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# Jump bids in real estate auctions

Dag Einar Sommervoll

*School of Economics and Business, Norwegian University of Life Sciences and NTNU Trondheim Business School, Norway*

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ABSTRACT

The lion's share of Norwegian homes changes hands through closely monitored and regulated auctions. Some housing market experts advocate the supremacy of a jump bid, a significant bid increase to discourage fellow bidders, and thereby acquire the dwelling at a lower price compared to bidding strategy with moderate bid increases. We find no evidence for the efficacy of this jump bid strategy. Jump bidders, if successful, pay a positive jump premium. This also applies to the case where the jump is not the final bid and the jump bidder win at a later stage. In this case, the jump bid premium is around 1 to 2%. However, a jump bid is a credible signal of "serious intentions". Jump bidders tend to win auction more often even in cases, where the jump bid is matched, and the auction continues.

## 1. Introduction

To acquire a home by entering a real estate auction is, for most, a scary endeavor. Bids tend to be several times the bidder's annual net income, and bid increases may be enough to buy a new car. The bids are naturally placed with care and with the intention to acquire the dwelling at the lowest possible cost.[1] In the case of an English auction, classic auction theory is comforting.[2] Bids should be raised by small increments (straight forward bidding) (Milgrom and Weber, 1982; Bikhchandani and Riley, 1991). In this case, the bidder with the highest willingness to pay acquires the dwelling at a price close to the second-highest willingness to pay in the group of bidders.[3] In contrast, a bid that involves a large bid increase, a jump bid, may surpass the second-highest willingness to pay by an excessive margin. A bidding round is a strategic game, where bids and bid increases serve as signals. There is a burgeoning literature on auction environments where jump bids are perceived to be rational (Ettinger and Michelucci, 2015).

A prospective homeowner is not likely to delve into academic journals and make up her mind regarding what economic auction model she finds adequate and place bids according to its recommendations. She may, however, try to seek advice from "real estate experts". One such piece of advice (under the title "The correct and smart way to bid") is:[4]

*In an auction with modest increments, you strike swiftly with a bid that outdistances the other bidders. The point is to show strength and encourage others to give up before the price slowly but inevitably ends up too high...*

This advice could make sense if bidders enter the auction with a fuzzy willingness to pay. A jump bid stimulates some bidders to exit early, and the transaction price potentially ends up lower compared to an auction with straight forward bidding.

In this paper, we adopt the bidders' perspective and ask: Do jump bids work? We address this question empirically by considering a rich data set on auctions in the Norwegian housing market.

We find that jump bids correlate with higher prices. A jump bidder that wins with a final jump may fear that she surpassed the second-highest willingness to pay by an excessive margin. In the case that the jump bid seals the deal, our jump premium estimate is in the 9 to 10% range. This is consistent with that the unmatched jumps on average are too high. More intriguing is that a jump premium in the 1 to 2% range also applies in the case where the jump bidder wins at a later stage. This premium is present even when we control the competitiveness of the auction. This finding is not consistent with the efficacy of a jump bid to deter competition. However, we find that jump bidders win auctions more often, even in the case where the jump was matched, and the auction continues. In other words, a jump bid is a credible signal of determination.

*E-mail address:* dag.einar.sommervoll@nmbu.no.

[1] In Norwegian real estate auctions all bids are legally binding.

[2] An English auction is an open outcry ascending auction. Bidders observe the current highest bid and may place a higher bid. The object in question (a house) change hands at a price equal to the final and highest bid if it surpasses the seller's reservation price.

[3] In other words, the transaction price is close to the expected outcome of a Vickery auction (sealed-bid auction where the bidder with the highest bid gets the object in question for a price equal to the second-highest bid).

[4] This example is taken from http://e24.no/privat/eiendom/bolig/slik-byr-du-riktig-og-smart/10076677. e24 is a well-known and much-read Norwegian e-newspaper. The strategy of placing a jump as a signal of strength is considered by Hörner and Sahuguet (2007).

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The paper is organized as follows. Section 2 gives a brief literature review on jump bids in auctions. Section 3 provides information about the Norwegian real estate auctions. We present institutional details as well as describe how the auction tends to unfold. This "behind the scenes"-information provides some insight into possibilities and limitations of auction signaling. Moreover, we give a brief discussion of bid increments in real estate auctions. Section 4 states different jump bid criteria and gives a jump bid definition. The section also provides summary statistics of dwelling types, hedonic characteristics, and bidding rounds for bidding rounds with and without jump bids. In Section 5, we look at the consequences of jump bids. We find that jump bids correlate with higher transaction prices and explore two possible explanations for this.[5] Section 6 consider reasons for jump bids. We explore to what extent they are a response to competitive auctions and whether or not they seem to be an attempt to stress the seller and fellow bidders. Section 7 concludes.

## 2. Literature review

A jump bid has the obvious downside of exceeding the fellow bidders' willingness to pay. In this case, the jump is misguided, and jump bidder ends up paying too much. The auction literature, however, offers a wide array of theoretical justifications for jump bids. The following list gives the most common explanations:

i. Signaling (Avery, 1998). In Avery's seminal paper jumps in the first round helps bidders to coordinate upon an equilibrium in the second round. Hörner and Sahuguet (2007) consider jump bids as a signal of strength to deter subsequent competition.
ii. Revision cost of bids (Fishman, 1988; Hirshleifer and Png, 1989; Daniel and Hirshcleifer, 1998). Revisions can be costly. A jump can give fewer revisions and less costs.
iii. Risk of new arrivals in the auction (Easley and Tenorio, 2004). A jump can discourage new bidders from entering the auction.
iv. Manipulate the quality of new information as the auction unfolds (Ettinger and Michelucci, 2015). Straightforward bidding gives more detailed information regarding the fellow bidders' reservation prices compared to bidding with jumps.
v. Speed up the auction (Börgers and Dustmann, 2005; Rothkopf and Harstad, 1994). There is an economic trade-off between auction duration and bid increases.

None of these rational explanations for jump bids are mutually exclusive, but some of them are less likely to play a significant role in the Norwegian real estate auctions we are considering. In particular, revision costs (ii) are low. A typical auction lasts a day, and speeding up the auction to close the deal (v) or prevent late arrivals (iii) may play a part. The real estate expert advice quoted in the introduction is in line with explanation (i). It is to signal financial strength and determination to deter competition. Explanation (iv) is arguably more abstract, but (Ettinger and Michelucci, 2015) argue that this explanation is likely in the case where the object for sale is hard to evaluate, and there is heterogeneity regarding experience across bidders. The housing market is such a case.[6]

[5] The two possible explanations explored are: 1. Jump bids exceed the second-highest willingness to pay. 2. Jump bids are a credible signal of determination.

