate increasing the number of firms involved in negotiations, making it challenging for corrupt firms to obtain land at the reserve price. Alternatively, authorities might consider narrowing the scope of land eligible for negotiations, thereby channeling more land towards auctions. In the context of two-stage auctions, based on our model simulation results, governments could consider reducing the costs associated with entering auctions, facilitating greater firm participation even when corrupt firms are known to be involved. For instance, reducing required cash deposits can alleviate the financial burden firms bear to participate in auctions. Additionally, the government can provide firms with free information about the land up for auction, enabling firms to make auction participation decisions without incurring consulting fees to further understand the property. Moreover, the government can set a lower reserve price and arrange more standalone auction lettings. By doing these things, the impact of competition in reducing the effect of corruption will become more pronounced.

APPENDICES

A Negotiations

A.1 Article 12 of "Regulations on the Negotiation of State-owned Land Use Rights"

The following is the article 12 of "Regulations on the Negotiation of State-owned Land Use Rights": After the negotiation land transfer plan and the reserve price have been approved by the people's government with the power of approval, the land and resources administrative department of the city or county people's government shall engage in full negotiations with the intended land user regarding the land transfer price and etc. An agreement can only be reached if both parties reach a consensus, and the agreed-upon transfer price is not lower than the reserve price.

A.2 2006 Legislation

In addition to the three circumstances discussed in the text, the 2006 legislation specifies a fourth condition for negotiations: land not intended for commercial, touristic, entertainment, industrial, or commercial residential use, with only one intended user. In such cases, if only one auction applicant emerges by the auction start date, the process switches to a negotiation.

This scenario is extremely rare, with only 45 cases found on the Chinese land market website (`https://landchina.com/#/`), compared to 1,034,114 observations in our dataset, indicating that most land transactions follow predetermined transfer methods.

However, we performed a robustness check focusing on lands not subject to negotiation-to-auction shifts (e.g., land for commerce, tourism, etc.). The results are consistent with those in Tables 5 and 6.

A.3 Details on the third criteria for negotiations

The followings are detailed items for the 3^{rd} case of negotiations:

Table A.1: The Forth Criteria for Negotiation

VARIABLES	Transaction-Level (1) ln(price)	Market-Level (2) ln(price)	Land Subs. (3) ln(price)
corrupt	-0.922***	-0.922***	-0.917***
	(0.081)	(0.081)	(0.081)
auction	0.457***	0.457***	0.456***
	(0.051)	(0.051)	(0.051)
corrupt×auction	-0.031	-0.032	0.010
	(0.086)	(0.083)	(0.087)
corrupt×auction×comp	0.189***	0.201***	0.301***
	(0.048)	(0.035)	(0.064)
City×Usage×Year FE	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Radius		1500 m	
Observations	265,093	265,093	265,093
R-squared	0.732	0.732	0.732

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

1. If a land parcel cannot be developed independently because the project on this land is an appendage to the main project on another piece of land or for some other reasons, then negotiations should be initiated between the government and the owner of the main project.

2. If land around subway stations, public service facilities, transportation hubs, or other public spaces needs to be developed, it should be transferred through negotiations to the entity that has acquired the land for these transportation construction projects and public service facilities.

3. If for-profit elderly care service institutions are involved in the construction of elderly care facilities on land transferred through government allocation, this land should be transferred through negotiations to the elderly care service institutions.

4. When cultural public institutions with for-profit operations are transformed into enterprises, all land obtained by these public institutions through government allocation should be transferred to them through negotiations.

5. Due to adjustments in urban planning, changes in the economic situation, enterprise transformation, and other reasons, if industrial land that has been obtained through government

allocation needs to be transferred to the current landowner, negotiations should be employed.

6. For enterprises whose land has been reclaimed due to relocation and reconstruction based on city planning, they could acquire another land parcel with the same usage type through negotiations.

7. For the restructuring of the enterprise (bankruptcy, merger, consolidation, etc.), the lands that are not included in the firm's restructuring capital should be transferred through negotiations to the party identified in the restructuring documents.

8. The historical illegally occupied land that existed prior to the issuance of this clause should be transferred through negotiations to the current land user.

9. If the effective legal documents of the court and the notice of assistance in execution involve the transfer of a land parcel to a specific land user, negotiations should be employed.

B Evidence for the Existence of Special Help Provided by Corrupt Officials

In the model, the special favor granted by corrupt firms is represented by κ, which is unobservable in practical scenarios. This section aims to provide empirical evidence for the existence of κ and estimate its potential magnitude. To analyze the effect of corrupt firms on the transaction prices of land not acquired by them, it is necessary to construct a variable that captures the interest of corrupt firms in the associated land.

To achieve this, we adopt a methodology similar to the one used to identify potential bidders for a land auction. Specifically, we approximate interest of potential corrupt bidders for a given auction by leveraging transaction timing. We develop a proxy to measure corrupt firm activity based on transactions completed by such firms within 365 days after each auction, categorized by city and land-use type. For instance, for a commercial land auction in Shanghai on March 20, 2010, the corresponding market includes all commercial land transactions finalized in the subsequent 365 days. The count of corrupt transactions is then determined and normalized by dividing it by 100 to create the variable *Corrupt Firm Interest Level* for use in our empirical analysis..

