games

Article

Promoting Entry and Efficiency via Reserve Prices

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Abstract: Reserve prices are used by sellers to modify the allocation induced by standard auctions. The existing literature has shown that, if the number of bidders is fixed, a reserve price can be used to increase expected revenues. This comes at the expense of efficiency when the auctioned good goes unsold. Instead, when the number of bidders is not fixed, a reserve price may discourage entry. The reduction in the number of bidders caused by the reserve price in this situation is detrimental for both revenues and efficiency. This work shows that a different conclusion may emerge when potential entrants arrive sequentially and face the risk of incurring losses conditional on winning the object on sale. In fact, we show that reserve prices may lead to more entry and raise the efficiency. Applications characterized by the presence of an incumbent who is better informed about some common characteristics of the object for sale may yield the type of features that are needed for our different conclusion to hold.

Keywords: reserve prices; entry; auctions; English auction

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1. Introduction

A reserve price is an instrument commonly used to modify the allocation induced by standard auctions and affect the price paid by the winner. Its effects are well understood: if the seller sets a reserve price, they avoid selling at a low price when the second highest valuation is low and the highest one is high. At the same time, a reserve price exposes the seller to the risk of not selling. If the reserve price is optimally set, the first effect prevails over the second one, and standard auctions may maximize expected revenues; see [1,2].

Another well established fact is that, if the number of bidders is not fixed, a reserve price may discourage entry (for a quite general analysis of the effects of entry in different auction formats, see [3]). Furthermore, the negative impact on revenues of this latter effect may be of first order importance relative to the former one (see [4,5]). Indeed, it has been emphasized that one key aspect any market designer should care about is to find ways to promote entry (see [6]). Additionally, [7] demonstrated that the effect on revenues of an extra bidder was superior to the setting of an optimally chosen reserve price.

In the open ascending auction (English auction) an additional reason for which entry may be discouraged is that an incumbent may signal via a jump bid to have a high valuation. For an analysis of preemptive bids when an entrant needs to incur a cost to learn her valuation, see [8] for a private value setting and [9] for a common and affiliated value setting. For experimental evidence confirming the effects of preemptive bids, see [10]. The empirical literature testing the theoretical effects of reserve prices brings mixed conclusions; see for instance [11] for EBay auctions and [12] for Hattrick auctions.

In light of the above theoretical results, it might appear striking that we can show that a reserve price may promote entry and lead to higher efficiency (as well as revenues) precisely for the open ascending auction. Clearly, it must be the case that the environment we present is strategically rather different from the canonical one. Indeed, while the well-known results mentioned above are derived in a setting in which all standard auctions deliver efficient allocation (except [9]), this is not the case in our setting. Most of the auction literature has either worked with ex-ante symmetric bidders and the independent private value environment (see [13]) for which efficiency is not a concern, or it has imposed conditions under which the interdependent value setting still delivers the efficient allocation.

For instance, for the open ascending auction format [14,15] research identified generalized single crossing conditions that guarantee a smooth information aggregation and hence efficiency. By focusing on environments under which efficiency is achievable, the literature has largely neglected settings that are strategically very rich. Such richness can lead to new and rather different insights, as it is the case here. It also leads to more complexity and thus makes it more difficult to write general models.

The efficient allocation is not achievable in relevant applications. This is the case if an incumbent has superior information regarding a characteristic that also affects the valuation of potential entrants. One example is the auctioning of a license for which the incumbent may have superior information about the market size (and hence the profitability from winning the license); however, one or more of the potential entrants may have a higher value for winning. Another example is an art auction in which one of the art dealers may be known to have better information about the authenticity of the art work.

A key element in this type of environment is that the potential entrants face a rather risky situation due to the expected losses that may arise following the exit of the incumbent. In fact, the exit of the incumbent may convey adverse information regarding the profitability of winning the auction. Due to this, the entrants may experience ex post regret along the equilibrium path, and the auction can be inefficient. Indeed, the pairwise single crossing condition, which is a necessary condition for any mechanism to be efficient (see [16]) can be violated in these situations.

An analysis of the open ascending auction in these environments is provided by [17,18]. The first paper shows that the ascending auction is constrained (or second best) efficient when the number of bidders is two. The second paper shows that, with more than two bidders, that is no longer the case because of rushes that occur along the equilibrium path (a rush occurs when all active bidders quit simultaneously). The authors then proposed an alternative mechanism to implement constrained efficient allocation. Those papers are related to the current one because the stylized example presented here shares the feature that (first best) efficiency is not achievable.