[6] The attempt to disrupt the information gathering in the auction is closely linked to auction efficiency. Banks et al. (2003) examine both theoretical and experimental evidence and find that auctions with jump bids may hinder efficiency. Isaac et al. (2005) came to the opposite conclusion; jump bids are either neutral or improve efficiency. Ettinger and Michelucci (2015) show that the strategic environment in open auctions is so rich that jump bids do not necessarily deter competition. It may very well be the other way round transaction prices may be higher. They offer this as an explanation of why open auctions, in general, allow jump bids.

The empirical literature on jump bids is modest. At the same time, there is considerable variation regarding jump bid definitions. In auctions where there is a minimum bid increase, any bid that exceeds this minimal increase is considered a jump bid (Easley and Tenorio, 2004; Raviv, 2008; Grether et al., 2012). Raviv (2008) looks at car auctions where the minimal increase is 25 dollars. Some cars were sold for 50 dollars while others were sold in the 5000 to 10,000 dollar range. Most bids exceed the minimum requirement of 25 dollars, so in that sense, most were jump bids. Plott and Salmon (2004) labels bid as a jump bid if it exceeds the previous bid by 7.5%.

In the Norwegian real estate auctions, there are no rules regarding minimal increments. However, as houses are sold for several million Norwegian kroner (NOK), minimal increments like one NOK, are impractical. This implies that bidding will need to address the trade-off between auction duration and bid increases. We find evidence of "standard" bid increases that can be viewed as straightforward bidding. More challenging is to find a jump bid definition that makes sense across auctions of dwellings with significant variation of fundamental price. We address this challenge by stating seven jump criteria and require a jump to satisfy at least three of these criteria. Moreover, we explore how sensitive our results are to the this jump definition (for more detail see Section 4).

## 3. Data description

### 3.1. Institutional detail

Most dwellings in Norway change hands in an auction with a realtor as an auctioneer. The real estate agent administers not only the auction but also the necessary paperwork. The auction has free entry, and interested parties are entitled to get information regarding the current highest bid. A bid is legally binding, but the seller is not obliged to accept the highest bid.

In most cases, the auction commences shortly after the open house. The open house tends to be on the weekend, and the following Monday is the preferred day for the auction. At the open house is a list where potential bidders can provide their contact information (telephone number/email). Interested parties not present at the open house may contact the realtor directly and be added to the list.

The realtor uses this list when she administers the auction. Often, the auction ends with an accepted bid the same day. There is, however, considerable variation. An auction can last several days, and in principle, an interested party can place a bid before or at the viewing. Moreover, in contrast to most other auctions, the bid also involves a deadline for acceptance. This bid duration may be several days or a few minutes. In other words, there is a possibility to place a (jump) bid with a short duration with the intention to curb competition.

### 3.2. The data set

The raw data set consists of 28,276 auctions with a total of 202,657 bids. Details regarding data preparation and cleaning are given in Table A.1 in the Appendix A. A novel feature of this data set is the minute-to-minute information regarding bidders, bid placement, bid sizes, and bid deadlines. Moreover, the data set contains information about hedonic characteristics and asking prices.

Fig. 1 shows an auction. The first bid is 3,150,000 NOK and expires at noon. Just before 10 a.m., a new bidder enters the auction and half an hour later a third. The first bidder matches the bids of these two new bidders. A few minutes before noon, a fourth bidder enters the auction. The final stage of this bidding war is between bidder 1 and bidder 4. Bidder1's last bid is 3.5 million. The auction ends with Bidder4's final bid of 3.52 million.

Bidder 2 places a bid with a significant bid increase of 200,000 NOK. It is 100,000 over the asking price (and 50,000 over the

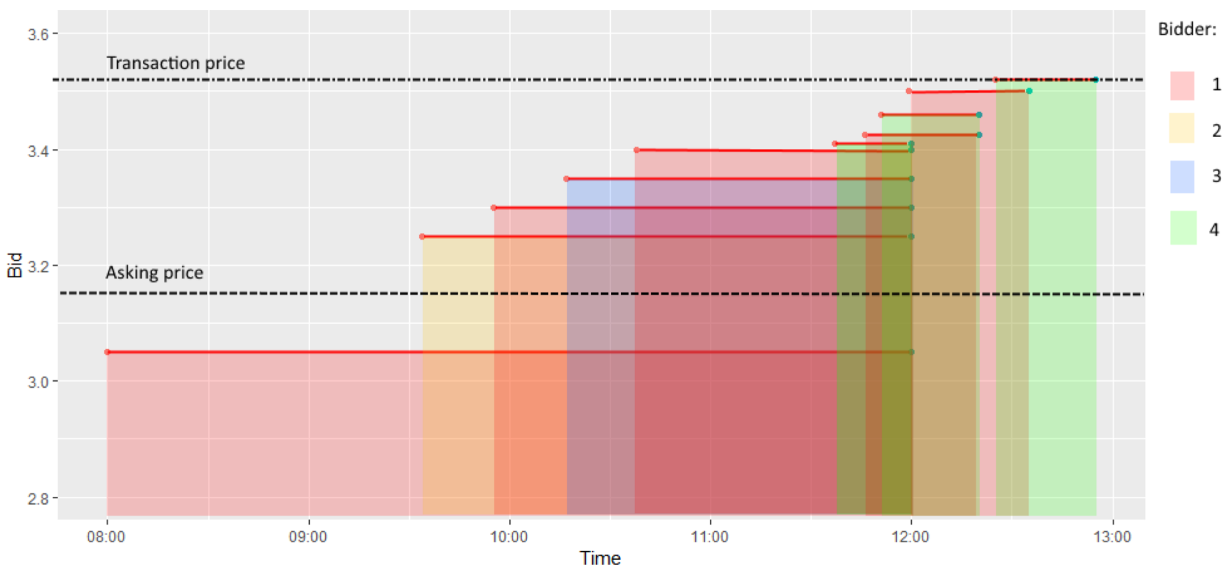


**Fig. 1.** A typical auction. 4 bidders. 10 bids. Bid levels (in millions NOK), bidders, and timings of bids are displayed for each bid. This auction had 15 interested parties, and the market value (appraisal) of the house by a government approved valuator was 3.2 million.).

valuation).[7] Bidder 1 was not discouraged by this bid, and two more bidders entered the auction after this "jump bid". Moreover, the latest bidder to enter the auction managed to win the auction by placing a bid of mere 20,000 NOK above the second-highest bid.

Table 1 gives the summary statistics of key bidding round variables and Fig. 2 gives the frequency of bidding round by the number of bids.