We conduct a regression analysis, detailed in equation B.1, to examine whether higher Corrupt Firm Interest Levels are linked to higher transaction prices. For this analysis, we exclude land acquired by corrupt firms, as it lies outside the focus of our primary investigation.

$$P_{ijft} = \beta_0 + \beta_1 CorruptFirmInterestLevel_{ijft} + \gamma X_{ijft} + \psi W_{ft} + \delta_t + \varepsilon_{ijft} \qquad \text{(B.1)}$$

where P_{ijft} is the logarithm of the per-unit land price ($Yuan/m^2$) for a parcel of land denoted as i in city j, acquired by firm f at time t. X_{ijft} includes the logarithm of land size hectares, land quality, city-year- land usage fixed effects, an indicator variable for whether the parcel is a new piece of land, and proxy measures for the market condition expectations. W_{ft} includes firm characteristics like firm size, firm experience, firm industry dummy variables, and an indicator for whether the land-buying firm is state-owned. δ_t comprises year and month fixed effects.

Table B.1: Evidence for the Existence of κ

VARIABLES	lnprice	lnprice
Corrupt Firm Interest Level	0.832*	0.905*
	(0.338)	(0.352)
Radius	1,500 m	500m
City×Usage×Year FE	Yes	Yes
Firm industry FE	Yes	Yes
Sale Method	Yes	Yes
Month FE	Yes	Yes
Other Controls	Yes	Yes
Observations	297,965	162,953
R-squared	0.736	0.764

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, firm industry fixed effects, and proxies for expected HHI, number of transactions, and number of potential bidder.

Table B.1 presents the results using 1,500-meter and 500-meter radii, constructed following the approach outlined in Section 4.3. The findings reveal that land parcels with higher Corrupt Firm Interest Level are associated with higher auction prices. Greater interest level of land parcels suggests a higher likelihood of their involvement of corrupt firms. Consequently, the estimate indicates that, as Corrupt Firm Interest Level increases from 0 to 1, the price of auctions attracting corrupt firms—yet won by non-corrupt firms—rise by approximately 1.3-1.47 times.

C No variation in aggregate effect

Table 2 presents aggregate results, which may mask the differential effects of corruption on auctions and negotiations across varying time frames or central government activities. To examine these differences, we leverage two exogenous variations in corruption intensity. First, the 2012 nationwide anti-corruption campaign launched by Chinese President Xi Jinping targeted the land market extensively.[24] Xi directed the Central Commission for Discipline Inspection to dispatch teams for rigorous provincial investigations and appointed new, loyal provincial leaders to enforce the campaign.

Table C.1: The Effects of Corruption on Land Prices

	(1) Pre 2012	(2) Central Inspection	(3) Xi Appointed	(4) Post 2012
VARIABLES	ln(price)			
corrupt	-0.939***	-0.097	-0.363**	-0.737***
	(0.064)	(0.175)	(0.105)	(0.096)
auction	0.492***	0.524*	0.484**	0.480***
	(0.071)	(0.252)	(0.144)	(0.072)
corrupt × auction	-0.011	0.010	0.023	0.015
	(0.065)	(0.155)	(0.134)	(0.110)
City×Usage×Year FE	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes
Radius	1,500 m			
Observations	192,307	6,423	29,051	95,757
R-squared	0.722	0.832	0.761	0.786

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

Table C.1 presents estimation results across four scenarios: (i) transactions before the 2012 anti-corruption campaign, (ii) transactions in regions subject to central inspections, (iii) transactions in regions led by provincial leaders appointed by President Xi, and (iv) transactions after

[24]For details on the campaign's effectiveness, see Lin et al. (2016), Chen and Kung (2018), Ding et al. (2020), Fang et al. (2022).

the anti-corruption campaign. As noted by Chen and Kung (2018), these measures significantly reduced price discounts and land acquisitions by corrupt firms. However, the effects on auctions are not significantly different from those on negotiations. This implies a general equivalence in price discounts from corruption between negotiation and auctions, even with shifts in central government anti-corruption policies.

D Threats to Identification - Details

D.1 Summary stats for variables constructed by history of transactions

To explore the determinants of competition structure and incorporate them into our regressions, we construct historical transaction variables available to bidders at the time of the auctions. These variables include (i) the number of corruption cases (CA), (ii) the HHI measure based on land transfer activities, (iii) the number of transactions ($Trans$), and (iv) the number of distinct winners (SoB). These measures are constructed for two time frames: within 20 days and 365 days prior to the transaction date. The 20-day window captures the effects of corruption and competition during the announcement and sequential entry phases of two-stage auctions, while the 365-day window captures potential long-term influences of corruption and market competition on current transactions.

Table D.1: Summary stats for variables constructed by history of transactions

Stats	mean	sd	min	max
HHI_{365^-}	0.210	0.317	0.001	1
HHI_{20^-}	0.526	0.398	0.003	1
CA_{365^-}	0.400	1.352	0	72
CA_{20^-}	0.049	0.381	0	55
$Trans_{365^-}$	65.023	99.456	0	880
$Trans_{20^-}$	7.892	13.884	0	344
SoB_{365^-}	54.977	88.357	0	810
SoB_{20^-}	6.847	12.567	0	334

Notes: 365^- and 20^- indicate the 365-day and 20-day time windows.

D.2 Predicting the competition level using history of transactions

Using the variables described in section D.1, along with our controls for location, land quality, usage type, and time, we conduct regressions to identify the determinants of the competition measures employed in our analysis. The regression specification is as follows:

$$\begin{aligned} CompetitionMeasure_{ijft} &= \gamma_0 + \gamma_1 HHI_{365^-} + \gamma_2 CA_{365^-} + \gamma_3 Trans_{365^-} + \gamma_4 SoB_{365^-} + \gamma_5 HHI_{20^-} \\ &+ \gamma_6 CA_{20^-} + \gamma_7 Trans_{20^-} + \gamma_8 SoB_{20^-} + \delta X_{ijft} + \epsilon_{ijft}. \end{aligned} \tag{D.1}$$

where, the dependent variables include the HHI measure constructed using transactions from the consecutive 365 days (HHI_{365^+}) and the multiple-auction indicator. The regressors consist of the constructed historical transaction measures alongside controls for city, year, month, land usage, land quality, land area, and the new land indicator.

