Land Auctions in Singapore

Christopher Saw

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Introduction

- State-owned land in Singapore is sold to private developers through first-price, sealed bid auctions
- Land is sold on lease for commercial, industrial, hotel, or residential purposes; leases are mostly for 99 years, except industrial leases (15/30/45 years)
- This market provides a rich setting for IO research
  1. Bidders interact with each other regularly
  2. The seller announces what it wants to sell every 6 months, and later conducts a separate auction for each piece of land
  3. The average tender period is about 60 days
  4. After every auction, the seller announces all bids received and names of the bidders
- The primary goal of this project is to understand the behaviour of market participants and ask if bidding is competitive

Collecting the data

- I collect data from past auctions from two sources: the Urban Redevelopment Authority (URA) and the Housing Development Board (HDB)[1]
- HDB's bid and sales data are fully available and start from 1990
- URA only provides data on final sales, but a news release at the time of auction close shows the bids Example
- I hand-collected old news releases using internet web archives and manage to gather bid data from 1996 Example
- My current dataset consists of 582 auctions with 3,684 observed bids, from 1990 to 2022 — and there is more data from URA I have not collected
- I observe site details (size, location, land type[2]), bids made, the names of bidders/winner and sale price

[1] Auctions conducted by URA and HDB are identical.

[2] Sites are zoned as residential, commercial, industrial, hotel, or mixed-use.

There are many bidders in each auction

Land Type[3]	No. Auctions	(%)	No. Bids	(%)	Avg. No. of Bids	SD	Max
Residential	369	63.4	2588	70.2	9.83	5.17	32
Commercial	35	6.0	155	4.2	7.11	2.71	14
Mixed (Resi/Comm)	33	5.7	221	6.0	10.0	3.32	15
White Site	21	3.6	93	2.5	7.00	4.20	15
Hotel	31	5.3	185	5.0	8.52	3.18	15
Industrial	73	12.5	380	10.3	7.98	4.48	18
Others	20	3.4	62	1.7	6.60	3.76	11
URA	392	67.4	2336	63.4			
HDB	190	32.6	1348	36.6			
Total	582	100.0	3684	100.0			

[3] A white site can be used for any mix of residential, commercial, recreational or hotel developments. Others includes purposes such as hospitals, agriculture, and places of worship.

Many bidders participate only once, and a few bidders win many times

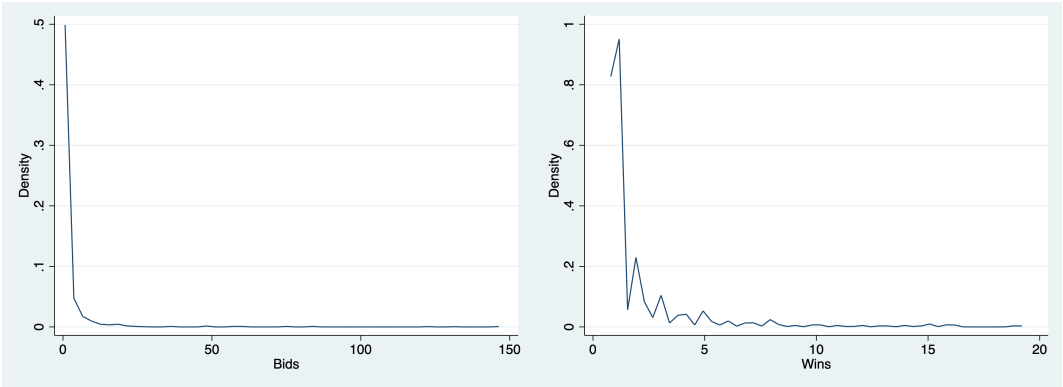

Figure 1: Frequency[4] of bidding and winning in Singapore land auctions

[4]For joint bids with 2 or more bidders, each bidder is counted separately.