### 3.3. The distribution of bid increases

The lack of an established minimal bid increment in these real estate auctions does not rule out the presence of informal rules. One such example is that all bids and bid increases are in thousands. Table 2 gives a summary of the most usual bid increases. More than 90% of bid increases are round numbers, as we would expect. Furthermore, more than 50% of all bid increments are for the most round numbers of all: 10,000, 50,000, and 100,000.

Fig. 3 gives the distribution of bid durations for all bids and accepted bids.

## 4. Jump bids

The Norwegian real estate auctions do not have a rule regarding minimum bid increases. This means that a jump bid needs to involve a more substantial increase compared to "normal" bid increases. However, a bid increase can be substantial in several ways, both absolute and relative to the value of the house. So rather than using one jump criterion that can easily be challenged, we state seven different jump criteria.

These jump bid criteria are given in Table 3. The table also gives the number of bids according to each of these seven criteria as well as their percentages.[8] Though these seven criteria are chosen with care, they may be challenged as there is no sharp division between a jump bid and a regular bid.

The first four jump definitions are absolute in the sense that they relate to a fixed sum, 100K, or 200K (in NOK). The last three are relative as they relate to a 10% increase relative to the asking price, the EV-estimate, and the valuation, respectively. The main challenge for a general jump definition is the significant variation in fundamental price. In particular, for expensive houses, a 100,000 bid increase above the asking price may not be considered a jump by fellow bidders, but a 10% increase relative to the asking price would. For inexpensive dwellings, it may be the opposite; a 10% bid increase relative may not be considered a jump, but an absolute increase of a 100,000 would. To address this concern, we define a jump to be a bid increase that satisfies three or more of the above-stated criteria. This gives us 602 bidding rounds with jump bids and 4515 bidding rounds without jump bids.

In order to explore the sensitivity of our results to this jump definition, we vary the 10% threshold up and down 2%. It must be noted that a similar variation of the absolute measures is not meaningful due to the clustered nature of bid increases. For instance, there are virtually not any bid increases between 150,000 and 250,000 apart from those at 200,000.

It is natural to assume that the probability of a jump bid correlates with hedonic and bidding round characteristics. To explore to what extent whether or not dwellings that sees a jump bid differ from those that do not see a jump, we compare summary statistics of these two groups. Tables 4 and 5 summarize the result. We see that the jump group experience slightly more interested parties, bids, and bidders. The dwelling characteristics house type, size, and age do not vary significantly. The sales price of jumpers is marginally higher (though not statistically significantly different.)

**Table 1**
Summary statistics for bidding rounds (million NOK).

| Statistic | N | Mean | St. Dev. | Min | Max |
|---|---|---|---|---|---|
| Sales price | 17,744 | 3.5 | 1.9 | 0.05 | 32.5 |
| Asking price | 17,744 | 3.5 | 1.9 | 0.25 | 30.0 |
| No. on interested list[a] | 17,377 | 12 | 11 | 1 | 169 |
| No. Bidders | 17,744 | 2 | 1.4 | 1 | 17 |
| No. Bids | 17,744 | 7 | 5 | 1 | 20 |

*Note:* [a] At the open house, there is a list where interested parties can sign up. Interested parties can also contact the realtor to be put on the list. 17,377 of the 17,744 bidding rounds in our data set had the number of interested parties on the list.

[7] Some dwellings have listed a valuation. This is a market value assessment of a government-approved and independent valuator.

[8] An auction does not necessarily only have positive bid increases. In particular, a bid may expire, and the auction may be dormant (in some cases for days), and a new bid may be lower than the preceding expired bid. In our analysis, we only consider auctions that only have positive bid increases. For more details regarding data preparation, see Table A.1 in the Appendix A.

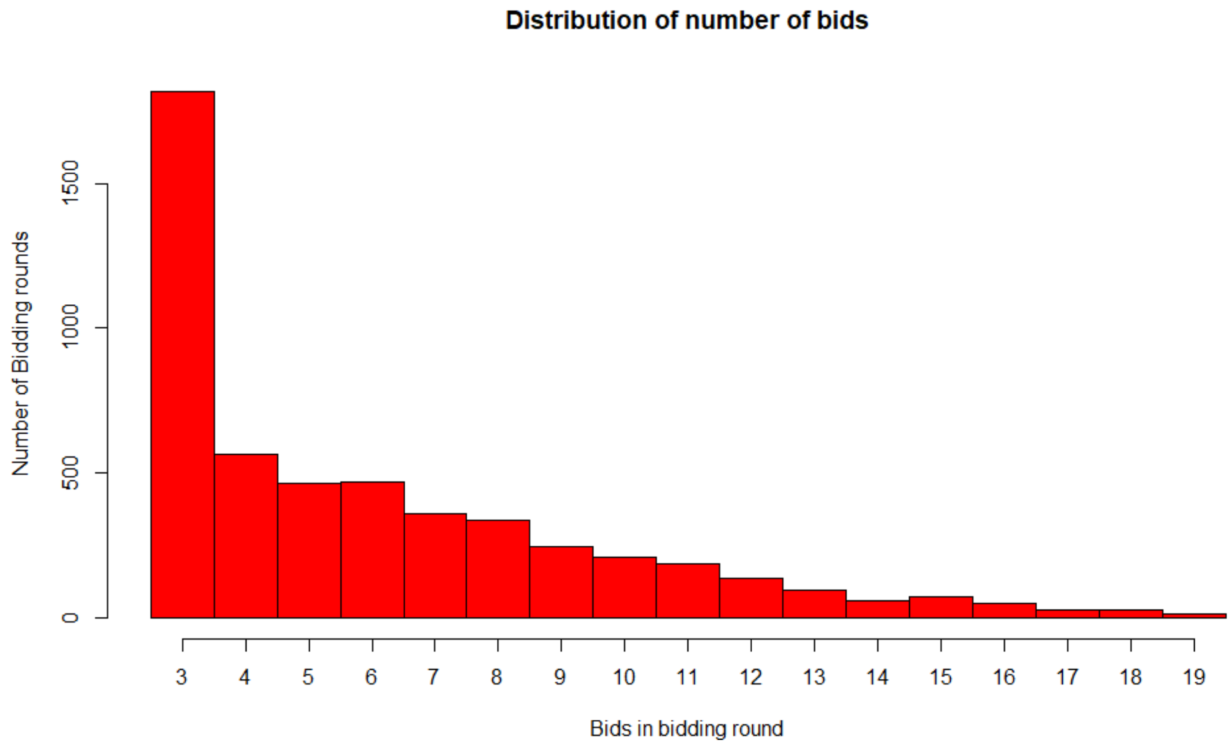


**Fig. 2.** Frequency distribution of bidding rounds by number of bids in bidding round (Three or more bids).

**Table 2**
Distribution of bid increases. Bid increases with frequency over 1%.

| Bid increase | Freq (%) |
|---|---|
| 50,000 | 26.1 |
| 100,000 | 12.4 |
| 10,000 | 12.3 |
| 20,000 | 10.3 |
| 25,000 | 8.0 |
| 30,000 | 6.6 |
| 40,000 | 4.0 |
| 150,000 | 2.3 |
| 200,000 | 2.3 |
| 15,000 | 1.9 |
| 5000 | 1.8 |
| 60,000 | 1.3 |
| 75,000 | 1.2 |
| Sum | 90.7 |

## 5. Consequences of jump bids

### 5.1. Jump bid premium

To find the average effect of a jump bid on the transaction price, all else equal, we would like to see the same unit sold with and without a jump bid at the same time. Neither this nor the prospect of a random assignment to the jump treatment is a viable option. A less appealing first pass is to try to estimate the net effect of a jump on (log)price controlling for hedonic characteristics.