Table D.2: Determinants of potential competition

	(1) OLS	(2) Probit
VARIABLES	HHI (consecutive 365 days)	Multiple Auction Ind.
HHI(prior 365 days)	0.144***	-0.002
	(0.010)	(0.038)
Corrup. act. (prior 365 days)	-0.004**	0.003
	(0.001)	(0.007)
# of trans. (prior 365 days)	-0.001**	0.002**
	(0.000)	(0.001)
# of diff. buyers (prior 365 days)	0.000	-0.002*
	(0.000)	(0.001)
HHI(prior 20 days)	0.050***	-0.046*
	(0.005)	(0.023)
Corrup. act. (prior 20 days)	-0.001	0.019
	(0.003)	(0.014)
# of trans. (prior 20 days)	0.001*	0.014***
	(0.000)	(0.003)
# of diff. buyers (prior 20 days)	0.001	-0.008*
	(0.001)	(0.004)
City FE	Yes	Yes
Year FE	Yes	Yes
Usage FE	Yes	Yes
Month FE	Yes	Yes
Land Quality FE	Yes	Yes
Other Controls	Yes	Yes
Observations	828,890	828,854
R-squared	0.588	

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province level. Other Controls include land area and new land indicator.

Table D.2 presents the estimation results. The first column reports the determinants of HHI_{365^+} using an OLS regression, while the second column outlines the determinants of multiple-auction cases using a Probit regression.

E Robustness - Details

E.1 Selected Sample Issue

Since our data only include transfer outcomes, we can only observe successful land transfers to the corrupt firms. As a result, instances of corrupt firm involvement in our dataset may not be random, potentially introducing selection bias into our findings. To address the potential impact of observing only successful corrupt transactions, we implement a Heckman-style selection model.

We begin by estimating the probability of land being acquired by a corrupt winner using a Probit regression. This estimation incorporates historical transaction information, as described in Section D.1, along with our standard set of control variables. These variables offer additional exogenous variation for the first-stage regression. The regression specification is as follows:

$$\begin{aligned} CorruptWinner_{ijft} = {} & \gamma_0 + \gamma_1 HHI_{365^-} + \gamma_2 CA_{365^-} + \gamma_3 Trans_{365^-} + \gamma_4 SoB_{365^-} + \gamma_5 HHI_{20^-} \\ & + \gamma_6 CA_{20^-} + \gamma_7 Trans_{20^-} + \gamma_8 SoB_{20^-} + \delta X_{ijft} + \epsilon_{ijft}. \end{aligned} \tag{E.1}$$

where, the dependent variable is the indicator for corrupt winner. The regressors consist of the constructed historical transaction measures alongside controls for city, year, month, land usage, land quality, land area, and the new land indicator.

Table E.1: Determinants of princeling winner

	(1)
VARIABLES	Corrupt winner indicator
HHI(prior 365 days)	0.030***
	(0.004)
Corrup. act. (prior 365 days)	0.258***
	(0.041)
# of trans. (prior 365 days)	-0.000
	(0.001)
# of diff. buyers (prior 365 days)	-0.001
	(0.001)
HHI(prior 20 days)	-0.014
	(0.026)
Corrup. act. (prior 20 days)	0.079**
	(0.026)
# of trans. (prior 20 days)	-0.006**
	(0.002)
# of diff. buyers (prior 20 days)	0.005*
	(0.002)
Radius	1500m
City FE	Yes
Year FE	Yes
Usage FE	Yes
Month FE	Yes
Land Quality FE	Yes
Other Controls	Yes
Observations	303,664

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province level. Other Controls include land area and new land indicator.

Table E.1 reports the results of the Probit regression, demonstrating that the constructed transaction history measures significantly contribute to explaining the determinants of corrupt winner cases. The results from this regression are then used to calculate the *Inverse Mills Ratio*, which enables us to account for selection bias in our analysis, following the approach outlined in Heckman (1979).

Incorporating the *Inverse Mills Ratio* allows us to empirically evaluate the impact of selection bias on our findings. Table E.2 presents the effects of two-stage auctions on the log of unit land prices for corrupt winners, both with and without the *Inverse Mills Ratio*. The results indicate no significant evidence that selection bias meaningfully affects our sample.

Table E.2: Sample Selection Investigation for Corrupt Bidders

VARIABLES	(1) lnprice	(2) lnprice
Two-Stage Auction	0.278**	0.279**
	(0.078)	(0.078)
Inverse Mills Ratio	0.014	
	(0.062)	
City×Usage×Year FE	Yes	Yes
Firm industry FE	Yes	Yes
Month FE	Yes	Yes
Other Controls	Yes	Yes
Observations	12,982	12,982
R-squared	0.939	0.940

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

E.2 Splitting Sample

In addition to interacting competition measures with *corrupt* × *auction*, we also investigate the effects of competition on price discount differences by splitting the sample into competitive and non-competitive categories. Table E.3 presents the regression results by splitting sample into two competitive market structure.

