Property Market Bubbles, Toeholds, and the Winners' Curse: Evidence from Hong Kong Land Auctions[#]

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Abstract

In this paper, we use evidence from Hong Kong land auctions to test the *toehold effect* in bidding behavior (Bulow, Huang and Klemperer, 1999). In Hong Kong, auctions are widely used by the government to sell land to property developers. These auctions are associated with a significant "toehold effect" which arises because a developer may already have an ongoing development project in the same geographical area in which the auction is being held. If the winning bid in the auction is high, then it might help the developer sell the new units from the on-going project at a higher value. Auction theory predicts that higher toeholds will be associated with more aggressive bidding and higher probability of winning by the toeholder. However, in a common value environment, asymmetry in toeholds will give rise to winners' curse and low expected sale price. Moreover, a unique implication of the toehold effect is that losing may be good news for bidders with high toeholds. We find strong support for these effects for Hong Kong land auctions. The effects mostly come from auctions associated with greater dispersion in analysts' forecasts regarding the value of the property being auctioned, which in turn coincides with periods of high property valuation in Hong Kong. Our results are consistent with the idea that developers have a stronger incentive to bid aggressively when the property market is overvalued in order to protect the value of their toeholds.

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I. Introduction

Auction theory suggests that asymmetry among bidders can have important effects on auction outcomes.[1] One particular form of bidder asymmetry that has received attention is bidders having initial stakes, or *toeholds*, in the object being auctioned. For example, in the context of takeover bidding, a bidder has a toehold in a target if it owns shares of the target company prior to bidding. A toehold gives a bidder an incentive to bid more aggressively for the target - this is because, for a bidder with toehold, a bid is both a "bid" price and an "ask" price. If the bidder wins the auction, then it pays the bid price; however, since it will sell its stake to a rival bidder if it loses the auction, its bid also sets a "reserve price" for the sale of its stake.

Auctions with toeholds have been analyzed in both private values (Burkart (1995), Singh (1998) and common values settings (Bulow, Huang and Klemperer (1999), Dasgupta and Tsui (2003)), and in both first and second price auction contexts. Irrespective of the value environment, a bidder bids more aggressively if it has a higher toehold. Consequently, a bidder is more likely to win the auction if its toehold is higher. However, while in the private values setting toeholds give rise to a higher expected sale price, this need not be the case in a common value setting. In particular, for the second price

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[1] Myerson (1981) noted that when buyers are asymmetric, the optimal selling mechanism need not allocate an indivisible object to the buyer with the highest valuation. For a "private values" environment, McAfee and McMillan (1989) and Naegelen and Mougeot (1998) show that bidders with a more favorable distribution of private values should be discriminated against in an auction setting. Engelbrecht-Wiggans, Milgrom and Webber (1983) characterize the Bayes Nash equilibria of a first-price auction in a common value setting in which information is asymmetric: specifically, one bidder has exact information about the common value of an object, whereas other bidders only observe a noisy signal. Hendricks and Porter (1988) adapt this model with the specific objective of analyzing auctions of federal offshore gas and oil drainage leases, in which information is likely to be asymmetric. Consistent with the model's predictions, they find that more informed bidders earn higher expected profits than the less-informed bidders.

auction, Bulow et al. (1999) show that when toeholds are asymmetric, aggressive bidding by the high toehold bidder can cause the low toehold bidder to bid very conservatively due to the winners' curse. This, in turn, may allow the high toehold bidder to win the auction very cheaply, since in a second price auction, it only needs to pay the second highest bid.

In spite of the empirical relevance of toeholds and these theoretical developments, there is a paucity of empirical evidence that toeholds influence auction outcomes in a manner consistent with the theory. Betton and Eckbo (2000) find that if an initial bidder has a toehold, then it is less likely that a rival bid will follow. This is only indirectly supportive of the idea that toeholds allow a bidder to bid more aggressively.[2] Perhaps the closest direct test of the toehold effect is in the context of Swedish bankruptcy auctions (Eckbo and Thorburn, 2000), which are ascending bid auctions. These authors show that distressed bank debt essentially creates a toehold effect since the bank benefits from a higher auction price. The authors provide evidence that banks often finance the winning bid, and show that that smaller bank expected recovery rates based on piecemeal liquidation value (equivalent to higher toehold) lead to higher winning bids.

In this paper, we provide a variety of evidence on how toeholds affect auction outcomes in a unique context – that of land auctions in Hong Kong. In Hong Kong, the government owns all land, and sells long term leases on land to private developers. Proceeds from land sales have averaged at about 15% of government revenues. The most important way

[2] They also find that initial bids are often associated with a share tender agreement (a commitment on part of the shareholders to tender their shares to a particular bidder), which they also interpret as consistent with Bulow, Huang and Klemperer's (1999) result that more equal toeholds increase the expected sale price.

in which the government sells land for development is through open ascending bid auctions. At least fourteen publicly traded companies (developers) - some of them among the biggest companies in Hong Kong - frequently participate in the land auctions, along with several smaller developers, many of which are not publicly traded. What creates a "toehold effect" in these auctions is the following. Many developers often have other development projects that have been recently completed or are soon to be completed in the same geographical area (district) as the land being auctioned. The winning bid in the auction is known to influence the transaction prices in the property market subsequent to the auction – in fact, the press now regularly reports whether or not there is a significant impact on property prices as a result of the auction. Thus, bidders who already have units under sale or under construction benefit from a high winning bid in the auction even if they lose – as such bids enable them to sell property in the same region at higher prices.

The fact that high auction bids affect property prices locally, and that bidders with toeholds benefit from these high bids, is well recognized in Hong Kong. For example, a news article in the local daily dated 26 October, 2006, commenting on two successful applications for two auction sites [3] writes

[3] The daily newspaper in question is the Chinese language daily *Ming Pao*. The article appeared under the heading "Two successful applications attract large developers". A "successful application" under the current system in Hong Kong occurs if a developer offers a price for a site that is above 80% of the government's secret reserve price for the site (see section II for details). The developer was K. Wah International, which successfully triggered the auction for two pieces of land located in 1 Broadcast Drive, Kowloon Tong, Kowloon and Area 77, Ma On Shan, Sha Tin, New Territories. Cheung Kong is one of the biggest property companies in Hong Kong. *Sausalito* is the name of the project. The Centaline Group owns the Centaline Property Agency Ltd., a major property agency in Hong Kong.

"According to a senior regional operating director of Centaline Group, sellers of property units with more than 1000 sq ft in the same district immediately increased their asking price by about 5%, being stimulated by the successful application news and the high launch price of *Sausalito* in Ma On Shan by Cheung Kong"[translation ours].

Further, the article adds:

"Cheung Kong executive director ….. claimed that, had the company known about the land application earlier, it would have set a higher launch price for *Sausalito*."

Moreover, it is not unusual to come across discussions similar to the toehold effect addressed in this paper. A news article dated September 13, 2006 writes:

"Sino Land initially bidding aggressively in the auction yesterday has two investment properties in the same area. The large shareholder Wong's family also privately holds buildings in Gold Coast. If the auction results are favorable, they will benefit indirectly" [translation ours].[4]

To examine whether or not there are toehold effects consistent with auction theory, we obtain a comprehensive data base that provides information on various attributes of the

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[4] This article also appeared in the *Ming Pao* under the heading "Sun Hung Kai has a heap of land bank along Castle Peak Road". The eventual winner was Sun Hung Kai, a major developer in Hong Kong (Sino Land is another major property developer in Hong Kong).

land being auctioned, information on bids and participants, as well as up to nine estimates of the value of the property being auctioned provided by analysts at various points prior to the auction. This data is mostly compiled from newspaper reports and marketed by a private vendor. Further, we hand-collect data on ongoing or completed projects (either for residential or commercial use) of fourteen publicly traded (henceforth, "major") developers in each district each year from the company annual reports.

We identify significant toehold effects. First, consistent with the prediction of auction theory that a bidder will be more likely to win an auction (irrespective of the value environment) if its toehold is higher, we find that the probability that a developer wins in an auction is increasing in its toehold (measured in terms of saleable area of projects under construction or sale in the same district as the auction). Second, we find that – consistent with a common value environment and winners' curse – more asymmetry in toeholds reduces the winning bid. Most significantly, consistent with the toehold effect but inconsistent with other potential explanations of why a bidder with a toehold might bid more aggressively (such as a higher synergy from existing projects in a given area), the stock price reaction or cumulative abnormal returns from one day before to one day after the auction is significantly increasing in the toehold for bidders that *lose* in the auction.

The toehold effects we document are strongest when the standard deviation of analysts' estimates about the value of the lot being sold is high. The analyst estimates presumably differ because the analysts rely on different pieces of information about future market conditions (economic and demographic trends, supply estimates largely determined by government policy, progress of other projects and so on). When the dispersion of these estimates is high, it is also likely that there would be greater dispersion in the *private* signals of the participants in the auction, thereby creating conditions under which the auction theory predictions such as the winners' curse are more likely to be observed. However, whereas the sophisticated developers would be expected to rationally account for winners' curse in deciding how to bid, for the less sophisticated investors in the property market, this is likely to create more heterogeneity of estimates.[5]

In fact, the stronger toeholds effects= in the presence of greater uncertainty suggests an additional mechanism that may be at work. As pointed out by Miller (1977), prices will reflect the beliefs (value estimates) of the most optimistic investors if the pessimists are kept out of the market because of short sale restrictions. However, since these value estimates are above the "average", there is overvaluation on average. Short-sale constraints are obviously strongly binding for property market. Therefore, it is likely that a local residential market is most likely overvalued when there is greater dispersion in estimates. Our data for Hong Kong seem to support this possibility: both the standard deviation and the coefficient of variation of analyst's forecasts peak prior to significant declines in the property market index. Thus, if property developers (who are sophisticated) have projects in progress in a region and see a bigger potential for a future price drop, they are more likely to bid aggressively in an auction to indicate more

[5] For example, a particular less sophisticated investors may "trust" one source of information more than another and may underweight other pieces of information.

optimism about the market. In other words, the toehold effect itself is likely to become more significant when there is more heterogeneity of estimates in the market.