We consider a hedonic model of the following form:

$$\log P_i = \alpha + \sum_{j=1}^{3} \beta_j \log(X_{ji}) + \sum_{j \in FE-regressors} \gamma_j D_{ji} + \eta J_i + \epsilon_i,$$

where $P_i$ is price, $X_{1i}$ is area (in sqm.), $X_{2i}$ is age (in years), $X_{3i}$ is the lot size (if the dwelling is a detached house), $D_{ij}$, are dummy variables, $j \in \{$ Floor number, number of bedrooms, dwelling type, month, postcode$\}$, $J_i$ is the jump dummy, and $\epsilon_i$ is the error term for dwelling $i$.

The first column of Table 6 gives the hedonic model with a jump dummy. The jump bid premium is estimated to be 3.3%.[9] This model has a high $R^2$ (0.896) and controls for location, time of the transaction, and a wide array of hedonic characteristics. Still, there may be unobserved heterogeneity that correlates with both price and jump bids. We will attempt to address the concern of omitted variables in several ways.

One way to address this concern is to try to control for more dwelling characteristics. A Norwegian firm, Eiendomsverdi, owned by Norway's largest bank, DNB ASA, has a real-time valuation of all Norwegian dwellings. Their valuation relies on all Norwegian housing market transactions, a wide array of hedonic variables, as well as more tailored evaluations for idiosyncratic characteristics. Banks and realtors use these evaluations for market price assessments. We interpret this dwelling evaluation as an "official" prediction of common value and call this estimate, EV-estimate (short for EiendomsVerdi-estimate).

We acquired the price predictions for all dwellings on the day of the accepted bid. This paves the way for a regression approach where we estimate the effect of a jump bid controlling for the prediction of common value. Observed transaction prices do not only depend on this "official" estimate alone but potentially also on the reservation price of the buyer. We include the asking price in an attempt to control for the bias driven by the censoring of data due to the seller's reservation price (Gatzlaff and Haurin, 1997).

We consider a regression model (EV model) given by:

$$\log P_i = \alpha + \beta_4 \log(X_{4i}) + \beta_5 \log(X_{5i}) + \eta J_i + \epsilon,$$

where $P_i$ is the transaction price, $X_{4i}$ the EV-estimate, $X_{5i}$ is the asking

[9] The jump bid definition relies on the three relative deviation measures stated in Table 3. It is natural to ask to what extent our results are sensitive to the 10% threshold. To explore this, we run this and all subsequent regressions with $\pm$ 2 percentage variation of this threshold. Table A.2 in the Appendix A gives the regression results for this threshold equal to 8, 10, and 12%. The jump estimate is 2.7, 3.3, and 3.7%, respectively. In other words, a higher threshold translates to a higher jump premium.

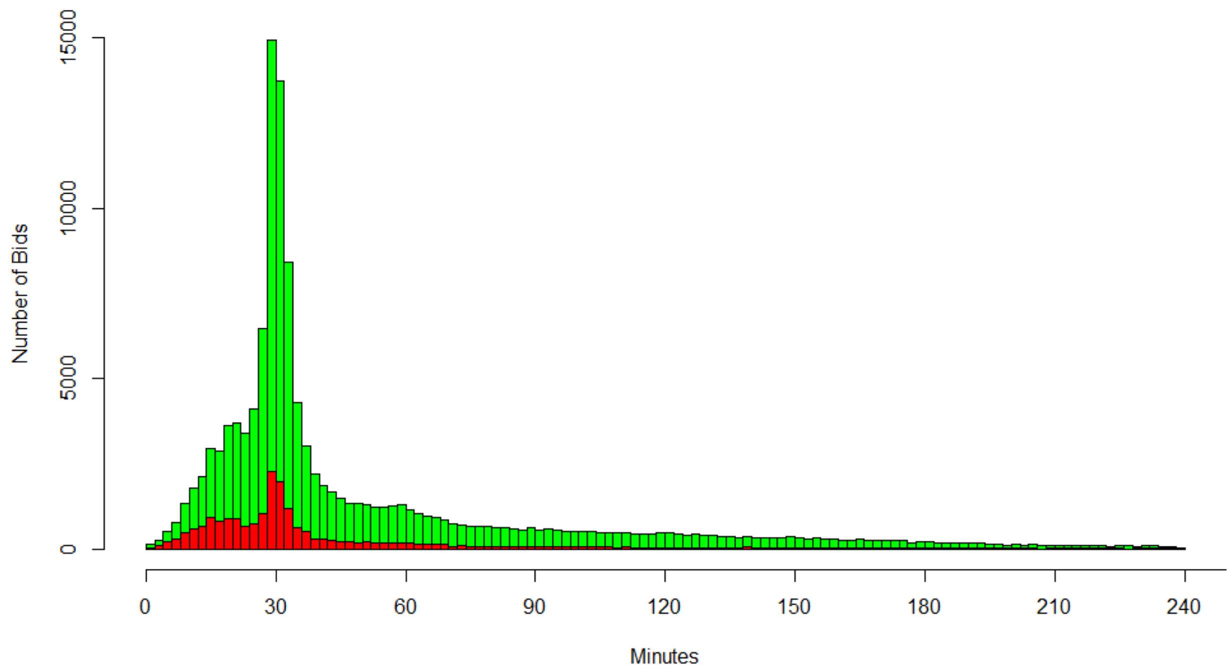


**Fig. 3.** Bid duration (Minutes to the bids expiration time when the bid was submitted). Green: All bids, Red: Accepted bids. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

**Table 3**
Jump criteria.

| Bid Increase | No Jump | Jump | % |
|---|---|---|---|
| ≥ 200K NOK | 27,997 | 1837 | 6.2 |
| ≥ 100K NOK and ≥ 100K NOK above Asking price | 27,820 | 2014 | 6.8 |
| ≥ 100K NOK and ≥ 100K NOK above EV-estimate | 27,861 | 1973 | 6.6 |
| ≥ 100K NOK and ≥ 100K NOK above Valuation | 29,167 | 667 | 2.2 |
| More than 10% of Asking price | 29,116 | 718 | 2.4 |
| More than 10% of EV-estimate | 29,215 | 619 | 2.1 |
| More than 10% of Valuation | 29,576 | 258 | 0.9 |

*Note:* 100*K* short for 100,000. EV-estimate is the market price estimate calculated at the time of the auction. Not all units have a valuation. This affects 20,823 bids.