Columns (1), (3), and (5) use the sample of negotiations and noncompetitive auctions, while columns (2), (4), and (6) use the sample of negotiations and competitive auctions. The interaction term in the third row captures the price discount difference. For noncompetitive auctions, the price discount differences are −1.94%, −0.79%, and 1.17%, respectively, depending on the competition measures used. However, all these differences are statistically insignificant. In contrast, the price discount differences between negotiations and competitive auctions are statistically significant, and they are 7.85%, 7.86%, and 16.38%, depending on the competition measures.

Across all three measures of competition, the findings are consistent with the results presented in earlier tables, reinforcing the robustness of our conclusions.

Table E.3: The effect of competition on Price Discount Difference - Splitting sample

	Transaction-Level		Market-Level		Land subs.	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	lnprice	lnprice	lnprice	lnprice	lnprice	lnprice
corrupt	-0.904***	-0.957***	-0.914***	-0.962***	-0.921***	-0.936***
	(0.061)	(0.054)	(0.061)	(0.054)	(0.123)	(0.051)
auction	0.510***	0.505***	0.491***	0.511***	0.446***	0.570***
	(0.057)	(0.059)	(0.056)	(0.067)	(0.050)	(0.077)
corrupt × auction	-0.049	0.186**	-0.020	0.187**	0.029	0.349***
	(0.067)	(0.063)	(0.063)	(0.067)	(0.112)	(0.084)
City×Usage×Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Competitive Market	No	Yes	No	Yes	No	Yes
Radius	1500m					
Observations	183,591	164,364	186,024	161,816	207,331	78,058
R-squared	0.752	0.746	0.750	0.752	0.772	0.785

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

E.3 Greater Competition

We explore the HHI threshold values to differentiate between competitive and non-competitive two-stage auctions. As we reduced the threshold value, the average level of competition for competitive two-stage auctions increased, and the difference in the impact of corruption between competitive auctions and negotiations accordingly should become more pronounced. Table E.4 presents the case if we focus on 25th percentile of most competitive markets.

The price discount differences between negotiations and competitive auctions are 12.88%, 11.4%, 9.87%, 12.32%, 10.48%, and 9.87% in columns (1)–(6). In comparison, Table 5 shows price discount differences of 7.77%, 6.23%, 5.59%, 9.27%, 7.31%, and 7.43% in columns (1)–(6), respectively. These effects are notably weaker than the corresponding effects presented in Table E.4.

Table E.4: Focusing on more competitive markets

	Transaction-Level			Market-Level		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ln(price)	ln(price)	ln(price)	ln(price)	ln(price)	ln(price)
corrupt	-0.835***	-0.908***	-0.857***	-0.835***	-0.908***	-0.857***
	(0.040)	(0.061)	(0.054)	(0.040)	(0.061)	(0.054)
auction	0.481***	0.485***	0.439***	0.481***	0.485***	0.439***
	(0.052)	(0.054)	(0.056)	(0.052)	(0.054)	(0.056)
corrupt×auction	0.023	-0.005	0.014	0.020	-0.007	0.011
	(0.062)	(0.066)	(0.055)	(0.062)	(0.067)	(0.055)
corrupt×auction×comp	0.237***	0.254***	0.195***	0.230***	0.238***	0.198***
	(0.048)	(0.045)	(0.043)	(0.055)	(0.049)	(0.043)
City×Usage×Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Radius	No	1,500 m	500 m	No	1,500 m	500 m
Observations	976,829	283,168	162,780	976,829	283,168	162,780
R-squared	0.699	0.745	0.774	0.699	0.745	0.774

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

As auction competition intensifies, it becomes increasingly difficult for corrupt firms to secure price discounts, as discussed in the previous sections. Consequently, the price discount in auctions is expected to decrease with higher levels of competition. To further explore this relationship, we use the 10th-percentile thresholds of our HHI competition measures to categorize each auction's competitiveness level. This categorization allows us to better analyze the relationship between auction price discounts and competitiveness. For the land substitution measure, we categorize substitutable lands in to ten groups with their intensities with the following set of values $\{0, 1, 3, 5, 7, 9, 11, 13, 15, 17, 20\}$.

Table E.5 reports the impact of higher competition on unit prices for transfers conducted through auctions. The variable *CompGroup* represents the competition group index, where a higher index indicates a more competitive auction group. Consistent with the auction literature, as shown by the second row, we observe that higher competition leads to increased prices. More importantly, in highly competitive markets, corrupt firms tend to pay higher prices, as indicated by the significantly positive estimates in Table E.5.

Table E.5: Effect of more competition on auction outcomes

	Transaction-Level	Market-Level	Land Substitution
	(1)	(2)	(3)
VARIABLES	lnprice	lnprice	lnprice
corrupt	-1.01***	-1.02***	-1.18***
	(0.02)	(0.02)	(0.02)
compGroup	-0.00	0.01***	0.01***
	(0.00)	(0.00)	(0.00)
compGroup × corrupt	0.02***	0.02***	0.04***
	(0.00)	(0.00)	(0.00)
City×Usage×Year FE	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Radius		1500m	
Observations	246,089	246,089	246,089
R-squared	0.77	0.77	0.77

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

E.4 Alternative Demand-Side Competition Measure

As a robustness check, we apply the methodology proposed by Hendricks et al. (2003) to estimate the number of potential bidders for each auction, providing an alternative perspective on auction competitiveness. Specifically, we count the unique auction winners and use this count as a proxy for the number of potential bidders. Unlike the HHI, which accounts for the frequency of firm wins, this measure assigns equal weight to all firms. The results are presented in the first two columns of Table E.6, and our findings remain consistent when using this alternative competition measure.