A key characteristic of the open ascending price auction is the ability of aggregating information, which gives a better chance to achieve efficiency compared to sealed bid formats in which no new information can be aggregated. The existence of rushes already suggests that information aggregation in general may not be smooth and that inefficiencies may arise. Another dimension that is often neglected by the literature is that the ability of the open ascending auction to aggregate information also comes with an incentive for active bidders and for the seller to manipulate it according to their own advantage. The idea that the amount of information that is endogenously aggregated in an open ascending auction can be strategically manipulated is used in the current work, and this was introduced in [19].

In that paper, it is the bidders who can do so by placing jump bids. Jump bids are ruled out by the standard representation of the open ascending auction via a clock auction (in which active bidders can only decide whether to be active or to exit at the current price). Relaxing that assumption makes the model truly dynamic, and in an interdependent value setting with asymmetric bidders, it is difficult to produce general results. Indeed, Ref. [19] showed that a variety of different strategic effects may be at play leading to ambiguous results for both revenues and efficiency. Ref. [20] provided a simple example that shows that the seller can also profitably manipulate information via a reserve price (another way a seller could affect the aggregation of information is by setting discrete bid levels. For an analysis of the English auction under discrete bid levels, see [21,22].)

That paper does not study the issue of endogenous entry, which is the focus of this study. An additional simplification of the standard representation of the open ascending auction is that exit is irrevocable. For a model that allows for reentry, see [23]. We do not allow for reentry here. Our entrants arrive sequentially, and if they do not find it profitable to wait for the start of the auction, they leave. If they enter, they cannot reenter after they quit. Finally, this paper is also related to [24,25] who allowed for sequential entry in a setting where entry is costly, similar to [8]'s preemptive model.

Our new insight can be understood as follows. Without a reserve price, the knowledge of the presence of an existing entrant decreases the expected gains from winning when it is profitable below the level necessary to compensate for the expected losses that arise if negative information from the exit of the incumbent is aggregated. This makes additional entry unprofitable even without assuming any direct entry cost into the auction. Typically models that allow for endogenous entry need to assume the presence of some cost. In our case, the potential losses and the diminished profitability caused by the presence of other entrants are sufficient to deter further entrance.

We show that a reserve price can be used to prevent the aggregation of potentially adverse information and undo the strategic advantage of being one of the first entrants to arrive, thus, leveling the field and promoting both entry and efficiency.

The remainder of the paper is organized as follows. The model presents the assumptions we introduce and relates them to relevant practical applications. The analysis delivers our theoretical predictions for the case in which no reserve price is in place, as well as for the one in which an optimally chosen reserve price is in place. It then compares the two cases in order to deliver our new insight. Finally, the conclusions summarize our findings and the key characteristics of the environment that we introduce.

2. The Model

Assume an open ascending price auction that awards the license to operate in a market and that an incumbent, bidder 0, is competing against n potential entrants, indexed by e:1, . . . , n (In what follows, we adopt the convention to refer to the incumbent as *she* and to a generic entrant as *he*). The incumbent has private information that affects the profitability of holding the license but may not be the firm that holds the highest value for winning the license.

This situation can be described expressing bidders' value functions by $v_i = t_i + Q$, i:0, . . . n, where t_i is a private value component and Q is a common value component, assuming each bidder i is privately informed about the realization of t_i and the incumbent is additionally informed about the realization of Q (For a setting adopting a private plus common value framework, see [26]). We model the key features of this environment by assuming that the set of incumbent's private component, as well as the set of the common value component are binary with $t_0 \in \{t_l, t_h\}$, $t_h > t_l$ and $Q \in \{Q_l, Q_h\}$, $Q_h > Q_l$ and that the entrants' private type t_e is drawn from the support $[\underline{t}, \bar{t}]$, with $\underline{t} > t_l$ and $\bar{t} < t_h$, $\bar{t} > \underline{t}$.