Bids differ across and within land types

	Bid (S$ mil)	PSM (S$ per m^2)	Site Area ($1000m^2$)
Residential (N: 2588)			
Mean	180	4415	17.6
SD	142	3162	10.9
Commercial (N: 155)			
Mean	396	7213	11.6
SD	414	3627	9.5
Mixed (N: 221)			
Mean	324	8795	11.4
SD	254	3970	7.0
Hotel (N: 185)			
Mean	112	6547	5.0
SD	104	3947	3.6

Table 1: Summary Statistics on Bids and Site Area

About 9% of auctions are won by a margin of $< \$1m$

Bid spread (s)	**Freq.**	**(%)**	**Cumulative (%)**
$s \leq 1{,}000$	2	0.39	0.39
$1{,}000 < s \leq 10{,}000$	0	0	0.39
$10{,}000 < s \leq 100{,}000$	3	0.59	0.98
$100{,}000 < s \leq 1\text{m}$	41	8.01	8.98
$1\text{m} < s \leq 10\text{m}$	216	42.19	51.17
$s > 10\text{m}$	250	48.83	100
Total	512	100	100

Table 2: Distribution of bid spread

	Total	**Residential**	**Industrial**	**Hotel**	**Mixed**
Freq.	46	32	11	2	1

Table 3: Auctions with bid spread (s) $< \$1m$

I use OLS to control for observable differences across bids

- The bid-level regression for bid i in auction t looks like

$$\begin{aligned}\log bid_{it} = \beta_0 + \log \beta_1 SiteArea_t + \beta_2 TenderPeriod_t + \beta_3 NumberBids_t \\ + \sum_{k=0}^{4} \beta_{4+k} \cdot \mathbb{1}\left(DevType_t\right) \times \log FloorArea_{kt} \\ + \alpha \cdot \mathbb{1}\left(Bidder_{it}\right) + \lambda \cdot \mathbb{1}\left(Location_t\right) + \delta \cdot \mathbb{1}\left(Year_t\right) + \varepsilon_{it}\end{aligned}$$

- $\sum(\cdot)$ interacts a dummy $\mathbb{1}(\cdot)$ for each type with the relevant floor area measure (*Ind* uses the *Gross Plot Ratio*; the rest use *Gross Floor Area*)
- I also estimate a specification with log(*BidSpread*) as the dependent variable
- I then plot $\exp(\hat{\varepsilon}_{it})$ to get a sense of private values (from a specification without bidder FEs)
- I drop the *Others* category; OLS sample has 512 auctions and 3,622 bids

VARIABLES	(1) log(Bid)	(2) log(Bid)	(3) log(BidSpread)
log (Site Area)	0.962***	0.799***	0.520***
	(0.0205)	(0.0297)	(0.130)
Tender Period	0.00114***	0.000959***	0.000615
	(0.000253)	(0.000276)	(0.00163)
No. Bids	-9.66e-05	0.00108	-0.0422**
	(0.00262)	(0.00386)	(0.0182)
1.Resi X log(GFA)	0.0892***	0.0695***	0.0632***
	(0.00793)	(0.0159)	(0.0199)
1.Comm X log(GFA)	0.122***	0.115***	0.171***
	(0.0110)	(0.0207)	(0.0400)
1.Mixed X log(GFA)	0.105***	0.0859***	0.134***
	(0.00806)	(0.0155)	(0.0345)
1.Hotel X log(GFA)	0.0930***	0.0814***	0.146***
	(0.0109)	(0.0191)	(0.0513)
1.White Site X log(GFA)	0.156***	0.119***	0.190***
	(0.0110)	(0.0201)	(0.0455)
1.Ind X log(GPR)	-0.692***	-0.471***	0.0413
	(0.103)	(0.173)	(0.366)
Constant	7.345***	8.591***	11.85***
	(0.261)	(0.391)	(1.543)
Bidder FE	No	Yes	
Location FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	3,622	3,622	512
R-squared	0.844	0.943	0.342