Additionally, to test robustness over different time frames, we construct the HHI using transaction data from 180 days instead of 365 days. The results are reported in columns (3) and (4) of Table E.6. Since the HHI is always equal to one when there is only one auction in the market, regardless of market competitiveness, we further analyze the effects by excluding these auctions. The results for this analysis are shown in columns (5) and (6) of Table E.6.

Table E.6: Alternative measures for potential competition

	# potential bidders		180-day span		Excl. no-comp	
	Trans	Market	Trans	Market	Trans	Market
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	lnprice	lnprice	lnprice	lnprice	lnprice	lnprice
corrupt	-0.908***	-0.911***	-0.911***	-0.910***	-0.892***	-0.905***
	(0.061)	(0.061)	(0.061)	(0.062)	(0.066)	(0.062)
auction	0.485***	0.486***	0.485***	0.485***	0.484***	0.488***
	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.055)
corrupt × auction	-0.022	-0.038	-0.045	-0.031	-0.034	-0.046
	(0.065)	(0.067)	(0.067)	(0.062)	(0.072)	(0.065)
corrupt×auction×comp	0.130**	0.193***	0.201***	0.163***	0.157**	0.198***
	(0.040)	(0.047)	(0.040)	(0.043)	(0.057)	(0.035)
City×Usage×Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Radius	1500m					
Observations	283,168	283,168	283,168	283,168	248,932	272,618
R-squared	0.745	0.745	0.745	0.745	0.737	0.739

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

The results in Table E.6 support our main findings: the price discount between non-competitive auctions and negotiations is not statistically significant, as shown in the third row. However, the price discount for competitive auctions is significantly smaller than that for negotiations, as indicated by the significantly positive values in the fourth row.

E.5 Land Value Controls

Following Covert and Sweeney (2023), we also adopted grid-year fixed effects approach for controlling land value. In this context, grid-year fixed effects enable us to account for potential variations in land value across grids that could potentially bias the estimation of the price discount resulting from varying parcel counts across grid-year pairs. Under these modified methodologies, we consistently replicated our original findings.[25]

[25]We contend that both the radius-range and grid fixed effects approaches are more suitable for incorporating unobservable factors in land values compared to the Nearest Neighbor and Propensity Score Matching methods used in Genesove and Hansen (2023). Our empirical analysis controls not only for all observable attributes of the land, which serve as matching parameters, but also for various fixed effects that account for unobservable variations across locations and time.

The results are presented in Table E.7. The third row shows the price discount differences between negotiations and noncompetitive auctions, which are −1.32%, −1.23%, and −0.93%, respectively, depending on the competition measures. However, these differences are not statistically significant. In contrast, the fourth row indicates significant price discount differences between negotiations and competitive auctions, which are 4.54%, 4.69%, and 12.34%, respectively, depending on the competition measures. These findings are consistent with the results shown in Table 5 and Table 6.

Table E.7: Grid-Year Fixed effects

	Transaction-Level	Market-Level	Supply-side
	(1)	(2)	(3)
VARIABLES	lnprice	lnprice	lnprice
corrupt	-0.807***	-0.807***	-0.805***
	(0.073)	(0.074)	(0.073)
auction	0.546***	0.546***	0.546***
	(0.054)	(0.054)	(0.054)
corrupt × auction	-0.030	-0.028	-0.021
	(0.086)	(0.082)	(0.081)
corrupt×auction×comp	0.127*	0.128*	0.265***
	(0.049)	(0.047)	(0.052)
2750mGrid*times*Year FE	Yes	Yes	Yes
Usage	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Observations	929,166	929,166	929,166
R-squared	0.859	0.859	0.859

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

E.6 Two-stage vs English Auctions

Recall that, depending on province and cities, a local government could choose between three auction types (i. two-stage auctions, ii. English auctions, iii. first-price auctions.) as explained in Section 2. As a result, our empirical findings could have been impacted by the auction selection mechanism of the local government. To address these concerns, we provide estimation results from locations that exclusively use two-stage auctions for transactions. The results presented in Table E.8 indicate that price discount differences only emerge when comparing negotiations with competitive auctions. Therefore, our results continue to support our initial findings and details of these analysis are available in Table E.8.

Table E.8: Locations that uses two-stage auctions exclusively

	Transaction-Level	Market-Level	Supply-side
		Only Two-Stage	
	(1)	(2)	(3)
VARIABLES	lnprice	lnprice	lnprice
corrupt	-0.804***	-0.808***	-0.800***
	(0.044)	(0.045)	(0.044)
auction	0.395***	0.396***	0.394***
	(0.062)	(0.062)	(0.062)
corrupt × auction	-0.023	-0.040	-0.006
	(0.054)	(0.052)	(0.049)
corrupt×auction×comp	0.149**	0.222***	0.282***
	(0.048)	(0.052)	(0.073)
City×Usage×Year FE	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Radius		1500m	
Observations	111,626	111,626	111,626
R-squared	0.785	0.785	0.785

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

E.7 Switching Costs

Some land transfers include scenarios where firms negotiate for the land lease that is already in use. Firms might offer higher prices during these negotiation processes to avoid switching costs associated with moving to a different parcel of land when they are unable to reach an agreement with the government. This might skew the comparative outcomes of the influence of corruption on negotiations versus auctions. To address this concern, we restrict our sample to land that had not been previously used. Table E.9 presents the results. The outcomes align with our prior findings. For newly transacted lands, the price discount between negotiations and auctions remains comparable in noncompetitive markets. However, the differential effects of two-stage auctions on prices persist in competitive markets.