The objective of this note is to construct the simplest possible example to show that both entry and efficiency can be increased by adding a reserve price. We thus assume the following parametrization: $t_l = \frac{1}{10}$, $t_h = \frac{9}{10}$, $\underline{t} = \frac{1}{2}$, $\bar{t} = \frac{3}{5}$, $Q_l = 0$, $Q_h = 1$; with the incumbent's information drawn as follows: $Pr(t_0 = \frac{9}{10}, Q = 0) = (t_0 = \frac{9}{10}, Q = 1) = \frac{2}{7}$, $Pr(t_0 = \frac{1}{10}, Q = 1) = \frac{3}{7}$; and the entrants' types drawn as follows: $t_e \sim U[\frac{1}{2}, \frac{3}{5}]$.

An alternative way to interpret the value structure above is that entrants may have better technology than the incumbent; however, they face higher fixed cost to enter the market for which the license is sold. Thus, while it may be more efficient to allocate to one of the entrants if the size of the market is large ($Q = 1$), this is never the case if the size of the market is small ($Q = 0$).

The entry process is the following. The incumbent is always present. The entrants arrive sequentially to the auction with each entrant e arriving in position e. An entrant e, when deciding whether to enter or not observes how many entrants (if any) are already present, and upon this information and the knowledge of t_e, decides to enter or remain out. After the entry decisions of the n potential entrants are collected, all bidders are told the number of entrants present, and a standard clock auction unfolds (with or without a reserve price). See [13] for a description of a clock (or Japanese) auction. Ties are assumed to be resolved by a random device that assigns the object with equal probability to any of the bidders in the tie.

3. The Analysis

3.1. Equilibrium Analysis without Reserve Price

To understand why this environment exposes entrants to the *risk* of losses, it is instructive to first focus on the situation in which the incumbent is competing with one entrant only. The incumbent knows both her private value component and the common value component, and thus she has a weakly dominant strategy to stay active up to $v_0 = t_0 + Q$, and we assume throughout that she does so. Given the distribution of possible valuations of the incumbent, this means that she will exit at one of the following price levels: $\frac{9}{10}$, $\frac{11}{10}$, $\frac{19}{10}$, with the exit at $\frac{9}{10}$ revealing adverse information about the common component (i.e., $Q = 0$).

The entrant's optimal strategy instead is to be active up to $t_e + 1$, $\forall t_e$. To see why, notice first that quitting before t_e is weakly dominated by quitting at t_e. Similarly, quitting at a price above $t_e + 1$ is weakly dominated by quitting at $t_e + 1$. What about the values between t_e and $t_e + 1$? In this range, the potential exit of the incumbent at price $\frac{9}{10}$ conveys adverse information and leads any entrant's type t_e to a loss of $\frac{9}{10} - t_e$. The risk of incurring this loss, however, is more than compensated by the gains from winning the auction in case the incumbent exits at price $\frac{11}{10}$, which are $(t_e + 1) - \frac{11}{10}$. In fact, since the positive event is $\frac{3}{2}$ as likely as the adverse event, we have that $\frac{3}{2}(t_e + 1 - \frac{11}{10}) \geq \frac{9}{10} - t_e$, for any t_e.

The main result of the setting with no reserve price is presented in the proposition below.

Proposition 1. *Assume the setting introduced in the model section, that no reserve price is introduced and that the incumbent follows her weakly dominant strategy. Then, only one entrant can make strictly positive expected profits upon entry. The expected revenues when only one entrant enters are $\frac{82}{70}$, and the expected value of the winner (efficiency) is $\frac{91}{140}$.*

The proposition is based on the set-up in which the incumbent is already present, whereas the entrants arrive sequentially to the auction. To prove the proposition notice that the previous analysis already shows that entrant number 1, regardless of t_1, would find profitable to enter at least under the conjecture that no one else will. Hence, if we can show that no other entrant can find it strictly profitable to enter we are done. To do so, it is sufficient to check the incentive to enter of entrant 2 in the event that he has the highest possible type $\bar{t} = \frac{3}{5}$. Given that entrant 2 can observe the presence of entrant 1, he can anticipate that the expected gains when the incumbent quits at $\frac{11}{10}$ are down to $\frac{3}{5} - t_1$ due to the presence of entrant 1.