Robust standard errors in parentheses

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

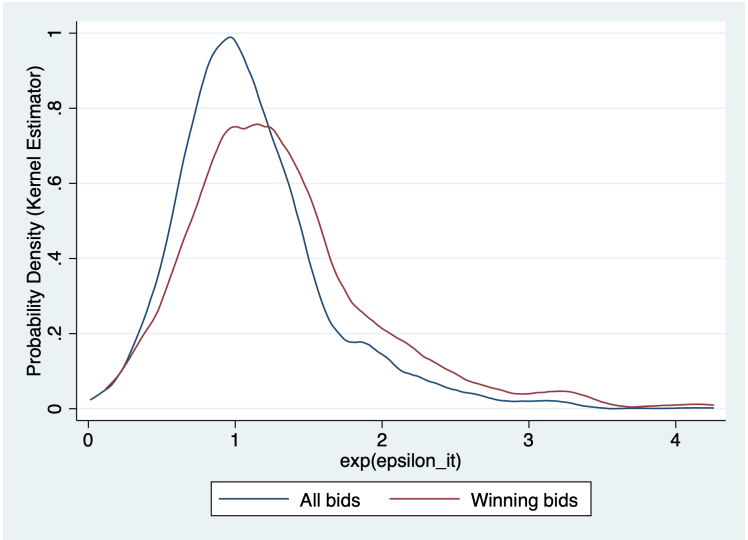

Figure 2: $\exp(\hat{\varepsilon}_{it})$ from log regression (1)

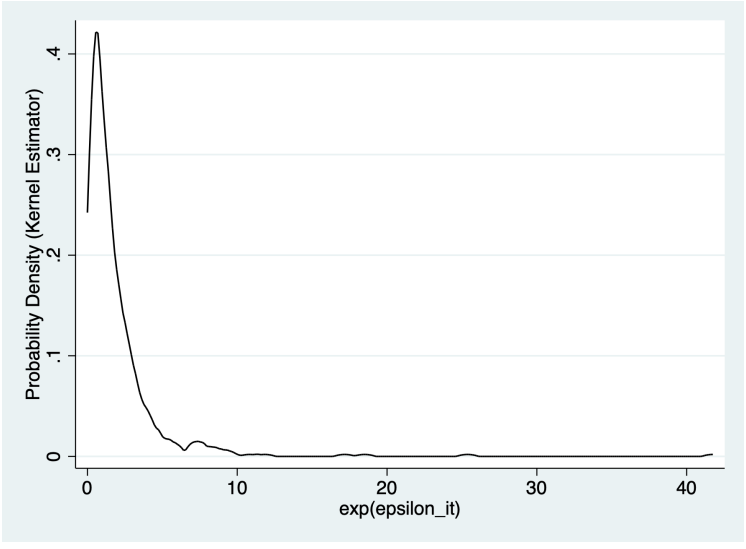

Figure 3: $\exp(\hat{\varepsilon}_{it})$ from (3), with $\log(BidSpread)$ as LHS variable

The market has several features that make collusion plausible

- Asymmetry among bidders (strong vs weak) and repeated interaction among strong bidders/incumbents
- Seller's actions are predictable (holds a set of auctions every 6 months, announces future supply of land)
- Average tender period (60 days) could facilitate communication among bidders
- Ex-post announcement of bids by seller — perfect and zero-cost monitoring for a bidding ring, should one exist
- Narrow margins of winning could be episodes of deviation, or a coordinated appearance of competition
- Are there phantom bids? Can I construct a test for whether bidders play the same strategy in equilibrium?
- Do strong bidders compete in the same auctions? Is there bid rotation?

Appendix

How is the sale of land conducted?

- Each sale begins with an announcement[5] of available sites; a site is either on the
  (i) **Confirmed List** — which will be put for auction within the next 6 months; or
  (ii) **Reserve List** — which will be put for auction at the seller's discretion (next slide)

- Regardless, once a site is put for auction, the auction has the following timeline:
  (1) *Date of Launch:* Auction begins; further site details and deadline to bid are given
  (2) *Date of Closing:* Bidding closes and the bids received are announced
  (3) *Date of Award:* An official announcement of the winner is made

- The average tender period (between *Date of Launch* and *Date of Closing*) is about 60 days

[5] Announcements are made every 6 months.