The rest of the paper is organized as follows. In section II, we provide a brief overview of Hong Kong's land auctions. In section III, we develop our testable hypotheses. Section IV provides a description of our data sources, while section V presents the empirical results. Finally, section VI concludes.

II. A Brief Overview of Land Auctions in Hong Kong

Land in Hong Kong is a state property under the management of the government. The government sells new land parcels for specific developments through long term land leases. Land sales have historically contributed significantly towards government revenues – in some years, proceeds from land sales have been as much as 45% of total revenues.[6] One of the primary ways in which the government sells land is through land auctions.

In Hong Kong, "auction" refers to sale of land through a method that is essentially an Ascending Bid or English auction. Land sold through auctions have well defined land-use and development plans that are part of the lease contract. In contrast, "tender" refers to sealed bid auctions, and are usually for land where the development plan is not yet well

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[6] This happened in 1980-81. The average for 1947-48 to 1984-85 was 20%. In the ten years from 1991-2000, land sale proceeds averaged 12% of government revenues.

defined. Developers are required to submit a development plan along with the bid – consequently, the highest bid need not win. In this paper, we only focus on "auctions".

Except for some periods during which the auctions were suspended, since 1991, auctions have been generally held at an average of at 6 different dates in a year. At times, auctions of several parcels of land are held in the same day – the typical case is two auctions per auction date (about half of the auctions during the period 1991-2004 werein this category). In Hong Kong, there are at least fourteen major property developers that are publicly traded companies – some are among the largest companies in Hong Kong.[7] Besides, there are some private companies that are also major players in the property market.[8] These major developers as well as several minor developers are regular participants in the land auctions.

The auction method has changed somewhat in recent years. Prior to March, 1999, the government would have "scheduled auctions", whereby it would make available specific parcels land for sale through auction, i.e. the supply of land for auction would be primarily determined by the government. The government would generally almost always set an "upset price" for each auction, which is the minimum bid price. In principle, this is different than the reserve price, which would be kept secret. The government could withdraw the land from the auction if the highest bid did not exceed the reservation price.

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[7] Of the companies that are in the property sector, Cheung Kong Holdings and Sun Hung Kai Properties are, respectively, the 9th and 10th in terms of market value among the constituent companies of the Hang Seng Index. Several others (Hang Lung Properties, Henderson Land and Sino Land) rank in the top 30. Hutchison Whampoa (ranked 6), Hong Kong and China Gas (ranked 23), Wharf Holdings (ranked 30) and New World Development (ranked 34) are also major players but are more diversified companies.

[8] Chinachem and Nan Fung are the main non-listed developers in Hong Kong. Both have an estimated value of assets of over 100 billion HKD (12.5 billion USD).

In a 24-year period between April 1962 and December 1985, out of 1870 lots offered for auction, only 22 were withdrawn when the bid price equaled or exceeded the upset price.[9] However, since the government is reluctant to withdraw a lot from auction if the highest bid exceeds the upset price (for fear of being criticized of following a high land price policy – see previous footnote), the upset price was the *de facto* reserve price (Wu (1986)).

In April, 1999, the government introduced the so-called "Application List System". Under this system, each year the government would announce the Application List, which contains the list of sites that are available for sale in the financial year. Interested developers can submit an application for any of the sites on the list, indicating an offer price and also submitting a deposit (10% of the trigger price subject to a cap of 50M HKD). If the offer price exceeds the government's secret reserve price for that lot of land (or 80% of the reserve price according to recent modifications of the system), then an auction is triggered within 10 weeks (7 weeks according to a subsequent modification). In the auction, the offer price is used as the upset price. If no bid at or above the upset price materializes, then the triggering bidder forfeits the deposit.[10]

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[9] See Wu, C. L., 1986, "Government Land Sales in Hong Kong: Auctions and a Proposed Alternative", Hong Kong Economic Papers, Vol. 1986, No. 17, pp. 51-63. Wu remarks that although the percent of lots withdrawn is low, the withdrawals generated widespread attention and negative publicity because the government was accused of pursuing a high land price policy. Wu also remarks that the usual reason for withdrawal was that the auctioneer suspected collusion among bidders – presumably based on discussion among bidders during the auction. In more than half of the cases, the price at which the lot was withdrawn was lower than the price at which land in the same area had been sold in the recent past.

[10] The government justified the move to the Application List System as a step in the direction of a more "market driven system". The move coincided with a change in its own role in the property market as a property developer engaged in the production and sale of subsidized flats. However, it appears that the main reason for the government to move to the Application List System may have been to counter collusive practices of developers: Hong Kong at present has no laws to deal with bid-rigging or collusion. Since the government is sensitive to the public criticism that would ensue if it had to withdraw a land from auction if

III Hypothesis Development

The effect of toeholds (in particular, toehold asymmetry) on bidding behavior depends on whether the value environment is a "common value" or a "private value" environment. Unfortunately, the theoretical developments in this regard are far from complete. A major limitation is that the theory of bidding with toeholds is almost entirely restricted to the two-bidder setting. Given limited guidance from theory, we will not try to test any specific predictions of a particular bidding model. Rather we will primarily draw on the intuition from this setting in developing our testable hypotheses. We first briefly review the theory before developing our hypotheses. For a more detailed exposition of auctions with toeholds, see Dasgupta and Hansen (2007).

3.1 Private Value Models

Burkart (1995) and Singh (1998) present models of bidding with toeholds in the independent private values setting. Two bidders bid for 100% of the shares of a target firm. Each bidder has an independent draw of a "private value" v_i, for $i=1,2$, which is best thought of as a synergy from the acquisition of the target. The auction is a second price auction, which in this setting is equivalent to an ascending bid auction. A bidder's toehold is the fraction of the target's shares already owned by the bidder. In this setting, Burkart (1995) shows that (a) if a bidder has no toehold, then it is a dominant strategy for

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the maximum bid did not meet its reserve price (in the past, it has been accused to following a policy of high land prices when this happened), it has generally kept the upset price low.

that bidder to bid exactly its private value, and (b) it is a dominated strategy for a bidder with positive toehold to bid below its value. Hence, toeholds will cause bidders to bid more aggressively in general.

For the special case in which one of the bidders has a positive toehold and the other bidder has zero toehold, one can obtain close-form solutions for the bid functions. Without loss of generality, assume that bidder 1 has a positive toehold of θ, where 1>θ>0. Since bidder 2 has no toehold, it is a dominant strategy for this bidder to bid $b_2(v_2)=v_2$. Hence, modeling the auction as a second price auction, bidder 1's problem is to choose b_1 to maximize

$$\Pi_1(b_1, v_1, \theta) = \int_0^{b_1} \left(v_1 - (1-\theta)v_2\right) dF_2(v_2) + \theta b_1 (1 - F_2(b_1)) \qquad (1)$$

Here, the expression within large brackets within the integral represents bidder 1's profit if it wins the auction. In this case, it gets the synergy v_1 but pays a per-unit price v_2 (bidder 2's bid) for buying all the shares (the fraction 1-θ) that it does not own. The second term indicates that if it loses it can sell its toehold at a price equal to its own bid to bidder 2.

The first-order condition is

$$(v_1 - (1-\theta)b_1) f_2(b_1) + \theta(1 - F_2(b_1)) - \theta b_1 f_2(b_1) = 0. \qquad (2)$$

Simplifying, we get

$$b_1 = v_1 + \theta \frac{1 - F_2(b_1)}{f_2(b_1)}. \qquad (3)$$

It is immediate that a bidder with toehold bids above its value. Further, under the standard assumption that the inverse hazard rate is non-increasing (i.e. $\frac{d}{dv_2}\left(\frac{1-F_2(v_2)}{f_2(v_2)}\right) \leq 0$), it also follows that the bid is increasing in the bidder's toehold.[11] The sale price is $\min(b_1,v_2)$, and hence the expected sale price is also increasing in the toehold of bidder 1. Unfortunately, close form solutions for the bid functions in the general asymmetric case are not available; however, we at least know (Burkart (1995), Proposition 1) that in the two-bidder case, any bidder with a strictly positive toehold bids higher than what it would bid with zero toehold.[12] For the asymmetric two bidder case in which one bidder has a zero toehold, it is also immediate that the high toehold bidder's probability of winning is increasing in its toehold. While we do not have a more general result, it seems highly likely that an increase in any bidder's toehold will cause it to bid more aggressively relative to other bidders, and therefore increase its probability of winning. Finally, notice that winning can be bad news, while losing can be good news for a bidder. To see the former, suppose that bidder 1 wins "narrowly", i.e., $b_1 \cong v_2 > v_1$. Then, bidder 1's gain or loss is given by $v_1 - (1-\theta)b_1$. From the first-order condition (2)

[11] The hazard rate assumption also ensures that the scond-order conditions hold when the bid function is given by (3).

[12] According to Burkart (1995), this result can be extended under some additional assumptions to the n-bidders case, where n>2.

and (3), it can be shown that this expression is negative if $v_1 < (1-\theta)\dfrac{1-F_2(b_1)}{f_2(b_1)}$. For $\theta<1$, this condition holds for v_1 sufficiently small. Since the ex-ante profit given by (1) must be positive, in this case, winning must be bad news. On the other hand, losing can be good news. As an example, suppose that v_1 and v_2 are both drawn from the uniform distribution on the unit interval, and let $\theta=0.4$. Integrating (1) over the unit interval, the ex-ante profit to bidder 1 can be shown to be 0.31905. On the other hand, profit conditional on losing is θb_1. Using (3), it can be shown that this exceeds the ex-ante profit for $v_1>0.716$.