The expected losses if the incumbent quits at $\frac{9}{10}$ and both entrants are active at that price are $\frac{\frac{9}{10} - \frac{3}{5}}{2}$ (the two entrants would quit simultaneously, and therefore entrant 2 would have probability $\frac{1}{2}$ of incurring loss $\frac{9}{10} - \frac{3}{5}$). Since $\frac{\frac{9}{10} - \frac{3}{5}}{2} \geq \frac{3}{2}(\frac{3}{5} - t_1)$ for all t_1, it follows that, regardless of the second entrant's type, it is never profitable to be active beyond price $\frac{9}{10}$ if the first entrant does. However, since there is no chance to win at a price below $\frac{9}{10}$, entrant 2 can never enjoy a strictly positive profit from entering. The very same reasoning applies to all subsequent potential entrants.

What this also shows is that one may also consider equilibria in which more than one entrant enter; however, in any such equilibrium, entrants' bidding strategies must be asymmetric and of the following form: one of them (say e) is aggressive and bids up to $t_e + Q$, and all the others quit before $\frac{9}{10}$ and always lose. In calculating the expected revenues and efficiency, we focus on an equilibrium in which it is the first entrant that enjoys the strategic advantage coming from the ability to play the more aggressive strategy. This appears justified by the advantage of being the first in the queue. We also assume that other entrants do not enter at all since they can never make strictly positive expected profits. This is also quite natural. For instance, assuming an arbitrarily small opportunity cost for being active would make entering strictly dominated by not entering. The expected revenues when the incumbent plays her dominant strategy and the only entrant plays her optimal strategy are:

$$\frac{2}{7}\frac{9}{10} + \frac{3}{7}\frac{11}{10} + \frac{2}{7}(E(t_1) + 1) = \frac{82}{70}, \tag{1}$$

and the expected value of the private component of the winning bidder (the measure of efficiency) is:

$$\frac{5}{7}E(t_1) + \frac{2}{7}\frac{9}{10} = \frac{91}{140}. \tag{2}$$

3.2. Equilibrium Analysis with Reserve Price

Lets us now discuss the effect of introducing a reserve price. We have seen that the setting introduced led to insufficient entry. The reason was that the presence of another entrant diminished the profitability of winning when it was worth it, while still exposing the additional entrant to the risk of making a loss in case of adverse information. In other words, there was room for only one entrant to be active at the price that could convey adverse information. Clearly, the first entrant to arrive need not be the most efficient. Hence, the first entrant has a strategic advantage due to their privileged position in the queue.

A strategically set reserve price can preserve the uncertainty of whether the incumbent has drawn $(t_0 = \frac{9}{10}, Q = 0)$, or $(t_0 = \frac{1}{10}, Q = 1)$. In doing so, it kills the above mentioned advantage and produces an environment that induces all entrants to use the same bidding function and therefore yields higher efficiency and promotes more entry.

Proposition 2. *Assume the setting introduced in the model section and that a reserve price $r = \frac{11}{10}$ is introduced. Then, all entrants enter, the expected revenues are:*

$$\frac{5}{7}\left(E(t_e^{(2)}) + E(Q|v_0 \in \{\frac{9}{10}, \frac{11}{10}\})\right) + \frac{2}{7}\left(E(t_e^{(1)} + 1)\right), \tag{3}$$

and the expected value of the private component of the winning bidder (the measure of efficiency) is:

$$\frac{5}{7}E(t_e^{(1)}) + \frac{2}{7}\frac{9}{10}. \tag{4}$$

The optimal reserve price in this specific setting is $r = \frac{11}{10}$. We need to distinguish two cases: the incumbent does not match the reserve price, or she does. The first case happens if either $v_0 = \frac{9}{10}$ or $v_0 = \frac{11}{10}$. In this case, the revised expected value of an entrant of type t_e is $t_e + E(Q|v_0 \in \{\frac{9}{10}, \frac{11}{10}\}) = t_e + \frac{3}{5}$, which is greater or equal than $\frac{11}{10}$ for all t_e. Conditional on this case, and on having entered, all entrants then stay active up to their revised expected valuations. The winner is the most efficient entrant, and the price paid is the expected value of the second most efficient entrant.

Notice also that, regardless of their type, any entrant enjoys strictly positive expected profits conditional on being in this case. This is so that the probability of winning is strictly positive for any $t_e > \underline{t}$ and the expected profits conditional on winning are also strictly positive. The second case happens when $v_0 = \frac{19}{10}$. In this case, all entrants that are present can infer that $Q = 1$ for sure and stay active up to their revised valuation of $t_e + 1$. Since the incumbent has the highest value, she wins the auction and pays the value of the most efficient entrant given that $Q = 1$.