Table E.9: New lands - no switching cost

	Transaction-Level	Market-Level	Supply-side
	(1)	(2)	(3)
VARIABLES	lnprice	lnprice	lnprice
corrupt	-0.782***	-0.781***	-0.775***
	(0.073)	(0.073)	(0.072)
auction	0.424***	0.424***	0.423***
	(0.050)	(0.050)	(0.050)
corrupt × auction	-0.094	-0.085	-0.064
	(0.071)	(0.068)	(0.072)
corrupt×auction×comp	0.160***	0.148**	0.251***
	(0.042)	(0.045)	(0.060)
City×Usage×Year FE	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Radius		1500m	
Observations	162,693	162,693	162,693
R-squared	0.796	0.796	0.796

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

E.8 Residential and Commercial Lands

In certain instances, auctions for non-residential and non-commercial land (e.g., industrial land) may involve a screening process where the government selects firms to compete. To avoid potential bias in our results, we conducted a robustness check by focusing exclusively on residential and commercial land. The results, presented in Appendix E.8, are consistent with our main findings. There is no significant price discount difference between negotiations and noncompetitive auctions; however, the price discount in negotiations is greater than that in competitive auctions.

Table E.10: Residential and Commercial Lands

	Transaction-Level	Market-Level	Supply-side
	(1)	(2)	(3)
VARIABLES	lnprice	lnprice	lnprice
corrupt	-0.835***	-0.834***	-0.835***
	(0.067)	(0.066)	(0.065)
auction	0.467***	0.466***	0.466***
	(0.073)	(0.072)	(0.072)
corrupt × auction	-0.067	-0.072	-0.049
	(0.095)	(0.094)	(0.103)
corrupt×auction×comp	0.158^{+}	0.206*	0.280*
	(0.088)	(0.081)	(0.103)
City×Usage×Year FE	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Radius		1500m	
Observations	54,907	54,907	54,907
R-squared	0.707	0.707	0.707

Notes: $^{+}$, *, **, *** represent the significant levels at 10%, 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

F Evidence that Corrupt Firms Enter Two-Stage Auctions First

In two-stage auctions, the cooperation of corrupt officials is pivotal in allowing corrupt firms to bid early, granting them an advantage over other prospective bidders. Although direct observations of bid timings in these auctions are unobservable, we find that princeling firms are more likely to get the land at the reserve price by using a t-test for the dataset described in Appendix B. The p-value is 0.0286 under the H_a: the ratio of the reserve price in the non-princeling group is smaller than that in the princeling group. This indicates that corrupt firms tend to bid ahead of other potential bidders.

G The Consideration of Snapping Strategy

In the presented two-stage auction setting, a possible concern is the adoption of a "snapping strategy" by non-corrupt firms, where they mimic corrupt firms by placing an early bid equal to the reserve price. By design, the model excludes this possibility. However, this section illustrates that when κ is large or the land valuation of a non-corrupt firm is low, even if the non-corrupt firm can bid before a corrupt firm, it will not utilize this strategy. Our rationale is grounded in the appendix of Cai et al. (2013), with certain extensions.

Suppose there are N bidders with the land valuation distribution of $U[0, \bar{V}]$. For clarity, assume κ is large enough to discourage non-corrupt firms from participating auctions after they observe a reserve price bid at the beginning of the first stage. This narrows our focus to a choice for non-corrupt firms: snapping or equilibrium strategy.[26]

Consider a non-corrupt bidder 1 with valuation V_1. They can choose between the two strategies. In the equilibrium approach, they wait to see if a corrupt firm places an early reserve price bid. If not, they'll enter first. Define V^* as the valuation where the two strategies yield equal payoff for bidder 1. A valuation higher than V^* prompts the snapping strategy; otherwise, they choose the equilibrium strategy. If bidder 1 uses the snapping strategy, the presence of a corrupt bidder remains uncertain. With a probability p, they face a corrupt bidder with valuation V_c. The corrupt firm joins only if $V_c + \kappa - C \geq V^*$ or $V_c \geq V^* + C - \kappa = \widehat{V}$, occurring with a likelihood of $p^* = p(1 - \frac{\widehat{V}}{\bar{V}})$. In such a case, bidder 1's payoff is $\int_{\widehat{V}}^{\bar{V}} max(V_1 - V_c - \kappa, 0)\, dF_c(V_c)$, where $F_c(\cdot)$ represents the cumulative distribution function (CDF) of the corrupt bidder's valuation, given their decision to participate in the two-stage auction after an initial reserve price bid. If the corrupt firm stays out, bidder 1 gets $V_1 - r$ with a likelihood of $1 - p^*$. Thus, the snapping strategy yields an expected payoff of $E_s = (1 - p^*)(V_1 - r) + p^*(\int_{\widehat{V}}^{\bar{V}} max(V_1 - V_c - \kappa, 0)\, dF_c(V_c)) - C$.

Conversely, if bidder 1 chooses to deploy the equilibrium strategy, they will participate in the auction only when no firm proffers the reserve price at the beginning of the two-stage auction, indicating the absence of a corrupt firm. Given a probability p, a corrupt firm is present, and as

[26] The equilibrium strategy is when non-corrupt firms do not mimic corrupt firms.

per our preceding assumption, bidder 1 will refrain from entering the auction. With a probability $1-p$, bidder 1 enters the auction and reaps $(\frac{\hat{V}_1}{\bar{V}})^{N-1}(V_1 - \tilde{B}_1(V_1) - C)$. Consequently, the expected payoff of bidder 1, from the implementation of the equilibrium strategy, is $E_e = (1-p)(\frac{\hat{V}_1}{\bar{V}})^{N-1}(V_1 - \tilde{B}_1(V_1) - C)$.