3.2 Common Value Auctions

Considerably more is known about common value auctions in the two-bidder case – especially when the toeholds are asymmetric. Bulow, Huang and Klemperer (1999) analyze a class of common value auctions with two bidders in which each bidder draws an independent private signal t_i from a uniform distribution on the unit interval. The common value is given by a function $v(t_1, t_2)$ which is increasing in both arguments. The toehold of each bidder is given by θ_i, $i=1,2$. We consider here second price auctions – which are equivalent to the ascending bid auction. Given that bidder j bids according to the function $b_j(t_j)$, bidder *i's* problem is

$$\mathrm{Max}_{b_i} \Pi_i(t_i, b_i) = \int_0^{b_j^{-1}(b_i)} \left(v(t_i, \alpha) - (1-\theta_i) b_j(\alpha) \right) d\alpha + \theta_i b_i (1 - b_j^{-1}(b_i)). \quad (4)$$

The first-order condition is given by

$$\frac{1}{b'_j(b_j^{-1}(b_i))}\left[v(t_i, b_j^{-1}(b_i)) - (1-\theta_i) b_j(b_j^{-1}(b_i))\right] + (1 - b_j^{-1}(b_i))\theta_i - \theta_i b_i \frac{1}{b'_j(b_j^{-1}(b_i))} = 0 . \qquad (5)$$

Let us now define $\phi_j(t_i) = b_j^{-1}(b_i(t_i))$, i.e. it defines the pair of signals for which firm *i* with signal t_i bids the same as firm *j* (since $b_j(\phi_j(t_i)) = b_i(t_i)$). Then we can write (5) as

$$b_j'(\phi_j(t_i)) = \frac{1}{\theta_i}\frac{1}{(1-\phi_j(t_i))}\left[b_i(t_i) - v(t_i, \phi_j(t_i))\right]. \qquad (6)$$

Analogous conditions can be derived for bidder *j's* optimization problem. These two differential equations form the basis for the derivation of the equilibrium bid functions.[13] We will show below that for land auctions with property toeholds, we get a very similar differential equation, so that the analysis in Bulow et al. (1999) can be readily extended to this environment.

Some of the toehold effects in this common value environment are similar to those in the private value environment. For example, a higher toehold causes a bidder to bid more aggressively. Consequently, the probability of winning is increasing in a bidder's

[13] See Bulow et al. (1999) and Dasgupta and Hansen (2007).

toehold.[14] Further, a bidder bids more than the value of the object to it if the other bidder "just dropped out" at its bid (as in an ascending auction), which implies that if a bidder narrowly wins the auction, then it can earn a negative profit. Similarly, losing an auction can be good news for a bidder, since it profits on the sale of its toehold.

The most important difference between the outcomes of the common value model and the private value model is with regard to the effect of toehold symmetry or asymmetry. This is on account of the winners' curse. In the common value model, as toeholds become very asymmetric, the high toehold bidder begins to bid very aggressively. This imposes a winners' curse on the low toehold bidder, since the more aggressive the rival's bid, the lower is its signal when it drops out at a particular bid. Therefore, as the rival's toehold increases, the low toehold bidder bids more and more conservatively in view of this winners' curse, which in turn causes the rival to bid even more aggressively. Since in a second price auction the sale price is the second highest bid, greater asymmetry in the toeholds causes the expected sale price to *decrease*.

3.3 Land Auctions with Toeholds

We now show that when property developers in Hong Kong bid in a land auction, the fact that they may have other projects in the same region that will be completed in the next few years creates a toehold effect. Projects are often pre-sold in Hong Kong before they

[14] For the special case in which the value function is additive in the bidders' signals, bidder *i's* probability of winning is $\frac{\theta_i}{\theta_i + \theta_j}$.

are completed, and developers also obtain commitments from investors prior to completion. Thus, projects that are under construction and would be completed in the near future (for example, in two years' time) are more relevant for our arguments.

We will assume that property developers are rational bidders. The value environment will undoubtedly involve both common value and private value elements. Private value elements arise because there may be synergies associated with a particular bidder in a particular district – in particular, these synergies could be associated with toeholds – a possibility we shall explicitly address in our empirical tests. Common value elements will arise because the asset in question is land, and much of the uncertainty is about what is "correct" value of the property. The latter may well depend on economic and demographic factors in Hong Kong and neighboring areas in China, government policy about land supply, completion status of existing projects and so on, about which different bidders may have private information – all of which is relevant for the "common" value of property in that region. Thus, winners' curse could be very relevant in this environment.

Consider a property developer who has projects that would be completed in the same district as the auction two years later. We shall call the latter the bidder's toehold. Such a bidder has an incentive to bid high, because a high bid will help it sell the toehold at a higher price. By bidding high, the bidder can ensure that the winner – whether it is another bidder or itself - wins at a high price. When the toehold comes under pre-sale within one year, the auction price (for units that would come into the market shortly thereafter) becomes a reference point. Consequently, the bidder derives a benefit from a high bid that could be assumed to be proportional to the toehold.

There could be several reasons why a higher bid in the auction can enable a developer to sell toeholds at a higher price. A simple explanation would be that developers engage in markup pricing – so if the auction price is higher, the prices of the new units from the auction will also be higher in the future. This will in turn allow the toeholds to be sold at a higher price. Alternatively, the market may simply equate a higher bid with a more optimistic outlook about future market conditions (a more optimistic signal) by the bidder, without factoring in the incentive to overbid that such a perception creates. Finally, even if the market recognizes this incentive and is not fooled, bidders could still be trapped in a "signal-jamming" equilibrium in which if they did not bid high, the market would regard that as a pessimistic outlook for the future.

To see how this translates into a toehold effect similar to what has been modeled in the takeover literature, assume that size of the lot being auctioned is normalized to unity, and θ represents the saleable area of projects that will be completed in the future. Our arguments above suggest that the benefit from bidding high is increasing in the winning bid. Thus, in the private value model analogous to the one outlined in section 3.1, the bidder with toehold θ maximizes

$$\Pi_1(b_1, v_1, \theta) = \int_0^{b_1} \left(v_1 - v_2 + \delta\theta v_2\right) dF_2(v_2) + \delta\theta b_1 (1 - F_2(b_1)) \qquad (7)$$

where v_1 and v_2 are, respectively, the private valuations of the auction lot of the two bidders, and we assume that the toehold is sold at δ times the winning bid, which is v_2 if bidder 1 (with toehold) wins, and b_1 if the bidder without toehold wins. It is easily checked that (7) is exactly the same as (1), with δθ replacing θ.

Likewise, if the bidders in the land auction are bidding in a common value environment, the maximization problem for bidder *i* can be written as

$$\text{Max}_{b_i} \Pi_1(t_i, b_1) = \int_0^{b_j^{-1}(b_i)_1} \left(v(t_i, \alpha) - b_j(\alpha) + \delta\theta_i b_j(\alpha)\right) d\alpha + \delta\theta_i b_1 (1 - b_j^{-1}(b_i)) \quad (8)$$

Once again, this expression is completely analogous to (4), with δθ replacing θ.[15]

Having established the analogy between land auctions with property toeholds and the literature on takeover bidding with toeholds, we now proceed to discuss some testable hypotheses.

Hypothesis 1 The probability that an auction participant wins the auction is increasing in the participant's toehold, and decreasing in the toeholds of all other bidders.

As noted, for the two bidder case, in both the private and common value setting, a bidder bids more aggressively if its toehold increases. While results for more than two bidders are not known, the intuition from the two bidder case should go through.

Hypothesis 2 (a) The bid functions of individual bidders should be increasing in the toehold of each bidder. (b) In a common value environment, the bids of bidders that do not have the highest toehold among auction participants could decrease if the highest toehold increases.

The first part of the hypothesis follows because irrespective of whether the value environment is private or common value, a bidder bids more aggressively if its toehold increases. The second part follows because if the highest toehold increases, that bidder bids more aggressively, imposing a more severe winners' curse on the remaining bidders in a common value auction.

Hypothesis 3 If the value environment is predominantly a common value environment, then the expected winning bid should be decreasing in a measure of toehold asymmetry (alternatively, increasing in some measure of toehold symmetry), holding total toehold among participants unchanged.

For the private value environment, we do not have any clear results on the effect of toehold asymmetry, since the general case with arbitrary toeholds has not been solved. In a common value setting, however, such an asymmetry reduces the expected winning bid due to the winners' curse.

Hypothesis 4 The toehold effects discussed in hupotheses1-3 above will be stronger if there is more uncertainty about the bidders' value estimates.

Consider the common value environment. If the bidders have a fairly precise estimate of the other bidder's signal, then there will be little potential for winners' curse. The second-price auction outcomes in the common value environment are all driven by the winners' curse. For example, a bidder is more likely to win the auction if it has a higher toehold either because it induces a greater winners' curse on a lower toehold bidder, or it mitigates the winners' curse imposed by a higher toehold bidder. Therefore, we expect the toehold effects to be stronger when there is more uncertainty, associated with more severe winners' curse when toeholds change. Uncertainty is measured in our empirical tests by the coefficient of variation of analysts' estimates of the value of the land being auctioned.[16]

The fact that our toehold effects are stronger when the coefficient of variation of the analysts' estimates for the value of the land is high also points to an additional mechanism that may be at work. When uncertainly about the value of property is high, if individuals (as opposed to sophisticated market participants such as property developers) are dogmatic about their individual sources of information, there is likely to be more heterogeneity of opinion in the market. Miller (1977) argues that prices will reflect the beliefs (value estimates) of the most optimistic investors if the pessimists are kept out of the market because of short sale restrictions. However, since these value estimates are above the "average", there is overvaluation on average. Short-sale constraints are obviously strongly binding for property market. Therefore, it is likely that a local

[16] Indeed, in the data there is strong correlation between the coefficient of variation in the analyst estimates and that for the bids in a given auction.

residential market is most likely overvalued when there is greater dispersion in estimates. Our data for Hong Kong seems to support this possibility: both the standard deviation and the coefficient of variation of analyst's forecasts peak prior to significant declines in the property market index (see Figure 1). Thus, if property developers (who are sophisticated) have projects in progress in a region and see a bigger potential for a price drop, they are more likely to bid aggressively in an auction. As discussed above, a higher winning bid in the auction will enable projects currently being completed to be sold at a higher price –for example, it could be seen as a signal of optimism about future value, which in turn helps support market prices today. In other words, there may be an additional benefit to high bidding when the uncertainty in valuation is high. Formally, this has the effect of increasing the parameter δ in equations (7) and (8), and accentuating the toehold effect.