Notice that, regardless of their type, any entrant makes zero profits conditional on this second event. Combining the two cases together we can conclude that the ex-ante expected profits from entering are strictly positive for any type of the entrant. Hence, all entrants find it optimal to enter. After entering, they bid according to one of the strategies described above depending on whether the incumbent matches or not the reserve price.

Those strategies are optimal for the same reason that bidding the own value is optimal under the private value setting.

Given the above, it is direct to verify that the expected revenues are as in Equation (3), where $E(t_e^{(2)}) = \frac{1}{2} + \frac{1}{10}\frac{n-1}{n+1}$ is the expected value of the second highest type of the entrants out of n; and the expected value of the private component of the winning bidder is as in Equation (4), where $E(t_e^{(1)}) = \frac{1}{2} + \frac{1}{10}\frac{n}{n+1}$ is the expected value of the highest type of the entrants out of n.

We can finally state our main result.

Proposition 3. *An optimally set reserve price may induce higher entry, higher efficiency and higher revenues.*

The proposition follows directly from the comparison of the results in Propositions 1 and 2. We can see that, without the reserve price, the first entrant wins when the incumbent's value is less or equal than $\frac{11}{10}$, while in the same scenario with the reserve price, it is the most efficient of the n entrants who does. This raises both efficiency and revenues.

Clearly, the parametrization proposed made the analysis for the purpose of this note simpler and the result the most striking. Some comments are in order. First, $\underline{t}$ was set sufficiently high so that even the lowest type would enter without the reserve price. Second, the setting was constructed in such a way that the adverse information from the exit of the incumbent was strong enough to deter even the entrant with the highest type to be active if one entrant was already present in the queue. In a more general set-up, it is possible that more than one entrant may find it optimal to be active at prices that would cause all entrants to exit following adverse information from the exit of the incumbent.

The equilibrium analysis of the ascending auction in that case is more complex, see [18]. Furthermore, if more than one entrant is expected to enter, each potential entrant must take into account of the effects of subsequent entry. Finally, the parametrization was such that, regardless of the entrant's type, the expected value conditional on the incumbent not matching the reserve price was as high as the reserve price. This guaranteed that all entrants would enter in the open ascending auction under the optimally chosen reserve price.

4. Conclusions

We presented a setting with an incumbent and a set of potential entrants competing in an open ascending auction where a reserve price increased the entry, efficiency and revenues. The results were surprising because the standard effect suggested by the literature is that a reserve price decreases entry. The different conclusions were due to the differences in the environment analyzed. Most of the literature on auctions assumes environments for which all standard auctions are efficient, whereas we used a framework that may lead to an inefficient allocation and to ex-post losses along the equilibrium path. These features are present in realistic situations in which an incumbent is better informed about some common characteristics of the object for sale and can lead to a rather different set of results from those of the canonical auction environment.

For instance, Ref. [18] showed that an open ascending auction may fail to implement the second best efficient allocation due to rushes that occur along the equilibrium path. Ref. [19] showed that the bidders' ability to place jump bids may bring new strategic effects that, in general, lead to ambiguous results in terms of revenues and efficiency. The current work adds to those contributions showing a surprising effect of the reserve price when entry by potential entrants in an open ascending auction is sequential. The main insight that we provide can be summed up as follows. In an open ascending auction, the exit of a better informed bidder (the incumbent) can bring adverse information to the less informed bidders (the entrants) and induce losses. Those losses can be compensated by the gains that can be obtained when the exit of the incumbent brings positive information to the entrants. However, without a reserve price, the knowledge of the presence of some existing competition (some entrants already present) can discourage further entry.

Instead, in setting a reserve price, the seller can prevent the aggregation of adverse information. This has the effect of eliminating the advantage of being the first entrant to arrive and thus encourages entry and raises efficiency. Future research could contribute to unveil new strategic effects and allow a more comprehensive understanding of auction environments where the aggregation of information may not be as smooth as in the canonical model.