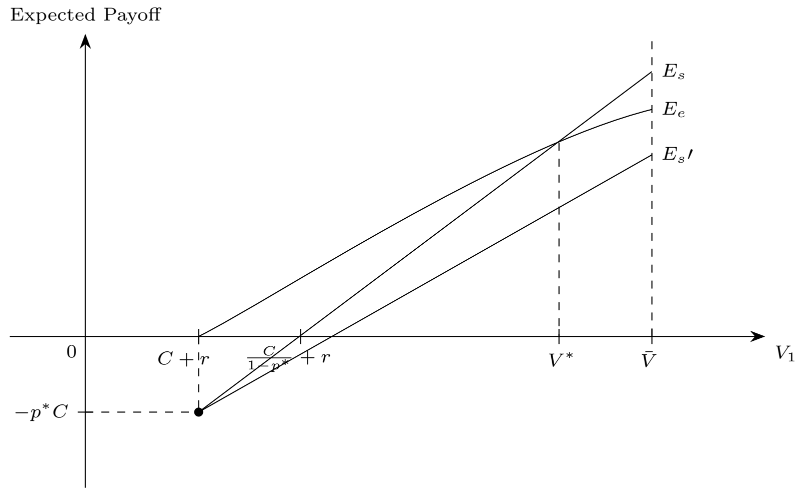

Figure G.1: Payoff of the Snapping Strategy and Equilibrium Strategy

Notes: The x-axis is the value of V_1 and the y-axis is the expected payoff of bidder 1. E_s and $E_s\prime$ are the expected payoff for bidder 1 to play the snapping strategy when they have different valuation. E_e is the expected payoff for bidder 1 to play the equilibrium strategy when they have different valuation.

Alternatively, with the equilibrium strategy, bidder 1 enters only if no early reserve price bid appears, suggesting no corrupt firms. Given a p chance of a corrupt firm, bidder 1 does not participate the auction. With $1-p$ probability, bidder 1 joins, obtaining $(\frac{\hat{V}_1}{\bar{V}})^{N-1}(V_1 - \tilde{B}_1(V_1) - C)$. Their expected payoff is $E_e = (1-p)(\frac{\hat{V}_1}{\bar{V}})^{N-1}(V_1 - (V_1) - C)$. Alternatively, with the equilibrium strategy, bidder 1 enters only if no early reserve price bid appears, suggesting no corrupt firms. Given a p chance of a corrupt firm, bidder 1 does not participate the auction. With $1-p$ probability, bidder 1 joins, obtaining $(\frac{\hat{V}_1}{\bar{V}})^{N-1}(V_1 - \tilde{B}_1(V_1) - C)$. Their expected payoff is $E_e = (1-p)(\frac{\hat{V}_1}{\bar{V}})^{N-1}(V_1 - \tilde{B}_1(V_1) - C)$.

We can show that: (1) $\frac{dE_s}{dV_1} \geq 1-p \geq \frac{dE_e}{dV_1}$, (2) $\frac{dE_s}{V_1}$ decreases with κ, and (3) at $V_1 = r + C$, $E_s = -p^*$ and $E_e = 0$. These are illustrated in Figure G.1.

The point where E_s and E_e intersect denotes V^*, at which bidder 1 is indifferent between the snapping and equilibrium strategies. If $V_1 < V^*$, bidder 1 will not mimic the corrupt bidder. As κ becomes larger, E_s could shift to E_s', making bidder 1 favor the equilibrium strategy regardless of V_1. The snapping strategy is not likely when V_1 is low or κ is high. Appendix B shows that a high κ is preferable, reducing concerns about the snapping strategy.

H English Auctions

Although we do not find empirical evidence supporting the selection of a specific transfer type for engaging in corruption, we provide a comparison between English auctions and negotiations for completeness. English auctions, the second most commonly used auction format, differ from two-stage auctions primarily in the bidder participation process. Unlike two-stage auctions, bidder participation in English auctions is simultaneous, eliminating the possibility of signaling corruption through first entry. Since the bidding stage in both two-stage and English auctions is effectively identical when more than one bidder is present, differences in participation timing enable us to examine the impact of sequential entry on outcomes.

Table H.1: Summary Statistics for Different Land Groups

Variables	Negotiations			English Auctions		
	Corrupt Firms	Non-corrupt Firms	Diff	Corrupt Firms	Non-corrupt Firms	Diff
Average Price	145.03	595.75	-75.66%***	785.79	1736.67	-54.78%***
Average Area	0.65	1.87	-65.24%***	5.24	3.04	72.03%***
Average Quality	12.25	13.85	-1.60***	13.09	13.79	0.05
Observations	6,983	198,161		1,151	95,139	

Notes: The unit of price is $Yuan/m^2$, where $Yuan$ is the unit of Chinese currency, and the unit for area is hectare. A larger number in land quality indicates a lower quality land. Diff indicates the difference between corrupt firms and clean firms conditional on the land transfer method. *, **, *** represent the significant levels of 5%, 1% and 0.1%.

Table H.1 presents the basic differences between negotiation and English auction, without taking various land and competition attributes. We apply Equations 1 and 2 to carefully examine the effect of corruption on English auction and negotiations and how it varies with competition levels. Table H.2 presents the results using the 1500-meter radius land control measure. Column (1) shows that as in the comparison between negotiation and two-stage auction, the effect of corruption on

English auctions is, on average, not significantly different from the effect on negotiations as in two-stage auctions. Interestingly, Columns (2)-(4) presents no evidence that corruption significantly influences auction outcomes differently based on competition levels. The lack of a significant effect of competition on price discounts in English auctions suggests that the primary driver of price discount differences in two-stage auctions is likely related to sequential participation behavior and the enhanced ability to deter participation in less competitive markets.