Hypothesis 5 A losing bidder can experience a positive stock price reaction on the announcement of the auction outcome if its toehold is sufficiently high.

This hypothesis is unique to the toehold effect. There could be potentially alternative explanations that could generate implications similar to the ones discussed in hypothesis 1-4. For example, it is possible that a bidder specializes in a particular region – presumably has high synergy – and thus participates regularly, bids aggressively, and ends up having a significant toehold. We will discuss in the next section how, in our empirical design, we try to ensure that our results are not driven by this alternative possibility. Another way to discriminate between these alternatives is to recognize that if synergy (proxied by toehold) drives this bidder's behavior, then losing the auction will be bad news – and the news will be worse the more the synergy or the toehold. In contrast, the toehold effect we test is consistent with more positive the announcement effects associated with higher toeholds for bidders that lose in the auction.

IV Data and Empirical Measures

4.1 Data

Our sample consists of land auctions and tenders in Hong Kong over the period from 1991 to 2004. There are 263 auctions/tenders. For each auction/tender, we have address information, lot number and geographical district, auction/tender information, transaction date, transaction price, the bottom price set by the government, the estimated number of bids, site area, development area, name of purchaser(s), names of some other bidders who participated in, but did not win, the auction/tender. The list of participants is obtained from newspaper sources, and typically includes the winner and some other losing top bidders, plus other bidders who participated in earlier rounds of bidding but dropped out. Tables A1 and A2 show the district wise participation and winning frequencies of the major developers in Hong Kong land auctions.

We also have estimates of the transaction price (i.e. the winning bid) by at most three commentators at three points of time: therefore, there could be a maximum of 9 estimates for one auction/tender. Commentators sometimes forecast a single price, and at other times a range. The three time points are the announcement date that the land is open for application for sale, the successful date of application for sale, and a point of time immediately before the auction/tender date. We also have the pre-auction/tender average price of the primary and secondary property markets in the same district. However, we do not have the average price information for each auction/tender, because there is not always a primary/secondary transaction.

Other than the particulars of the auction, we also have the information about the new development on the land that is auctioned, the completion year of the development, and the first launch year in which the development was initially sold. For these completion and launch years, we verify data accuracy by using another data set of the primary property market. Our auction/tender data is provided by EPRC Ltd.[17]. We further search the relation among winners, participants, and major developers because they could be associated with each other. For example, Hong Kong Ferry (Holdings) Co. Ltd. and Hong Kong and China Gas Co. Ltd are associated with Henderson Land, so we treat them as one entity. Similarly, Hutchison Whampoa is associated with Cheung Kong and Regal Hotel International Holdings Ltd with Paliburg Holdings Ltd.

To study effects of toeholds, we need a measure of toeholds. For each major developer, we therefore collect manually the area of projects that were newly completed or under sale in each of 28 districts every year for our sample period from their annual reports. We have not separated areas into different uses (such as for residential versus commercial

[17] EPRC is a member of the Hong Kong Economic Times Group.

use) because many projects are for dual usage, but we do not have the breakdown information from the annual reports. Furthermore, we think that for the purposes of our study, areas under residential and commercial usage are both relevant – although, admittedly, one category may be more relevant for a particular auction. For example, if the auction is for a site that will be developed for commercial purposes, toeholds of commercial property in the same region might be more relevant than toeholds of residential property.

In order to study stock price related wealth effects, we retrieve returns data of the major developers and market indexes from Datastream so that we can compute the cumulative abnormal returns for the announcements of the outcomes of the auctions and tenders. Our financial data of the major developers come from Worldscope and PACAP. We use two sources to obtain financial data because these two databases cover different time periods, and complement each other.

4.2 Key Empirical Constructs

Toehold: We measure a bidder's toehold in the auctions using the total square footage of the developer's finished projects (for both residential and commercial use) located in same area as the auction as reported in the annual reports *two years from the auction*. We choose to measure toehold using inventory of properties in two years rather than today's inventory based on two considerations. First, a large proportion of properties in Hong Kong are sold prior to completion (pre-sale) or receive pre-commitments from regular investors in the property market. Thus the current inventory will only benefit from the higher auction price if it is not pre-sold or pre-committed. This means that a significant part current inventory does not enjoy this benefit. In contrast, the inventory in two years, whether it is pre-sold or not, will benefit from a higher auction price. Therefore, inventory in two years captures the toehold effects better and is employed in our empirical analysis. [18]

A second reason is the following. As discussed in section III, a high bid in the auction is likely to affect the price at which the auction units are eventually sold. Therefore, the toeholds that would most directly benefit from the high bid are projects that have also been started recently and would be completed around the same time. (Of course, the pre-sale of these units usually is already under way). Given that the bigger projects (to which our empirical analysis is restricted – please see below) typically take 3-4 years to complete, projects that are completed two years later are a better choice for the toehold measure.

The use of a forward looking measure, however, creates a concern that some of our results might be mechanically driven by the fact that a winner in an auction automatically adds to its toehold when the project on that auction land is completed. Accordingly, we drop all cases in which the project on the auction land is completed in two years or less. However, due to the non-synchronicity of auction date and ending fiscal year date for companies, it is possible that even some projects that are completed in greater than two

[18] For example, the project whose launch was mentioned in our earlier newspaper quote of *Ming Pao* (October 26, 2006), *Sausalito*, was not yet completed at the time of the launch of sale, i.e. it was a pre-sale.

but less than three years may be reflected in the two-year forward looking toehold compiled from company annual reports. To deal with this issue, for projects with duration of greater than two but less than three years, for any auction winner, we subtract from their toehold the auction development area, provided the difference is positive.

Price Premium and Bid Permium: In testing the toehold effects on the winning bid or all bids, our dependent variable is the price premium or the bid premium, respectively. These are defined as the winning bid (respectively, the bid) normalized by the expected price from analyst forecasts. The literature sometimes uses the *reserve* price to normalize the sales price in defining the premium (e.g., Hendrikcks and Porter, 1988). We choose to use the expected price in the premium definition for two reasons. First, as discussed earlier, the reserve price is not announced, only the "upset price" is. The upset price, however, does not seem to be a good measure of the reservation price: before 1999, the government may withdraw the land from the auction even if the upset price has been met; in more recent years with the Application List System, the upset price is simply trigger price for the auction which only needs to exceed 80% of the reserve price. Second, since we are interested in measuring the aggressiveness of the bidders above their value estimates, the expected price, to the extent that it is available, is potentially a better benchmark than reserve price. This is because the reserve price is determined somewhat subjectively by the government a long time ago and may not reflect the current market condition. In contrast, the expected price reflects the analysts' valuation of the land. Since toehold is the bidder's private information and is not observed by the analysts (recall we use a forward looking measure of toehold), expected prices form a nice benchmark for capturing aggressiveness in bidding due to the toehold effects.

Uncertainty: We measure uncertainty by the coefficient of variation of analysts' estimates of the value of the land. We use coefficient of variation instead of raw standard deviations because there is likely to be considerable variation in the unit value estimates across districts and over time.

Winner: This is a dummy variable that takes the value of 1 if a developer is a winner in a particular auction. However, in 9% percentage of cases, subsequent to the auction, it is announced that the property is going to be jointly developed by several developers. All of these developers are assigned a value of 1 for the dummy. In adjusting the toehold for a winner if the completion is in three years (please see the discussion of the *toehold* measure above), we use the proportion of the development area attributed to a particular developer under joint development if that information is available; otherwise, we assume equal division.

4.3 Summary Statistics

Table 1 describes some salient features of our data. Panel A presents auction characteristics, while Panel B reports bidder characteristics. Panel C reports auction outcomes. It is noteworthy that bids by positive toeholders and higher than median toeholders tend to be associated with higher bid premia (the ratio of the bid to the mean estimated value of the land being auctioned) than those by zero or below median toeholders. The winning bid is from a positive toeholder 60% of the time. We consider two measures of toehold symmetry or asymmetry. The ratio of the second highest to the highest toehold is a measure of toehold symmetry. The mean is 0.35. Consistent with common value features of the auctions, the premium on the winning bid is higher if the symmetry measure is above median than when it is below median.

In Panel D, we report the cumulative abnormal returns (cars) for winners and losers from day -1 to +1 based on the market model. For losers, both the mean and median the abnormal returns are positive, and higher when the losers' toeholds are high or the premium on the wining bid is high. These results are consistent with a toehold effect. For winners, although the mean abnormal returns are generally positive, the median returns are often negative. The abnormal returns appear to be higher when the winning bid premia are higher.

V Empirical Analysis

5.1 Toehold and Chances of Winning

In this section, we examine whether a bidder with greater toehold has a greater chance of winning the auction. We estimate the following probit model:

$$Winning_{ij} = a + b\ Toehold_{ij} + c\ Total\ Toehold_j + d\ Lot\ Size_j + Bidder\ Characteristics_i + District\ Dummies + \varepsilon_{ij}, \qquad (9)$$

where *i* indexes bidders and *j* indexes auction. The dependent variable, *Winning*, is a dummy variable indicating whether the firm wins the auction in question. *Toehold* is one plus the log of the bidders' completed projects and projects under pre-sale in the same area - as reported in the annual reports two years from the auction. *Total Toehold* is the log of one plus the sum of toeholds of all major developers in the region.[19] *Lot size* is the size of the auction land (defined as the natural log of the total square footage of the development area). *Bidder Characteristics* include the bidding developer's size (defined as the natural log of assets) and a few variables related to the bidder's ability to finance the bid. They are leverage (defined as the book value of debt over assets), cash stock over assets, and profitability (ROA). We also control for the bidder's investment activities including investment opportunities (Tobin's Q defined as the market-to-book assets ratio) and actual capital expenditure over total assets.