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References

1. Myerson, R.B. Optimal Auction Design. *Math. Oper. Res.* **1981**, *6*, 58–73. [CrossRef]
2. Riley, J.G.; Samuelson, W.F. Optimal Auctions. *Am. Econ. Rev.* **1981**, *71*, 381–392.
3. Levin, D.; Smith, J.L. Equilibrium in Auctions with Entry. *Am. Econ. Rev.* **1994**, *84*, 585–599.
4. Engelbrecht-Wiggans, R. On Optimal Reservation Prices in Auctions. *Manag. Sci.* **1987**, *33*, 763–770. [CrossRef]
5. McAfee, R.P.; McMillan, J. Auctions with Entry. *Econ. Lett.* **1987**, *23*, 343–347. [CrossRef]
6. Klemperer, P. Using and Abusing Economic Theory. *J. Eur. Econ. Assoc.* **2013**, *1*, 272–300. [CrossRef]
7. Bulow, J.; Klemperer, P. Auctions Versus Negotiations. *Am. Econ. Rev.* **1996**, *86*, 180–194.
8. Fishman, M.J. A Theory of Preemptive Takeover Bidding. *RAND J. Econ.* **1988**, *19*, 88–101. [CrossRef]
9. Dodonova, A. Preemptive Bidding and Pareto Efficiency in Takeover Auctions. *Econ. Lett.* **2017**, *159*, 214–216. [CrossRef]
10. Khoroshilov, Y.; Dodonova, A. Preemptive bidding in takeover auctions: An experimental study. *Manag. Decis. Econ.* **2014**, *35*, 216–230. [CrossRef]
11. Patrick, B.; Hortaçsu, A. The Winner's Curse, Reserve Prices, and Endogenous Entry: Empirical Insights from EBay Auctions. *RAND J. Econ.* **2003**, *34*, 329–355.
12. Gonçalves, R. Empirical Evidence on the Impact of Reserve Prices in English auctions. *J. Ind. Econ.* **2013**, *61*, 202–242. [CrossRef]
13. Krishna, V. *Auction Theory*, 2nd ed.; Academic Press: Cambridge, MA, USA, 2010.
14. Dubra, J.; Echenique, F.; Manelli, A.M. English auctions and the Stolper-Samuelson theorem. *J. Econ. Theory* **2009**, *144*, 825–849. [CrossRef]
15. Birulin, O.; Izmalkov, S. On Efficiency of the English Auction. *J. Econ. Theory* **2011**, *146*, 1398–1417. [CrossRef]
16. Maskin, E. Auctions and Privatization. In *Privatization: Symposium in Honour of Herbert Giersh*; Siebert, H., Ed.; Institute fur Weltwirtshaft an der Univarsitat Kiel: Kiel, Germany, 1992.
17. Hernando-Veciana, A.; Michelucci, F. Second Best Efficiency and the English Auction. *Games Econ. Behav.* **2011**, *73*, 496–506. [CrossRef]
18. Hernando-Veciana, A.; Michelucci, F. Inefficient Rushes in Auctions. *Theor. Econ.* **2018**, *13*, 273–306. [CrossRef]
19. Ettinger, D.; Michelucci, F. Hiding Information in Open Auctions with Jump Bids. *Econ. J.* **2016**, *126*, 1484–1502. [CrossRef]
20. Ettinger, D.; Michelucci, F. Manipulating Information Revelation with Reserve Prices. *Ann. Econ. Stat.* **2019**, *133*, 87–92. [CrossRef]
21. Rothkopf, M.H.; Harstad, R.M. On the role of discrete bid levels in oral auctions. *Eur. J. Oper. Res.* **1994**, *74*, 572–581. [CrossRef]
22. Gonçalves, R.; Ray, I. A note on the wallet game with discrete bid levels. *Econ. Lett.* **2017**, *159*, 177–179. [CrossRef]
23. Izmalkov, S. *English Auctions with Reentry*; Mimeo; MIT: Cambridge, MA, USA, 2003. [CrossRef]
24. Bulow, J.; Klemperer, P. Why Do Sellers (Usually) Prefer Auctions? *Am. Econ. Rev.* **2009**, *99*, 1544–1875. [CrossRef]
25. Roberts, J.W.; Sweeting, A. When Should Sellers Use Auctions? *Am. Econ. Rev.* **2013**, *103*, 1830–1861. [CrossRef]
26. Goeree, J.K.; Offerman, T. Efficiency in Auctions with Private and Common Values: An Experimental Study. *Am. Econ. Rev.* **2002**, *92*, 625–643. [CrossRef]