**Table 4**
A comparison between bidding rounds with and without jump bid (J) 410 bidding rounds, the following line no jump (NJ) 3493 bidding rounds.[a]

| Statistic | Mean | St. Dev. | Min | 1st Qu. | 3rd Qu. | Max |
|---|---|---|---|---|---|---|
| Number of bids (J) | 7.00 | 3.89 | 1 | 4 | 9 | 20 |
| (NJ) | 6.82 | 3.75 | 1 | 4 | 9 | 20 |
| No on int. list[b] | 12.91 | 10.35 | 1 | 6 | 16 | 101 |
| | 11.21 | 8.41 | 1 | 6 | 14 | 92 |
| No bidders | 2.57 | 1.06 | 1 | 2 | 3 | 7 |
| | 2.21 | 0.89 | 1 | 2 | 3 | 7 |
| Dwelling age (in years) | 53.11 | 33.30 | 0 | 33 | 65 | 242 |
| | 49.34 | 35.04 | 0 | 23 | 63 | 326 |
| Size (in sqm.) | 92.26 | 54.26 | 16 | 57 | 112 | 316 |
| | 93.47 | 58.35 | 15 | 56 | 111 | 757 |
| Sale price (in $10^6$ NOK) | 3.97 | 2.03 | 1.13 | 2.65 | 4.79 | 17.40 |
| | 3.68 | 1.76 | 0.71 | 2.53 | 4.30 | 20.00 |

[a] This summary statistics in on the bidding rounds with complete hedonics. A jump is a bid increase that satisfies three or more of the criteria in Table 3.

[b] At the open house, there is a list where interested parties can sign up. Interested parties can also contact the realtor to be put on the list.

price, $J_i$ is the jump bid dummy, and $\epsilon_i$ is the error term for dwelling $i$.

The second column (2) in Table 6 displays the regression result of the EV model.

We see that the estimated jump premium for the EV model is 3.6% in contrast to 3.3 (columns one and two in Table 6). This is reassuring in the sense that a more refined hedonic control did neither remove or significantly diminish the jump bid premium. Though the EV-estimate may be viewed as the practical limit for a hedonically based approach, it does not rule out that the EV-estimate also suffers from an omitted variable bias. To address this concern, previous sales for a large subset of the dwellings in our data set (2946 of 5117 (57%)) were acquired. If the EV-estimates have a unit-specific bias, we may attempt to control this bias using (multiple) previous sales and their corresponding EV-estimates at the time of sale.

One natural measure of the accuracy of the EV-estimate is the relative deviation from the realized market price:

$$\text{Score} = \frac{\text{EV}-\text{estimate}-\text{Price}}{\text{Price}}$$

The correlation between present score (transactions in our auction data) and mean previous scores is 0.02. This is not consistent with a strong score bias on the unit level over time. As we view a jump as a treatment that potentially affects the transaction price, a comparison between the treated (jump) and untreated (no jump) groups is of interest. Table 7 shows the summary statistics for the mean scores of units with and without jumps.

We see that both the mean and the median score is somewhat lower for the sales with jump bids. This may indicate slightly lower estimates for units with a jump bid compared to those without a jump bid.

One way to control for this potential omitted variable bias is to include the mean score of the previous sale as a regressor. We refer to the EV model with the mean score of previous sales as EV model 2 in Table 6. We see that this attempt to control for systematic bias in the EV-estimate, reduce the effect of a jump from 3.6 to 2.9%. It is interesting to note that the mean previous score coefficient is negative but not statistically significant.

We do not have information regarding jump bids in previous sales. This prevents a standard unit fixed effects approach. We can do a pseudo unit FE, by assuming that there were only jump bids in the last sale. In such an approach, we wrongly label JJ (jumpjump) as NJ (nojumpjump), and JN as NN. If there is a positive impact of a jump on price, the wrong label for the first group (JJ) leads to a higher estimate of the nojump as a jump is labeled a nojump. For the second group (JN),

**Table 5**
Percentage of dwelling type by jump/no jump.

| | Flat | Row house | Duplex | Detached home |
|---|---|---|---|---|
| Jump | 74.3 | 8.2 | 5.3 | 12.2 |
| No Jump | 75.2 | 6.8 | 3.5 | 14.5 |

**Table 6**
The regression results for the hedonic, EV, EV 2, and the pseudo-FE model. Standard deviation in parenthesis.

| | *Dependent variable:* | | | |
|---|---|---|---|---|
| | logPrice | | | |
| | *Hedonic model*[a] (1) | *EV model* (2) | *EV model 2* (3) | *Pseudo FE* (4) |
| logSize | 0.548*** | | | |
| | (0.013) | | | |
| logAge | −0.077*** | | | |
| | (0.004) | | | |
| logLotSize | 0.009*** | | | |
| | (0.002) | | | |
| logEV-estimate | | 0.989*** | 0.977*** | 0.974*** |
| | | (0.004) | (0.005) | (0.006) |
| logAskingPrice | | −0.001* | −0.0002 | |
| | | (0.001) | (0.001) | |
| MeanScorePreviousSales | | | −0.012 | |
| | | | (0.023) | |
| Jump bid | 0.033*** | 0.036*** | 0.029*** | 0.037*** |
| | (0.015) | (0.005) | (0.005) | (0.008) |
| Constant | | 0.077*** | 0.144*** | |
| | | (0.026) | (0.029) | |
| Observations | 4003 | 5117 | 2946 | 8213 |
| $R^2$ | 0.896 | 0.922 | 0.937 | 0.954 |
| Adjusted $R^2$ | 0.872 | 0.922 | 0.936 | 0.925 |

*Note:* [a] The hedonic model has Floor FE, No. Bedrooms FE, Dwelling Type FE, Month FE, and Postcode FE. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

**Table 7**
The score distribution of jump/no jump in percent.[a]

| | Min | 1st Qu. | Median | Mean | 3rd Qu. | Max |
|---|---|---|---|---|---|---|
| Jump | −15.4 | −4.4 | 0.2 | 0.6 | 4.9 | 21.0 |
| No Jump | −16.5 | −3.7 | 0.8 | 1.4 | 6.6 | 21.4 |

*Note:* [a] This for the dataset with previous sales. The total number of bidding rounds 2946. Bidding rounds with jump bid: 342.

the reasoning is the same; a jump is labeled a nojump. This leads to a higher estimate of the nojump. The important insight is that this wrong labeling leads to an underestimate of the jump effect.