The theory suggests that the winning probability is increasing in the bidder's own toehold but decreasing in the total toehold.[20] The effect of toehold is captured in coefficient b and is expected to be positive. Unfortunately, our list of bidders in the auction is far from complete; therefore, we do not have an accurate estimate of the sum of the toeholds of all auction participants. Therefore, we treat *Total Toehold* as an auction characteristic rather than as another toehold-related variable to test the theory.

[19] Since our list of participants in the auction is clearly incomplete, we prefer not to leave out any major developer who has a toehold. However, our results do not change qualitatively if we only consider the toeholds of the reported participants.

[20] Bulow, Huang, and Klemperer (1999) show that with two bidders and a value function that is additive in the private signals drawn from a uniform distribution the winning probability for bidder 1 is $\theta_1/(\theta_1+\theta_2)$. In logarithmic form, the winner probability is $\ln(\theta_1)-\ln(\theta_1+\theta_2)$.

One particular concern about the estimated toehold effect is that bidders may win an auction not because they have more toeholds but because they specialize in certain district. Toehold simply picks up its level of specialization in the area where the land is auctioned. Therefore, in all estimation, we include district dummies to purge of this bidder specialization effect. We use a fine definition of districts which includes 28 districts in the Special Administrative Region of Hong Kong. Finally, since auctions may cluster over time (hot vs. cold markets), we report standard errors adjusted for clustering within years.

As reported in column (1) of Table 2, a bidder's toehold significantly increases its chance of winning the auction (at the 10% level). The point estimate translates into a marginal impact of toehold on the probability to win of 0.011. Thus, moving from the average toehold to one standard deviation above increases the chance of winning by 6%. Somewhat surprisingly, none of the bidder characteristics in this regression seem to be able to predict probability of winning.

One criticism about our estimated toehold effect could be that that strategy focuses or specialization of developers may shift over time. Thus including district dummies does not completely solve the problem that toeholds are simply a measure of specialization. We propose the following strategy to deal this problem. If a developer specializes in a certain district, it is likely to be a winner of a recent auction. If indeed specialization rather than toehold is driving the results, then if we control for whether the bidder is the winner in the last auction, it should render toehold insignificant. Thus in column (2) of

Table 2, we include a new independent variable, *Last Winner*. The coefficient on *Last Winner* is statistically significant (at the 5% level). Moreover, inclusion of *Last Winner* improves the overall fit of the model, with Pseudo-R^2 increasing from 0.09 to 0.13. However, *Last Winner* does not drive out the toehold effect: the coefficient on *Toehold* remains similar in magnitude and becomes more significant (at the 5% level). These results suggest that while specialization does help predict winning probabilities, it does not drive the toehold effects we identify earlier.

Next, we introduce the role of uncertainty or differences in opinion in bidding. In particular, we measure uncertainty or differences in opinion using the coefficient of variation (the standard deviation over the mean) of analyst forecasts of the value of the land. Although the existing auction literature does not directly examine the role of uncertainty, uncertainty about valuation has been shown to be important in determining asset prices in some market settings such as the stock market. For example, Diether, Malloy and Scherbina (2002) find that stocks with higher dispersion of analysts' forecasts have lower future returns, suggesting that greater uncertainty over valuation or heterogeneity of beliefs leads to overvaluation. Gilchrist, Himmelberg and Huberman (2004) develop a model in which increase of dispersion of investors' beliefs under short-sale constraint predicts a bubble (rise in stock price over fundamental value). Using variance of analysts' forecasts to identify a bubble component in Tobin's Q, they show how managers respond to bubbles by issuing equity and undertaking capital expenditure. These results are consistent with Miller's (1977) original argument that prices will reflect the beliefs (value estimates) of the most optimistic investors if the pessimists are kept out of the market because of short sale restrictions. However, since the value estimates of the most optimistic investors are above the "average", there is overvaluation on average.

In our current setting, it is possible that the toehold effect tend to be stronger when there is greater uncertainty for two reasons. First, as discussed above, there could be greater difference in opinion among property buyers when there is greater uncertainty about the value of land. This will cause land prices to be overvalued.[21] This places sophisticated bidders in land auctions with projects that would come to the market in the near future at greater risk due to a return of prices towards the true value. As we noted above, this could cause bidders with toeholds to bid even more aggressively when uncertainty is high. Second, greater dispersion in analysts' value estimates could also reflect greater uncertainty in the bidders' value estimates. This could accentuate toehold effects, as noted above.

To examine the role of greater uncertainty, we divide the sample based on coefficient of variation of analyst forecast above and below 10% (which roughly corresponds to the 25 percentile). The toehold effect is significant (at the 1% level) only when there is greater uncertainty (columns (3) and (4) of Table 2). Interestingly, the *Last Winner* becomes insignificantly when there is uncertainty, suggesting that bidder specialization does not predict winning when there is significant risk involved. This reinforces that our toehold effects cannot be explained by bidder specialization.

[21] Indeed, Figure 1 shows that the standard deviation and coefficient of variation of analyst estimates are typically high prior to major drops in the property market index.

5.2 Toehold and Bidding Behavior

The effect of toeholds (in particular, toehold asymmetry) on the winning bid, or the sale price, depends on whether the value environment is a “common value” or “private value” environment. Unfortunately, the theoretical developments in this regard are far from complete. First, most of the theory is developed only for a “two bidder” environment. Second, for the private value environment, the asymmetric toeholds case is only partially investigated: mostly, for the case in which one bidder has a positive toehold and the other bidder has no toehold, which hardly meets the reality.

To make thing more complicated, theory has opposing predictions about the impact of toehold on sale price in private vs. common value environment. In particular, in the private value environment, a higher toehold for the positive toehold bidder (with the other toeholds remaining zero) leads to a *higher* average winning bid. For a particular common value environment, it has been shown that if the sum of the toeholds remains fixed, more asymmetry in toeholds makes winners’ curse more severe, resulting in lower bids from the bidders with low toehold. Since it is a second price auction, the expected winning bids tend to be lower. Since land auctions are likely to have both common value and private value components, the effect of toeholds on the expected winning bid is an empirical matter.

5.2.1 Toeholds Asymmetry and the Winning Bid

The theory's predictions are most explicit on the sales price, i.e., the winner bid. Thus we first investigate the toehold effect on the winning bid. In particular, we estimate the following basic model:

$$\begin{aligned} \textit{Price Premium}_j = a + b \textit{ Toehold Asymmetry}_j + c \textit{ Total Toehold}_j + d \textit{ Lot Size}_j \\ + \textit{District Dummies} + \varepsilon_j, \qquad (10) \end{aligned}$$

where j indexes auction. The dependent variable is the bidding premium, defined as the natural log of the winning bid normalized by the expected price from analyst forecasts.[22] *Toehold Asymmetry* measures the asymmetry in toeholds among the bidders. We employ two measures. The first is an inverse measure of asymmetry: the ratio of the second highest toehold over the maximum toehold; the higher the ratio the more symmetric the toeholds are. The second measure is a more extreme measure of asymmetry: a dummy variable indicating auctions with only one bidder with positive toehold (other bidders have all zero toeholds), which corresponds well with theoretical models. The effect of toehold is captured in coefficient *b*, which is expected to be negative.

The results are presented in Table 3. In column (1) of Table 3, the (inverse) of *Toehold Asymmetry* as measured by the second largest toehold over the maximal toehold is significantly positive at the 5% level, which is consistent with winners' curse in common value models. We then examine the effect of uncertainty on the toehold effect. In column (2) of Table 3, we include the uncertainty measure (defined as the coefficient of variation

[22] The literature uses both the premium (e.g., Hendrikcks and Porter, 1988) and the natural log of the premium (e.g., Betton and Eckbo, 2000). If we use the premium as the dependent variable, we get very similar results, in terms of both the signs of the coefficients and their significance levels.

of analyst forecasts) as well an interaction term between the *Toehold Asymmetry* and a dummy indicating the uncertainty measure above the bottom quartile. We expect the interaction term to be positive, since greater uncertainty is likely to worsen the winners' curse, and also, as argued earlier, lead to a stronger toehold effect. Consistent with this hypothesis, the interaction term is significantly positive (at the 10% level). Meanwhile the *Toehold Asymmetry* measure becomes insignificant. Thus the winners' curse and the effect of toehold asymmetry are only present when there is enough uncertainty (above the bottom quartile). In column (3) and (4), we report the results for our second and more extreme measure of *Toehold Asymmetry*, namely a dummy indicating only one positive toeholder. Consistent with the above findings, the interaction term between asymmetry and uncertainty is significantly negative (at the 10% level) while the asymmetry itself is insignificant.

5.2.2 Toehold and All Bids

In the previous section, we identified a winners' curse effect on winning bid. In this section, we test some further predictions of common value auction models by examining the relationship between toehold and individual bidders' bidding strategy, including both the winning bid and bids from other bidders.