Table H.2: English Auctions vs Negotiations

		Competition-Heterogeneity		
		Transaction-Level	Market-Level	Supply-side
	(1)	(2)	(3)	(4)
VARIABLES	lnprice	lnprice	lnprice	lnprice
corrupt	-0.976***	-0.974***	-0.974***	-0.976***
	(0.054)	(0.054)	(0.053)	(0.054)
auction	1.004***	1.003***	1.003***	1.004***
	(0.072)	(0.072)	(0.072)	(0.072)
corrupt×auction	-0.144	0.058	0.054	0.197
	(0.147)	(0.083)	(0.072)	(0.159)
corrupt×auction×comp		-0.392*	-0.345	-0.365
		(0.164)	(0.263)	(0.197)
City×Usage×Year FE	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes
Radius	1500m		1500m	
Observations	90,053	90,053	90,053	90,053
R-squared	0.786	0.786	0.786	0.786

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

Although competition does not significantly affect outcomes in English auctions, the influence of corruption remains prominent, prompting an exploration of the underlying mechanisms. Cai et al. (2013) explains that in an English auction, other potential bidders remain uncertain about whether a bidder is corrupt. For the sake of argument, let us assume the corrupt bidder is Bidder 1. They only know there is a probability p that bidder 1 is corrupt, and all bidders, including bidder 1, make entry decisions simultaneously. In contrast, in a two-stage auction, other bidders are explicitly aware of bidder 1's corrupt status. If bidder 1 is corrupt and benefits from substantial special assistance (resulting in a higher expected valuation), other bidders face significantly reduced chances of winning the auction. This discourages their participation. Consequently, bidder 1 perceives a lower risk of losing and is more motivated to enter a two-stage auction compared to an English auction.

Building on the framework of (Cai et al., 2013), we propose that the probability p of a bidder being corrupt is influenced by market conditions, with non-corrupt bidders forming rational expectations about the prevalence of corruption in the market. To empirically analyze how the effects of corruption vary under different levels of expected corruption, we construct an *expectation* proxy. This variable is derived using a methodology similar to how we measure competition: it reflects the number of transactions acquired by corrupt firms within 365 days following each auction, categorized by city and land-use type. This approach assumes that successful corrupt transactions after an auction indicate the interest of potential corrupt bidders who might also consider competing for similar land. Thus, this variable captures the expected probability of corruption in the auction.

To examine the role of corruption expectations, we create an expectation indicator that captures the positive probability of corruption incidence in a market or not. In our data approximately 20.01% of the auctions conducted under positive probability of corruption expectation. Then, we integrate *expectation* indicator into the framework of Equation 1, extending the analysis as follows:

$$\begin{aligned} P_{ijft} = {} & \beta_0 + \beta_1 corrupt_{ijf} + \beta_2 auction_{ijft} + \beta_3 corrupt_{ijf} \times auction_{ijft} \\ & + \beta_4 corrupt_{ijf} \times auction_{ijft} \times expectation_{ijt} + \gamma X_{ijft} + \psi W_{ft} + \delta_t + \varepsilon_{ijft}. \end{aligned} \tag{H.1}$$

β_4, the coefficient of the interaction term $corrupt_{ijf} \times auction_{ijft} \times expectation_{ijt}$ allows us to estimate the price discount difference between auctions and negotiations (D_{diff}) under different corruption expectation conditions.

Table H.3 demonstrates that in markets with expected corruption, price discounts to corrupt firms are significantly larger in English auctions. In contrast, no significant effect is observed in two-stage auctions. These findings align with the theoretical framework proposed by Cai et al. (2013) and further support mechanisms that the impact of corruption varying based on competition levels in two-stage auctions.

Table H.3: Price Discount Difference - The Effect of Corruption Expectation

	English auctions			Two-stage auctions		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	lnprice	lnprice	lnprice	lnprice	lnprice	lnprice
corrupt	-0.877***	-0.976***	-0.948***	-0.834***	-0.905***	-0.855***
	(0.033)	(0.054)	(0.048)	(0.040)	(0.061)	(0.054)
auction	0.921***	1.003***	1.006***	0.481***	0.484***	0.438***
	(0.067)	(0.072)	(0.081)	(0.052)	(0.054)	(0.056)
corrupt×auction	0.052	0.072	0.050	0.084	0.057	0.071
	(0.068)	(0.068)	(0.080)	(0.062)	(0.069)	(0.058)
cor.×auc.×expectation	-0.245	-0.459*	-0.441*	-0.112	-0.095	-0.090
	(0.131)	(0.175)	(0.161)	(0.059)	(0.052)	(0.049)
Market History Controls	Yes	Yes	Yes	No	No	No
City×Usage×Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Radius	No	1,500 m	500 m	No	1,500 m	500 m
Observations	276,952	90,053	46,211	976,829	283,168	162,780
R-squared	0.734	0.786	0.833	0.699	0.745	0.774

Notes: *, **, *** represent the significant levels at 5%, 1% and 0.1%. Standard errors reported are clustered at province and firm level. Other control variables include ln(area), firm size, firm size × negotiation, land quality, state-owned firm dummy, new land dummy, firm experience, month fixed effects, land usage fixed effects, and firm industry fixed effects.

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