The regression results of the pseudo unit FE model is given in the last column of Table 6. We see that the model gives a jump bid premium of 3.7% in line with the EV model (3.6%) The model that attempts to control for bias in the EV-estimate gives the lowest jump premium (2.9%).

The results thus far in this section point towards a jump bid premium. Even the lowest estimate of 2.9% is economically significant. For a dwelling with the median sale price (3.5 million NOK), this corresponds to 98,000 NOK (10,500 USD). If there is a jump bid premium in the range of a few percents, it begs the question of why. In the following subsections, we will present two (plausible) explanations. These explanations have different empiric implications, and we briefly address to what extent we find the implied empirical regularities.

### 5.2. The jumps bids exceed the second-highest willingness to pay

In the case of an English auction, as these real estate auctions are, standard auction theory gives a strict recommendation. It is to increase bids with minimal increments. If we do that, we acquire the unit approximately at the highest willingness to pay among our fellow bidders. Jump bids, on the other hand, open for the contingency of exceeding this highest willingness to pay by an excessive margin. It is interesting to note that most jump bids are not final bids (462 versus 140). As the regression coefficients of Table 6 capture average effects, the prevalence of not final jumps does not rule out that the final jumps drive the result. Table 8 presents the models in Table 6, where we separate final from earlier jumps.[10] We see the final jump estimate is in the 10% range, whereas the earlier jump estimate is in the 1 to 2% range. This is consistent with the jump premium presented in Table 6 is, to a large extent, attributable to a final jump that exceeds the fellow bidders' highest willingness to pay. In other words, the jump seals the deal but at an excessively high price. The positive and statistically significant premium for all models except the hedonic, points towards that exceeding the fellow bidders' willingness to pay by too much is not the full explanation for a positive jump bid premium.

**Table 8**
The models of Table 6 with jump bids divided into final and not final bid. Standard deviation in parenthesis.

| | *Dependent variable:* | | | |
|---|---|---|---|---|
| | logSalePrice | | | |
| | *Hedonic model* (1) | *EV model* (2) | *EV model2* (3) | *Pseudo FE* (4) |
| Not final | 0.013 | 0.017*** | 0.011* | 0.019** |
| | (0.009) | (0.006) | (0.006) | (0.009) |
| Final | 0.096*** | 0.100*** | 0.100*** | 0.108*** |
| | (0.016) | (0.010) | (0.011) | (0.018) |
| Observations | 4003 | 5117 | 2946 | 8213 |
| $R^2$ | 0.897 | 0.923 | 0.938 | 0.954 |
| Adjusted $R^2$ | 0.873 | 0.923 | 0.937 | 0.925 |

*Note:* *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

### 5.3. Jump bids and the likelihood of winning

In the introduction, we quoted a much-read website offering bidding advice. The argument for placing a jump bid was to prevent fellow bidders from being caught in a bidding frenzy. This advice is in line with (Hörner and Sahuguet, 2007), signal strength and determination to deter subsequent competition.[11]

Table 9 gives the summary statistics regarding jump bid and jump bid winners. This summary statistics paves the way for a calculation of naïve winning probabilities. The first is just the number of auctions divided by the number of bidders. This may be viewed as an average winning probability. For the auctions with a jump (602), this is 39.1%. Jump bidders won 422 of these auctions, which translates to an average winning probability of 70.1%. If we exclude auctions with a final jump, the percentage is 61.0%.[12] It is important to note that these winning probabilities are underestimates as a jump may deter potential bidders from placing a bid. This is likely to lead to fewer bidders in auctions with jumps. In this respect, it would be better to use the number of interested parties and define the average winning probability as the number of auctions divided by the number of interested parties. This is 7.7% (last column of Table 9) and may serve as a lower bound for the

[10] The corresponding models where we vary the 10% threshold in the jump bid criteria are summarized in Tables A.3, A.4 and Table A.5 in Appendix A.

[11] Our first entry on possible explanations for a jump bid in Section 2 (Literature review).

[12] This is not displayed in Table 9. The exclusion of auctions where the jump seal the deal gives 602-140 = 462 auctions. The number of jumps that are not final is 422-140 = 282. This gives the fraction 282/462 = 0.610.

**Table 9**
The summary statistics for Jump bid winners and näive auction winner probabilities.

| N. of Auctions | N. of interested parties (bidders) | N. of winners[a] | Fraction of wins[b] |
|---|---|---|---|
| 602 | 7853 (1538) | 422(140) | 70.1 (7.7–39.1) |

[a] Number of auctions where the jump bidder won the auction. In parentheses: Number of auctions where the jump bidder won with a jump bid.
[b] Fraction of wins = Number of jump bid winners/ Number of auctions. The first number in parentheses is the number of auctions divided by the total number of interested parties in the auctions, the second the number of auctions divided by the number of bidders. Fractions are given in percent.

average winning probability. It must be stressed that signing up on the list of interested parties does not carry the same kind of commitment as placing a bid.

These naïve probabilities seem to indicate that jumpers are more wedded to dwelling in question. It interesting to note that these winning probabilities are closely linked to a probit model with unit fixed effects. Estimation of such a model allows us to add more detail regarding the marginal effect of a jump on the winning probability. Tables 10 and 11 displays the results.

We see that a jump bidder has a higher winning probability than compared to a no jump bidder. For the first quartile, the jump bidders winning probability is close to the double of the no jumper (61.2 versus 33.3). If we exclude winning with the jump bid, the first quartile probability is 50.0. It must be noted that excluding the jump in the case that the jump sealed the deal removes the auctions where the jump was most successful. That set aside, the higher winning probability, even when we exclude the most successful jump bidders, provide empiric support for jump bids as a signal of determination.

## 6. Reasons for jump bids

### 6.1. Jumps as a response to competitive auctions

In the analysis above, we have implicitly assumed that transaction prices should reflect hedonic characteristics. Search frictions may lead to a varying number of interested parties and a variation of willingness to pay even for two hedonically equal houses. In such a case, we will expect a positive correlation between the second-highest willingness to pay and the number of interested parties. Moreover, if jump bids are a response to a more competitive auction (measured by interested parties), we may wrongly attribute higher transaction prices in auctions as a jump bid premium. Our regression design so far has not controlled for more competitive auctions. In principle, a jump bidder may harvest a rebate in a competitive auction as the accepted bid may have been even higher in the absence of the jump bid.