In both private and common value models, the bid of a bidder with toehold is increasing in the bidder's toehold.[23] In common value models, when the allocation of toeholds

[23] Although, as discussed previously, for the private value model, we only know that the positive toehold bidder's bid is increasing in its toehold with the zero toehold bidder's toehold remaining unchanged at zero. Burkart (1995) shows that at least for small positive toeholds, bids are increasing in toeholds for all bidders in a 2-bidder auction, and under some further assumptions, this also holds for n>2 bidders.

becomes more asymmetric, the high-toehold bidders tend to bid more aggressively, which worsens the winners' curse and leads the low-toehold bidders to bid lower. It is not clear, however, that the same relationship would hold for private value settings. Thus we estimate the following model:

$$\textit{Bid Premium}_{ij} = a + b\ \textit{Toehold}_{ij} + c\ \textit{Total Toehold}_j + d\ \textit{Top Toehold} + e\ \textit{Lot Size}_j + \textit{Bidder Characteristics}_{ij} + \textit{District Dummies} + \varepsilon_{ij}, \qquad (11)$$

where *i* indexes bidders and *j* indexes auctions. The dependent variable *Bid Premium* is the natural log of each bid over expected price based on analysts forecast. Other variables are similarly defined as in Equation (1). The coefficient *b* captures the fact that the bid function is monotonically increasing in the bidder's own toehold, and is expected to be positive. The coefficient *d* captures the effect of bidder toehold asymmetry on the bidding strategy; *d* is expected to be negative, since holding the toehold of all bidders excluding the top toeholder constant, an increase in the top bidder's toehold leads to more severe winners' curse.[24]

Data on the highest bid from each bidder is reported in the local newspapers. Not all bidders' bids are reported – only those higher bids in the later rounds of the bidding are

[24] It is noteworthy that there is potentially an econometric issue here due to unobservable private values (in the case of private value auctions) or signal (in the case of common value auctions), which may cause correlation between the toehold and error term. Take the example of a simple private value model. The bidding function is $b_i = v_i + \theta \frac{1-F(b_i)}{f(b_i)}$. For a uniform distribution, this means $b_i = \frac{v_i}{1+\theta} + \frac{\theta}{1+\theta}$. Since v_i is unobservable and will be in the error term, there is potentially a mechanical correlation between toehold and the error term since both contain some functions of θ. However, we do not believe this is a serious problem, for two reasons. First, correlation may not be linear and thus may not bias the coefficient estimates. Second, to the extent that such a correlation is negative, it tends to bias against finding significantly positive toehold effects.

likely to be reported. Thus the reported bid prices reflect the bidders' willingness to pay and corresponds well to the prices at which the bidders drop out in a conventional ascending-bid auction. Since for some auctions only one bid is reported – namely, the winning bid - we include auctions with at least two bids in the estimation.

In column (1) of Table 4, the coefficient on own toehold is positive (although not statistically significant). Since the toehold effect tends to be stronger when there is some uncertainty, in column (2), we add uncertainty and an interaction between toehold and a dummy variable for above-bottom-quartile level of uncertainty. The interaction term is, as expected, significantly positive, suggesting that the bid function is increasing in the bidder's toehold when there is enough uncertainty. Note that this result is consistent with both private value and common value settings.

To examine how toehold asymmetry may affect bidding, in column (3), we include a new variable, namely the largest toehold among all bidders for each auction *(Top Toehold)*. Since we would like to examine the top bidder's toehold on *other* bidders' bids, this regression is restricted to bidders who do not have the highest toehold in the auction.[25] The coefficient on top toehold is significantly negative at the 1% level, consistent with a common value setting where an increase in the top toehold worsens the winners' curse and thus reduces other bidders' willingness to bid.

In sum, we find that toeholds significantly increase the bidder's winning probability, as well as individual bidder's bids. The toehold effects are most relevant when there is

[25] We exclude the top toeholders from the sample and calculate total toehold accordingly.

higher level of uncertainty. Moreover, our empirical analysis identifies significant winners' curse in the land auctions: toehold asymmetries are associated with both lower winning bid and reduced bids from bidders with lower toeholds.

5.3 Toehold and the Wealth Effect

Auction outcomes should have implications for the market values of bidders. A unique prediction of the toehold effect is that a bidder may benefit from its toehold even if *it loses*. As we note earlier, this prediction also provides a way to distinguish between the toehold hypothesis from a synergy story. We estimate the following model based on the market reactions to news of losing the auctions.

$$CAR_{ij} = a + b\ Toehold + c\ Price\ Premium + Auction\ Controls + Bidder\ Characteristic + District\ Dummies + \varepsilon_{jt}, \qquad (12)$$

where i indexes bidders, j indexes auctions. The independent variable, CARs, is the abnormal return of losing bidders during a 3-day window from one day before to one day after the auction date. We use two measures of CARs: one is the abnormal return from a standard market model; the other is the first measure of CARs normalized by the standard deviation of returns as suggested by Boehmer, Musumeci, and Poulsen (1999).[26] We expect *b* and *c* to be positive.[27]

As shown columns (1) and (2) in Table 5, the coefficient on *Toehold* has a significantly positive sign (at the 10% level for CAR and marginally significant at the 10% for a one-sided test for the standardized CAR), suggesting that losing is especially good news for those who have a higher toehold. Similarly, a higher sales price premium (*Price Premium*) benefits losers in the auctions (marginally significant at the 15% level for CARs and significant at 10% for a one-sided test).

We expect that the losers with toeholds would benefit little if the winning bid turns out to be low. Thus we further divide the sample into auctions with the sale price premium above and below the median value, respectively. Indeed, as shown in columns (3) – (6) of Table 5, the toehold effect is present only when the sales price premium is above the median value.

Finally, since the larger auctions tend to have more visibility and thus potentially greater impact on the price at which toeholds can be eventually sold, we expect the positive toehold effect on a bidder's market value to be stronger for such auctions. Therefore, we

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[26] One complicating factor in calculating abnormal returns is that there might be multiple events during the event window. In our sample, there are no cases where auctions occur in two consecutive days. However, the same bidders may participant in multiple auctions on the same day. Since our main results are for losers in the auctions, this may affect our results if a bidder loses in some auctions but wins in other auctions. Our results are robust to exclusion of such cases, which is not surprising since there are many more losers than winner in a given auction day and thus it is hard for the results from winners to explain those of the losers.
[27] We do not include the lot size in the estimation, since it should not affect the non-winners. To the extent it may affect the winners, we include, in an un-reported estimation, an interaction between winner and lot size, the coefficient is not significant.

divide the sample into those auctions with lot size above and below the median. As presented in columns (7)-(10), the positive effects of both toehold and price premium on the bidder's market value are driven by larger auctions – for these auctions, the toehold is significantly positive at the 10% level for both CAR measures and the price premium is significant at the 5% level for CARs and at the 1% level for standardized CARs.

VI Conclusion

In this paper, we provide evidence of a "toehold effect" in bidding behavior in the context of land auctions in Hong Kong. In these ascending bid auctions, the bidders are property developers who often have other projects that are under development in the same region. We show that if a higher winning bid in the auction helps all developers with projects under construction in the same region obtain higher prices during the pre-sale of these projects – as a result, we have an effect very similar to the toehold effect studied, for example, in the context of takeover bidding. In the context of the property market, these toehold effects are expected to be the strongest when there is greater uncertainty about the value of land. We find strong evidence in support of a toehold effect. Consistent with models of bidding with toeholds, the probability of winning in an auction is increasing in a bidder's toehold. While individual bidders' bids are increasing in the toehold, both the winning bid as well as bids of winners other than the top toeholder are decreasing in measures of toehold asymmetry, consistent with winners' curse and the common value models of Bulow, Huang and Klemperer (1999). These toehold effects are stronger when there is greater uncertainty about value, measured by the coefficient of variation of analysts' value estimates. Finally, loser's stock prices react positively to the news of a loss, and the announcement effect is increasing in the losers' toehold as well as the premium reflected in the winning bid.

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Table 1. Summary Statistics

The table presents summary statistics for auction and bidder characteristics, auction outcomes and the stock price reactions of winners and losers to announcements of the auction outcomes. Total Assets is the book value of total assets. Debt/Assets is the ratio of the long-term debt to the total assets. Market-to-book is the market-to-book ratio of the total assets. ROA is earnings before extraordinary items over total assets. Cash/Assets is the sum of cash and marketable securities over total assets. CAPEX/Assets is the capital expenditure over total assets. An identified bidder in an auction is any of our fourteen major (publicly traded) developers that are identified as having participated in the auction. The premium on the winning bid is the winning bid divided by the mean of the analysts' estimates of the value of the land being auctioned. Other bid premia are similarly defined

	Mean (1)	Median (2)	Standard Deviation (3)
Panel A: Overview of Hong Kong Land Auctions			
Number of Auctions (1994-2004)	201		
Number of Identified Bidders Per Auction	2.59	2.00	1.57
Total Toehold	1,113,813	669,185	1,330,635
Lot Size (Development Area in Square Footage)	365,761	244,836	406,303
Premium on Winning Bid	1.07	1.04	0.31
Dispersion of Unit Forecast Price (Coefficient of Variation)	0.17	0.15	0.12
Panel B: Bidder Characteristics			
Total Assets (HK$ Bil)	49.10	35.80	46.00
Debt / Asssets	0.15	0.14	0.07
Market-to-Book Assets	0.79	0.70	0.38
ROA	0.06	0.05	0.06
Cash Flow / Assets	0.06	0.06	0.04
CAPEX / Assets	0.02	0.01	0.03
Panel C: Bid Premia and Auction Outcomes			
Bid Premium for Positive Toeholders	1.04	1.00	0.32
Bid Premium for Zero Toeholers	1.02	0.97	0.31
Fraction of times a positive toeholder wins	0.43		
Bid Premia for Above Median Toeholders	1.06	1.02	0.29
Bid Premia for Below Median Toeholders	1.02	0.97	0.31
Measure of Teohold Symmetry - Second Highest Toehold/ Highest Toehold	0.36	0.35	0.32
Measure of Toehold Asymmetry - Only One Positive Toeholder in Auction	0.23		
Premium on Winning Bid with High Measure of Toehold Symmetry (Above Me	1.07	1.05	0.29
Premium on Winning Bid with Low Measure of Toehold Symmetry (Above Me	1.04	1.02	0.31
Premium on Winning Bid with Only One Positive Toeholder in Auction	1.09	1.05	0.31
Premium on Winning Bid with More than One Positive Toeholder in Auction	1.07	1.04	0.32
Panel D: Cumulative Abnormal Returns for the Window (-1 day, +1 day)			
Losers			
All Auctions	0.47%	0.38%	3.26%
High Premium on Winning Bid	0.82%	0.43%	3.42%
Low Premium on Winning Bid	-0.19%	0.12%	2.89%
Large Development Area	0.56%	0.35%	3.44%
Small Development Area	0.34%	0.43%	2.94%
High Toehold	0.93%	0.53%	3.19%
Low Toehold	0.28%	0.37%	3.27%
Winners			
All Auctions	0.45%	-0.15%	3.56%
High Premium on Winning Bid	0.84%	0.50%	4.06%
Low Premium on Winning Bid	-0.05%	-0.57%	3.00%
Large Development Area	0.47%	-0.27%	3.52%
Small Development Area	0.40%	0.47%	3.73%
High Toehold	0.51%	-0.35%	3.85%
Low Toehold	0.39%	-0.09%	3.30%