Reserve List Sites

- The Reserve List provides a way for land supply to respond to demand conditions
- It also provides a signal of future land supply (unsold land on the Reserve List is likely to be on a future Confirmed List)
- Reserve List sites are announced every 6 months together with Confirmed List sites, but they have no pre-determined date of launch
- Instead, Reserve List sites are made available for application, and will be put for auction at the seller's discretion:
  - When the seller receives at least one application above their reserve price[6]
  - When more than one unrelated party has submitted a minimum price that is *close to* the reserve price, within a reasonable period.

[6] The applicant who triggers a sale is committed to participating in the auction with a bid that is at least what they indicated. If they fail to do so, they lose their deposit.

LAND PARCEL AT BUKIT TIMAH LINK

ALLOWABLE DEVELOPMENT	:	**RESIDENTIAL**
SITE AREA	:	**4,611.1 m²**
MAXIMUM PERMISSIBLE GFA	:	**13,834 m²**
DATE OF LAUNCH	:	**31 AUGUST 2022**
DATE TENDER CLOSED	:	**3 NOVEMBER 2022**
LEASE PERIOD	:	**99 YEARS**

RANKING	NAME OF TENDERER	TENDERED SALE PRICE ($)	TENDERED SALE PRICE IN $PSM OF GFA
1	Bukit One Pte. Ltd.	200,001,888.00	14,457.27
2	Winchamp Investment Pte. Ltd.	172,888,888.00	12,497.39
3	Sims Park Pte Ltd	161,777,000.00	11,694.16
4	Sing Holdings Limited	155,200,000.00	11,218.74
5	TID Residential Pte. Ltd.	138,485,000.00	10,010.48

Figure A1: Example of Press Release Annex A (Bid Information) Back

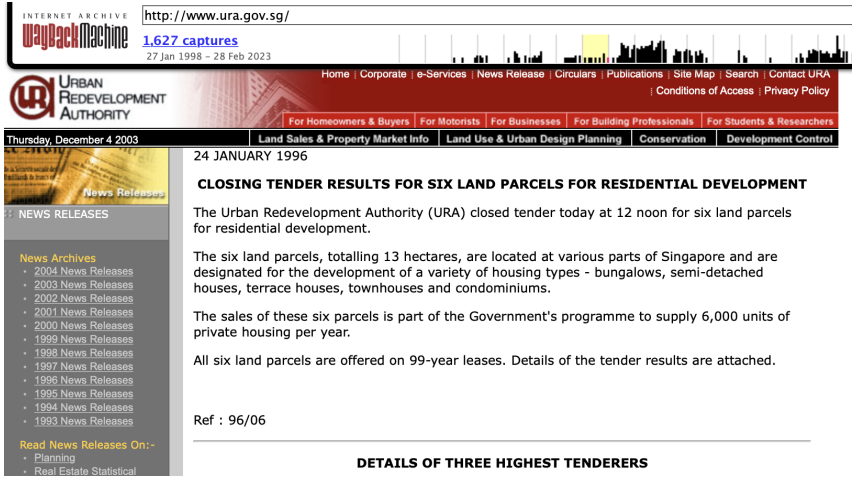

Figure A2: Getting Bid Information from 1996 Back

Technical issues

- I do not have clean bidder fixed-effects
  - Bid i in Auction 1 could be submitted by (X, Y, Z)
  - Bid i' in Auction 2 could be submitted by (X, Y), or (W, Z)
- There could also be unobserved (from this dataset) relationships between bidders in the data due to parent companies, holding companies, subsidiaries etc.
  - Bid j in Auction 1 submitted by R
  - Bid j' in Auction 2 submitted by S
  - R and S share the same parent company P (unseen from this data)
  - OR R is actually a holding company for joint venture by A and B (also unseen)
- Further text analysis of bidder names is needed to deal with these issues
- If joint ventures are more common for non-residential developments, it may be cleaner to study the sub-sample of *Residential* auctions