A challenge to this point of view is why bidders do not exit auctions with a high number of bidders. If they do exit, an equilibrium consisting of a uniform distribution of bidders across (hedonically equal) houses could arise. There are several reasons why such an equilibrium is unlikely. To buy the right house is a delicate matching problem in a market with search frictions. As pointed out in Nenov et al. (2016), housing markets have both vertical and horizontal heterogeneity. Vertical heterogeneity, such as size, location, and the number of bedrooms is easy to list and sort by. These hedonic characteristics divide the market into (fuzzy) segments. On the other hand, horizontal heterogeneity, such as light conditions, specifics regarding functionality, the general atmosphere of the house and surroundings, requires a first-hand inspection, and going to an open house is takes time. In case of a good match, a potential home buyer may still want to participate in an auction even when the competition appears to be somewhat higher than average.

**Table 10**
The winning probability for jumper (probit model with unit fixed effects).[a]

| | Estimate | Std. Error |
|---|---|---|
| (Intercept) | 0 | 0.886 |
| Jumper | 1.216*** | 0.075 |

*Note:* [a] A Jumper is a bidder that places a jump bid. $^{***}p < 0.01$.

**Table 11**
The probability distribution jumper versus non jumper for probit model with unit FE (Table 10). In parenthesis excluded auctions where the jump is final bid.[a]

| | 1st Qu. | Median | Mean | 3rd Qu. |
|---|---|---|---|---|
| Jumper | 61.2 (50.0) | 72.8 (64.3) | 69.9(60.8) | 72.8 (64.3) |
| Non Jumper | 33.33 | 50.0 | 42.8 | 50.0 |

*Note:* [a]Jumper is a bidder that places a jump bid.
$^{***}p < 0.01$.

The correlation between the jump dummy and the number of interested parties is 0.07. Hence, jump bids are a bit more likely in more competitive auctions. Moreover, the correlation between score, the EV-estimates relative deviation from the actual sales price, and the number of interested parties is $-0.05$. In other words, that sale price is (weakly) higher compared to the EV-estimate when the number of interested parties is higher. The somewhat higher transaction prices in auctions with more interested parties are consistent with a higher second-highest willingness to pay in an auction with more interested parties. The question is to what extent the jump bid premium is just driven by a semi-random assignment to auctions. One way to address this concern is to run the regression models presented in Table 8 with interested parties fixed effects. Table 12 gives the results.

We see that controlling for the competitiveness of the auction marginally reduces all jump coefficients. The reductions are a few tenths of a percent, and consistent with auction competition as a driver of jumps as well as transaction prices. However, the premium is still in the 9–10% range for a final jump and in the 1–2% range for a non-final jump bid in the EV models. For the latter premium, the significance levels are lower, but both are significant at the customary 5% significance level. The fact that the premium remains statistically and economically significant points towards that the premium is not just driven by search frictions and variations in auction competition.

**Table 12**
The regression model of Table 8 with no. of interested parties FE[a]. Standard deviation in parenthesis.

| | *Dependent variable:* | | |
|---|---|---|---|
| | logSalePrice | | |
| | *Hedonic model* (1) | *EV model* (2) | *EV model2* (3) |
| not final | 0.007 | 0.014** | 0.010* |
| | (0.009) | (0.006) | (0.006) |
| final | 0.090*** | 0.101*** | 0.103*** |
| | (0.016) | (0.010) | (0.011) |
| Observations | 4003 | 5117 | 2946 |
| $R^2$ | 0.901 | 0.925 | 0.940 |
| Adjusted $R^2$ | 0.875 | 0.924 | 0.939 |

[a] At the open house there is a list where interested parties can sign up. Interested parties can also contact the realtor to be put on the list.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

**Table 13**
Bid duration regression (duration measured minutes). Standard deviation in parenthesis.

| | Dependent variable: | | | |
|---|---|---|---|---|
| | duration | | | |
| | (1) | (2) | (3) | (4) |
| jump | − 0. 530* | − 1. 000*** | − 1. 019*** | − 1. 784*** |
| | (0.275) | (0.289) | (0.289) | (0.274) |
| Constant | 3.263*** | | | |
| | (0.069) | | | |
| bid number FE | NO | YES | YES | YES |
| Nu int. P. FE | NO | NO | YES | YES |
| Unit FE | NO | NO | NO | YES |
| Observations | 34,419 | 34,419 | 34,419 | 34,419 |
| $R^2$ | 0.0001 | 0.003 | 0.006 | 0.274 |
| Adjusted $R^2$ | 0.0001 | 0.002 | 0.004 | 0.144 |

*Note:* From 5117 bidding rounds (see Table A.1 in the Appendix A). Bid durations in excess of 300 min excluded. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

### 6.2. *A jump to stress the seller and the fellow bidders*

A jump bid may be a signal of strength and the intention to go even higher. It may also be an attempt to stress the seller and the fellow bidders. Another way to add stress is to place a bid with a short duration. This will leave the fellow bidders with a more limited time to consider whether or not to place a higher bid. Moreover, the seller faces the prospect of not accepting a bid that will expire and not be matched later in the auction. A way to enhance the stress factor of a jump bid is to choose a short bid duration. In other words, if putting pressure on the fellow bidders and the seller is a motive for jumps bids, we would expect that jumps correlate with shorter durations.

Table 13 gives the (OLS) regression estimates for duration explained by the jump dummy with a varying number of controls. Column 4 gives a net effect of 1.78 min shorter duration of jump bids in the model with interested parties, bid number, and unit fixed effects. The result is statistically significant. At the same time, an average effect of two minutes constitutes a small difference between a jump bid and regular bid durations. A likely explanation is that the median bid duration for most bid numbers is around 20 min. A duration of 20 min may be close to the practical limit for the realtor as an auctioneer to perform her duties. She needs to inform the seller and all bidders about the new bid. As the auctioneer may not, despite her best efforts, be able to get back to the jump bidder in time, the incentive to go for a really short duration may be low. In this respect, the statistically significant estimate of the jump on bid duration is more interesting than the actual size. Jump bidders try shorter expiration times despite being close to the practical limit of bid durations. This may be seen as a smoking gun for the intent to put pressure on the seller as well as fellow bidders.

## 7. Conclusion

We find that jump bidders harvest a positive price premium compared to no jumpers. The sign appears to be robust across model specifications. The premium is around 1–2% in the most refined models for a jump that does not end the auction. Final jumps, in contrast, have a jump premium of 9–10%. These results are consistent with a positive probability of exceeding the highest willingness to pay among fellow bidders in the case of a final jump. A positive jump premium, also in the case where the jump does not end the auction, is not consistent with the efficacy of a jump to deter subsequent competition. However, a jump bid is a credible signal of “serious intentions”. Jump bidders win bidding wars more often than their fellow bidders.