Table 2. Toeholds and the Winning Probability

The table reports results of a Probit model in which the dependent variable takes a value of 1 for a particular developer if that developer is a winner in an auction, and zero if a developer participates in an auction, but does not win. The regression is restricted to auctions where the project takes more than two years from the auction date to complete. Toehold is the natural log of 1 plus the toehold reported two years later. Total Toehold is the natural log of 1 plus the sum of the toeholds of all major developers. Uncertainty is the coefficient of variation of the analysts' value estimates for the land prior to the auction. All financial variables for the major developers are as of the end of the fiscal year in which the auction takes place. Total Assets is the book value of total assets. Debt/Assets is the ratio of the long-term debt to the total assets. Market-to-book is the market-to-book ratio of the total assets. ROA is earnings before extraordinary items over total assets. Cash/Assets is the sum of cash and marketable securities over total assets. CAPEX/Assets is the capital expenditure over total assets. The t-statistics are based on robust standard errors and allow for clustering by year. ***, ** and * denote, respectively, significance levels at 1%, 5% and 10%.

	Whole Sample		Uncertainty >10%	Uncertainty <10%
	(1)	(2)	(3)	(4)
Toehold	0.031**	0.033**	0.037*	0.029
	(0.014)	(0.016)	(0.023)	(0.053)
Auction and bidder controls:				
Last Winner		0.666*	0.174	1.225***
		(0.345)	(0.432)	(0.425)
Total Toehold	0.019	0.013	0.048*	0.066
	(0.023)	(0.021)	(0.027)	(0.062)
Log (Development Area)	0.181**	0.163	0.151	0.208
	(0.090)	(0.114)	(0.165)	(0.143)
Total Assets	-0.003	-0.002	-0.002	0.007
	(0.002)	(0.002)	(0.002)	(0.008)
Debt/Assets	-0.538	-0.304	-2.35	2.374
	(0.649)	(1.087)	(2.036)	(2.593)
Market-to-book	-0.147	-0.106	-0.357	0.227
	(0.411)	(0.457)	(0.428)	(0.650)
ROA	2.703	2.705	4.855	-6.278
	(2.781)	(3.421)	(3.340)	(4.170)
Cash/Assets	-4.882***	-3.792**	-4.517*	-4.298
	(1.548)	(1.730)	(2.653)	(6.716)
CAPEX/Assets	3.711	4.52	8.445**	0.769
	(3.095)	(3.595)	(3.296)	(5.681)
Observations	317	285	195	71
R^2	0.09	0.13	0.14	0.30

Table 3. Toeholds and the Sales Price

The table reports regression results of the effect of toehold symmetry or asymmetry on the wining bid (or sale price). The regression is restricted to auctions where the project takes more than two years from the auction date to complete. Toehold is the natural log of 1 plus the toehold reported two years later. Total Toehold is the natural log of 1 plus the sum of the toeholds of all participants. Uncertainty is the coefficient of variation of the analysts' value estimates for the land prior to the auction. Uncertainty Dummy takes a value of 1 if Uncertainty exceeds the 25th percentile, and zero otherwise. Toehold Symmetry Measure is a measure of toehold symmetry within an auction, and is the ratio of the second highest toehold to the highest. Toehold Asymmetry Dummy is a dummy variable taking a value of 1 if there is only one positive toehold in the auction, and zero otherwise. The t-statistics are based on robust standard errors and allow for clustering by year. ***, ** and * denote, respectively, significance levels at 1%, 5% and 10%.

	(1)	(2)	(3)	(4)
Development Area	-0.011	-0.014	-0.012	-0.013
	(0.025)	(0.026)	(0.026)	(0.029)
Toehold Symmetry	0.246**	0.101		
	(0.100)	(0.143)		
Uncertainty	-0.192	-0.373	-0.261	-0.036
	(0.460)	(0.513)	(0.512)	(0.489)
Toehold Symmetry*Uncertainty Dummy		0.197*		
		(0.123)		
Toehold Asymmetry Dummy			-0.007	0.144
			(0.051)	(0.095)
Toehold Asymmetry Dummy*Uncertainty				-0.884*
				-0.478
Total Toehold	-0.027	-0.027	0.001	0.002
	(0.023)	(0.023)	(0.014)	(0.013)
Observations	149	149	159	159
R-squared	0.28	0.29	0.18	0.2

Table 4. Toeholds and Bidding

The table reports regression results in which the dependent variable is the highest bid by auction participants. The regression is restricted to auctions where the project takes more than two years from the auction date to complete. Toehold is the natural log of 1 plus the toehold reported two years later. Total Toehold in columns (1) and (2) is the natural log of 1 plus the sum of the toeholds of all participants; in column (3) it is the natural log of 1 plus total toehold of all bidders excluding the highest. Uncertainty is the coefficient of variation of the analysts' value estimates for the land prior to the auction. Uncertainty Dummy takes a value of 1 if Uncertainty exceeds the 25th percentile, and zero otherwise. HighestToehold is the highest toehold in the auction. All financial variables for the major developers are as of the end of the fiscal year in which the auction takes place. Total Assets is the book value of total assets. Debt/Assets is the ratio of the long-term debt to the total assets. Market-to-book is the market-to-book ratio of the total assets. ROA is earnings before extraordinary items over total assets. Cash/Assets is the sum of cash and marketable securities over total assets. CAPEX/Assets is the capital expenditure over total assets. The t-statistics are based on robust standard errors and allow for clustering by year. ***, ** and * denote, respectively, significance levels at 1%, 5% and 10%

	Auctions with At Least Two Bids		Excluding the Top Toeholders
	(1)	(2)	(3)
Toehold	0.004	-0.011	-0.011
	(0.005)	(0.008)	(0.008)
Uncertainty	-0.303	-0.511	-1.045***
	(0.311)	(0.318)	(0.305)
Toehold*Uncertainty Dummy		0.019**	0.032**
		(0.008)	(0.010)
Highest Toehold			-0.102***
			(0.016)
Total Toehold	-0.019**	-0.019**	0.007
	(0.007)	(0.007)	(0.022)
Last Winner	0.148***	0.143**	0.06
	(0.049)	(0.049)	(0.093)
Development Area	-0.016	-0.02	-0.029
	(0.036)	(0.035)	(0.056)
Total Assets	0.000	0.000	0.001
	(0.001)	(0.001)	(0.001)
Debt/Assets	0.2	0.169	0.867*
	(0.476)	(0.422)	(0.420)
Market-to-book	-0.06	-0.074	-0.256
	(0.102)	(0.105)	(0.143)
ROA	0.697	0.643	2.177
	(0.901)	(0.931)	(1.236)
Cash/Assets	0.808	0.657	-0.121
	(0.699)	(0.651)	(0.689)
CAPEX/Assets	1.155	1.021	1.726*
	(0.764)	(0.762)	(0.863)
Observations	173	173	76
R-squared	0.4	0.43	0.77

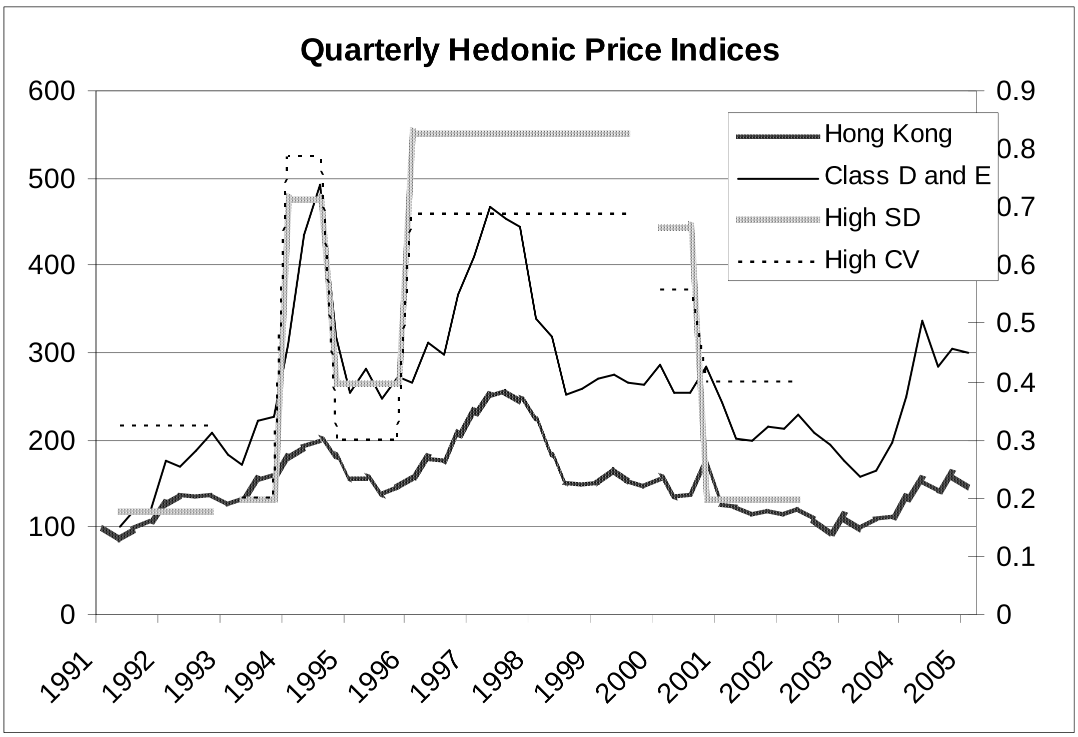
Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Toehold and the Wealth Effect of Auctions