## Author Statement

This is a single author paper, and apart from the initial download of data sets performed by Eiendomsverdi, all data manipulation, estimation and presentation is done by the author.

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## Appendix A

### A1. *Preparation of the data set*

**Table A.1**
Data preparation. The entire auction is excluded for all exclusions.

| Data operation | N. of bids | N. of auctions |
|---|---|---|
| Raw data | 202,657 | 28,276 |
| Bids with EV-estimate | 146,940 | 18,836 |
| Exclusion of non housing bids | 146,933 | 18,834 |
| Bids with correct time and date formats | 144,155 | 18,712 |
| In auctions with 20 less bids | 118,775 | 17,744 |
| In auctions with only increasing bids | 40,522 | 8585 |
| In auctions with at least 3 bids | 35,301 | 5192 |
| Bids with complete bidding information | 28,834 | 5117 |
| Bids where the unit has complete hedonics[a] | 27,412 | 4003 |

*Note:* [a] For hedonics: Lot size: exclude lots of less than or equal to 50 sqm. and greater than or equal to 10,000 sqm. Dwelling size: There are three different measures reported. BRA, BTA and P-rom, with slightly different definitions (Rules regarding the height of the ceiling, etc.). BRA is the one with the highest data quality (less missing/less obvious typos) We have used this measure and imputed one value using the BTA, by regressing BRA on BTA. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

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**Table A.2**
Hedonic regression models: Sensitivity of the jump definition. The relative bid increase criteria equal to 8, 10, and 12% (Jump8, Jump10, and Jump12, respectively).[a] Standard deviation in parenthesis.

| | *Dependent variable:* | | |
|---|---|---|---|
| | logSalesPrice | | |
| | (1) | (2) | (3) |
| logSize | 0.548*** | 0.549*** | 0.548*** |
| | (0.013) | (0.013) | (0.013) |
| logAge | − 0. 077*** | − 0. 077*** | − 0. 077*** |
| | (0.004) | (0.004) | (0.004) |
| logLotSize | 0.009*** | 0.009*** | 0.009*** |
| | (0.002) | (0.002) | (0.002) |
| Jump8 | 0.027*** | | |
| | (0.008) | | |
| Jump(10) | | 0.033*** | |
| | | (0.008) | |
| Jump12 | | | 0.037*** |
| | | | (0.009) |
| Observations | 4003 | 4003 | 4003 |
| $R^2$ | 0.896 | 0.897 | 0.897 |
| Adjusted $R^2$ | 0.872 | 0.872 | 0.872 |
| Residual Std. Error (df = 3245) | 0.149 | 0.148 | 0.148 |

*Note:* [a] Jump10 is the jump definition used in the main body of the paper. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

**Table A.3**
The four regressions of Table 6 for jump8 and jump12.[a] Standard deviation in parenthesis.

| | *Dependent variable:* | | | |
|---|---|---|---|---|
| | logSalePrice | | | |
| | *Hedonic* (1) | *EV model* (2) | *EV model2* (3) | *Pseudo FE* (4) |
| Jump8 | −0.003 | 0.030*** | 0.022*** | 0.033*** |
| | (0.008) | (0.005) | (0.005) | (0.008) |
| Jump12 | 0.037*** | 0.041*** | 0.036*** | 0.042*** |
| | (0.009) | (0.005) | (0.009) | (0.009) |
| Observations | 4003 | 5117 | 2946 | 8213 |
| $R^2$-Jump8 | 0.865 | 0.922 | 0.936 | 0.954 |
| $R^2$-Jump12 | 0.897 | 0.922 | 0.937 | 0.954 |

*Note:* [a] Jump8 (jump12) is the jump definition with the relative bid increase criteria equal to 8 (12)%, in contrast to the 10% criteria used throughout the paper. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

**Table A.4**
The regression of Table 8 (Last/Not Last jump) for Jump8 and Jump12.[a] Standard deviation in parenthesis.

| | *Dependent variable:* | | | |
|---|---|---|---|---|
| | logSalePrice | | | |
| | *Hedonic* (1) | *EV model* (2) | *EV model2* (3) | *Pseudo FE* (4) |
| Jump8notlast | 0.007 | 0.011** | 0.008 | 0.020** |
| | (0.008) | (0.005) | (0.010) | (0.008) |
| Jump8last | 0.093*** | 0.094*** | 0.081*** | 0.091*** |
| | (0.015) | (0.009) | (0.007) | (0.017) |
| Jump12notlast | 0.016 | 0.021*** | 0.017*** | 0.023** |
| | (0.010) | (0.006) | (0.006) | (0.010) |
| Jump12last | 0.099*** | 0.102*** | 0.106*** | 0.107*** |
| | (0.016) | (0.010) | (0.012) | (0.019) |
| Observations | 4003 | 5117 | 2946 | 8213 |
| $R^2$-Jump8 | 0.897 | 0.923 | 0.937 | 0.954 |
| $R^2$-Jump12 | 0.897 | 0.923 | 0.938 | 0.954 |

*Note:* [a] Jump8 (jump12) is the jump definition with the relative bid increase criteria equal to 8 (12) percent, in contrast to the 10% criteria used throughout the paper. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

**Table A.5**
The regression of Table 12 Int FE (Last/Not Last jump): Jump8 and jump12.[a] Standard deviation in parenthesis.

| | *Dependent variable:* | | |
|---|---|---|---|
| | logSalePrice | | |
| | *Hedonic* | *EV model* | *EV model2* |
| Jump8 notlast | 0.001 | 0.008 | 0.007 |
| | (0.009) | (0.005) | (0.005) |
| Jump8 last | 0.087*** | 0.094*** | 0.083*** |
| | (0.015) | (0.009) | (0.010) |
| Jump12 notlast | 0.009 | 0.018*** | 0.015** |
| | (0.010) | (0.006) | (0.006) |
| Jump12 last | 0.092*** | 0.103*** | 0.109*** |
| | (0.016) | (0.010) | (0.012) |
| Observations | 4003 | 5117 | 2946 |
| $R^2$-Jump8 | 0.901 | 0.925 | 0.940 |
| $R^2$-Jump12 | 0.901 | 0.925 | 0.940 |

*Note:* [a] Jump8 (jump12) is the jump definition with the relative bid increase criteria equal to 8 (12) percent, in contrast to the 10% criteria used throughout the paper. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

## Supplementary material

Supplementary material associated with this article can be found, in the online version, at 10.1016/j.jhe.2020.101713.

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