This table reports results of regressions: the estimated coefficients, their respective t statistics (in parentheses) based on robust standard errors and by-year clustering, and R2. The dependent variable is the cumulative abnormal return for the window (-1 day, +1 day) around the auction/tender date based on the market index model where the market return is the total return on the Hong Kong DS market from Datastream for car_m regressions, and standardized CAR(-1,+1) (Boehmer, Musumeci, Poulsen (1991) for car_sm regressions. Premium on Winning Bid is the winning bid divided by the average forecast bid. Development Area is the natural log of the development area of the auctioned land in sq ft. Toehold is the natural log of 1 plus the toehold reported two years later. All financial variables for the major developers are as of the end of the fiscal year in which the auction takes place. Total Assets is the book value of total assets. Debt/Assets is the ratio of the long-term debt to the total assets. Market-to-book is the market-to-book ratio of the total assets. ROA is earnings before extraordinary items over total assets. Cash/Assets is the sum of cash and marketable securities over total assets. CAPEX/Assets is the capital expenditure over total assets. ***, **, *, [a] denote 1%, 5%, 10%, 15% level of significance, respectively; significance at the 10% level by a one-sided test is indicated by [b].

	Whole Sample		High Premium		Low Premium		Larger Lots		Smaller Lots	
		Standized		Standized		Standized		Standized		Standized
	CARs	CARs	CARs	CARs	CARs	CARs	CARs	CARs	CARs	CARs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Development Area	0.003*	0.256**	0.009**	0.498**	-0.004*	-0.049	-0.004	0.163	0.008*	0.393*
	(0.002)	(0.100)	(0.004)	(0.218)	(0.002)	(0.121)	(0.005)	(0.250)	(0.004)	(0.183)
Toehold	0.001*	0.027[b]	0.001*	0.056*	0.001	0.012	0.001*	0.051*	0	0.019
	0.000	(0.021)	(0.001)	(0.037)	(0.001)	(0.039)	(0.001)	(0.030)	(0.001)	(0.038)
Price Premium	0.009[a]	0.504[b]					0.028**	1.571***	-0.015	-0.806
	(0.006)	(0.405)					(0.013)	(0.483)	(0.020)	(0.998)
Total Assets	0.000	-0.005*	0.000	-0.007	0.000	-0.001	0.000	-0.004	0.000	-0.011
	(0.000)	(0.003)	(0.000)	(0.005)	(0.000)	(0.003)	(0.000)	(0.004)	(0.000)	(0.006)
Debt/Assets	0.064	2.741	-0.016	0.681	0.191*	7.289*	0.121	4.198	0.035	1.704
	(0.059)	(2.481)	(0.064)	(3.623)	(0.097)	(3.436)	(0.083)	(2.765)	(0.069)	(3.646)
Market-to-book	-0.013	-0.165	0.006	0.498	-0.041*	-1.673	-0.027	-0.717	-0.001	0.138
	(0.011)	(0.537)	(0.010)	(0.683)	(0.021)	(0.953)	(0.030)	(1.098)	(0.007)	(0.648)
ROA	0.142	6.329	-0.045	3.102	0.436*	16.691**	0.335	15.801	0.083	3.763
	(0.119)	(3.941)	(0.121)	(7.423)	(0.212)	(6.937)	(0.315)	(9.903)	(0.065)	(3.598)
Cash/Assets	-0.034	-4.316	-0.012	-5.234	-0.144	-6.669	-0.105	-8.854	-0.08	-5.803
	(0.066)	(2.805)	(0.068)	(4.088)	(0.129)	(6.924)	(0.125)	(5.516)	(0.113)	(5.445)
CAPEX/Assets	0.025	3.031	0.003	3.123	0.173	9.754	0.011	0.765	0.106	7.461
	(0.128)	(6.189)	(0.123)	(7.316)	(0.208)	(8.575)	(0.146)	(8.250)	(0.241)	(13.288)
Observations	218	218	136	136	79	79	132	132	86	86
R-squared	0.12	0.14	0.23	0.2	0.39	0.33	0.18	0.21	0.25	0.28

Figure 1. The solid lines indicate residential housing price indices in Hong Kong during 1991-2005. Class D & E properties are the largest residential property classes (by area) in Hong Kong. The broken lines are step functions[1] indicating the proportion of transactions with above median standard deviation (SD) and coefficient of variation (CV) of analysts' estimates of the value of auction land over intervals of time corresponding to the length of the steps. Notice that the steps are typically high prior to major drops in the price indices.



[1] There are gaps in the data over two short periods during which we have either no records of auctions or no available analyst estimates.

Table A1. Participation frequencies

This table shows the district-wide participation frequencies of the major developers in land auctions in Hong Kong SAR region.

District	Cheung Kong	Chinese Estates	COLI	Hang Lung	Henderson Land	Kerry	K. Wah	Lai Sun	New World Development	Paliburg	Sino Land	Sun Hung Kai	Tai Cheung Holdings	Wharf	Total
ABERDEEN	1	0	0	0	0	0	0	0	0	3	0	0	2	0	6
CAUSEWAY BAY	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
CHEUNG SHA WAN	1	0	0	0	0	0	1	0	1	0	2	0	0	0	5
HO MAN TIN	4	1	6	1	3	0	2	3	2	1	3	5	0	1	32
HUNG HOM	5	0	0	2	3	1	3	0	1	2	5	3	0	1	26
ISLANDS	1	0	1	0	0	0	2	0	0	0	1	0	0	0	5
KOWLOON TONG	2	1	1	0	0	1	1	0	1	1	4	0	0	0	12
KWUN TONG	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
MA ON SHAN	2	1	1	3	5	1	3	0	3	1	5	3	0	0	28
MID-LEVELS	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2
MONGKOK	1	0	0	2	1	0	1	0	1	0	2	0	0	0	8
NORTH	2	0	0	0	4	7	2	1	0	1	6	3	3	1	30
NORTH POINT	2	0	0	1	0	0	1	0	1	2	3	0	1	2	13
PEAK & SOUTH	3	2	1	2	1	1	1	1	2	4	3	3	1	1	26
SAI KUNG	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2
SHATIN	2	1	3	0	2	1	2	0	1	1	6	5	5	2	31
SHAU KEI WAN	2	0	3	0	2	1	2	2	0	3	3	2	1	0	21
SHEK KIP MEI	0	0	1	0	0	1	0	2	0	0	2	1	0	0	7
SHEUNG WAN & CENTRAL	0	0	0	0	1	0	0	0	0	1	1	0	0	0	3
TAI PO	5	0	4	4	5	2	1	5	1	7	6	1	1	2	44
TSEUNG KWAN O	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
TSIM SHA TSUI	1	0	2	0	0	0	1	0	0	1	3	0	1	0	9
TSUEN WAN	1	0	0	1	0	3	4	1	0	1	5	1	0	0	17
TUEN MUN	4	0	3	2	1	0	5	1	0	4	6	3	5	0	34
WONG TAI SIN	4	0	0	1	2	1	1	0	2	0	1	3	0	2	17
YUEN LONG & TIN SHUI WAI	4	0	1	2	5	5	1	1	1	7	7	3	2	0	39
Total	47	7	28	22	36	26	35	17	17	40	77	36	22	12	422

Table A2. Winning frequencies

This table shows the district-wide winning frequencies of the major developers in land auctions in Hong Kong SAR regrion.

District	Cheung Kong	Chinese Estates	COLI	Hang Lung	Henderson Land	Kerry	K. Wah	Lai Sun	New World Development	Paliburg	Sino Land	Sun Hung Kai	Tai Cheung Holdings	Wharf	Total
ABERDEEN	0	0	0	0	0	0	0	0	0	2	0	0	1	0	3
CHEUNG SHA WAN	1	0	0	0	0	0	1	0	1	0	1	0	0	0	4
HO MAN TIN	1	0	3	1	1	0	0	0	0	0	1	1	0	0	8
HUNG HOM	3	0	0	0	1	0	0	0	0	0	1	2	0	0	7
ISLANDS	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
KOWLOON TONG	0	1	1	0	0	0	1	0	0	0	2	0	0	0	5
KWUN TONG	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
MA ON SHAN	1	0	0	1	0	0	1	0	0	0	3	0	0	0	6
MID-LEVELS	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
MONGKOK	1	0	0	1	0	0	0	0	0	0	1	0	0	0	3
NORTH	1	0	0	0	1	2	0	0	0	0	4	2	0	0	10
NORTH POINT	1	0	0	0	0	0	0	0	0	0	2	0	0	0	3
PEAK & SOUTH	0	0	1	0	0	0	0	0	0	1	1	1	1	0	5
SHATIN	0	0	2	0	0	0	1	0	0	0	1	2	1	1	8
SHAU KEI WAN	0	0	0	0	1	0	0	0	0	1	2	0	1	0	5
SHEK KIP MEI	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
SHEUNG WAN & CENTRAL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
TAI PO	1	0	0	2	3	1	0	3	0	2	2	0	0	0	14
TSEUNG KWAN O	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
TSIM SHA TSUI	1	0	0	0	0	0	0	0	0	0	1	0	1	0	3
TSUEN WAN	1	0	0	0	0	3	2	0	0	0	4	0	0	0	10
TUEN MUN	0	0	1	2	0	0	1	0	0	0	2	0	4	0	10
WONG TAI SIN	0	0	0	0	0	0	0	0	0	0	0	2	0	1	3
YUEN LONG & TIN SHUI WAI	2	0	1	0	1	4	0	0	0	3	5	2	0	0	18
Total	14	1	9	8	8	10	9	3	1	9	37	12	9	2	132