Replication Report for "Do Auctioneers Pick Optimal Reserve Prices?"

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Davis et al. (2011) investigate how auctioneers set reserve prices in auctions. Subjects play the role of a seller in a second-price auction with n potential buyers. The authors vary the number of buyers (n) as well as the distribution from which the buyers' private values are drawn. Contrary to standard theory, they find that sellers' reserve prices are increasing in the number of buyers.

Hypothesis to replicate:

In second-price sealed bid auctions, the seller chooses a higher reserve price when the number of bidders is larger (contrary to standard theory).

Power Analysis

In the original study, Davis et al. (2011) conduct a regression analysis with random effects for individual subjects. The dependent variable is the observed reserve price in a period, and the independent variables are (i) the number of bidders minus the average number of bidders ($n - \bar{n}$), (ii) the number of decision period minus the average number of periods ($Per - \overline{Per}$), and (iii) a binary indicator of which distribution buyer values are drawn from. See Model (1) in Table 2 of the paper. The authors find that the coefficient on $n - \bar{n}$ is positive and significant (coefficient=2.98, std. error = 0.08, $p < 0.01$).

To conduct the power analysis, we obtained the original data from the authors (specifically, the data for Cuberoot distribution, NoInfo, $n = \{1, 4, 7, 10\}$) and re-ran the regression with only two independent variables ($n - \bar{n}$ and $Per - \overline{Per}$). The resulting coefficient of $n - \bar{n}$ is 3.311 with a standard error of 0.104. This corresponds to a z-value of 31.70, and $p < 0.001$. Given that the original number of subjects was 20, our calculation shows that the number of subjects needed to achieve 90% power is much smaller than the original sample size. The MS Replication Project team has adopted a policy of using the original sample size as a lower bound for replication. Further, the team agreed that no replication shall have fewer than 40 participants. In this case, the floor of 40 is binding.

Sample

The original study was conducted at the Laboratory for Economic Management and Auctions at the Pennsylvania State University, Smeal College of Business. Participants were students, mostly undergradu-

ates, from a variety of majors. The sample for the primary replication consists of students from the University of Wisconsin-Madison. The sample for the secondary replication consists of subjects from the University of Michigan. The target sample size for each replication is 40 subjects. Due to in-person laboratory interruptions from Covid-19, each replication was first conducted online. Subsequently, if the p-value associated with the primary hypothesis is greater than .05, that location would repeat the study in-person. In all cases, students are recruited from general laboratory populations.

Materials

The original instructions and experiment software were kindly shared by the authors. We use the same instructions, with minor modifications to reflect the online environment as well as a different payment method (see details below). The experiment is recoded in SoPHIE, with the help of the authors. A video documenting the exact experiment process and stimuli we used is available online.[1]

Procedure

We follow the same protocols outlined in section "2.3 Experimental Implementation" on pages 180–181 with some minor deviations, detailed in a later section.

Each subject plays the role of a seller in a second-price (or English) auction with n computerized buyers. The seller's task is to determine a reserve price below which the object would not be sold. Each session consists of 60 periods of the auction.

The treatment we conduct is $n = \{1, 4, 7, 10\}$ with *Cuberoot* distribution and *NoInfo*. The pre-registration report for the experiment is available at https://aspredicted.org/w8cp6.pdf.

Analysis

As in the original paper, we conduct a regression analysis with random effects for individual subjects. The dependent variable is the observed reserve price in a period, and the independent variables are $n - \bar{n}$ and $Per - \overline{Per}$.

Differences from Original Study

The differences with respect to the original study are as follows. First, we use the subject pools at the University of Wisconsin-Madison and the University of Michigan rather than Penn State. Second we use SoPHIE software rather than the original z-tree software. Third, the replications are run online. Fourth, we pay subjects by emailing Amazon.com gift cards for University of Wisconsin-Madison subjects and mailing physical checks to University of Michigan subjects.

Replication Results

Following the protocol in the pre-registration resulted in data from 41 subjects included in the analyses for the primary site and 40 subjects for the secondary site. Data from one subject was excluded from the primary site due to a technical error that resulted in the subject answering questions multiple times.

Figure 1 shows the average reserve price by the number of bidders at each replication site, as well as in the original Davis et al. (2011) study.

Table 1 shows the results of the regression analyses. For reference, the first model corresponds to the coefficients estimated from the original data in Davis et al. (2011) as described in the Power Analysis section of this report. The second model corresponds to the primary site and the third model corresponds to the secondary site. In all models, the coefficient for the number of bidders is positive and statistically significant with $p < 0.001$.

[1] See https://osf.io/n5fwj/?view_only=08a56288a30941778e6ad75f399be2f9.

Unplanned Protocol Deviations

There were no unplanned protocol deviations.

Discussion

In summary, at both replication sites, the sellers tended to choose higher reserve prices when the number of bidders was larger. This effect was statistically significant at both replication sites with $p < 0.001$.

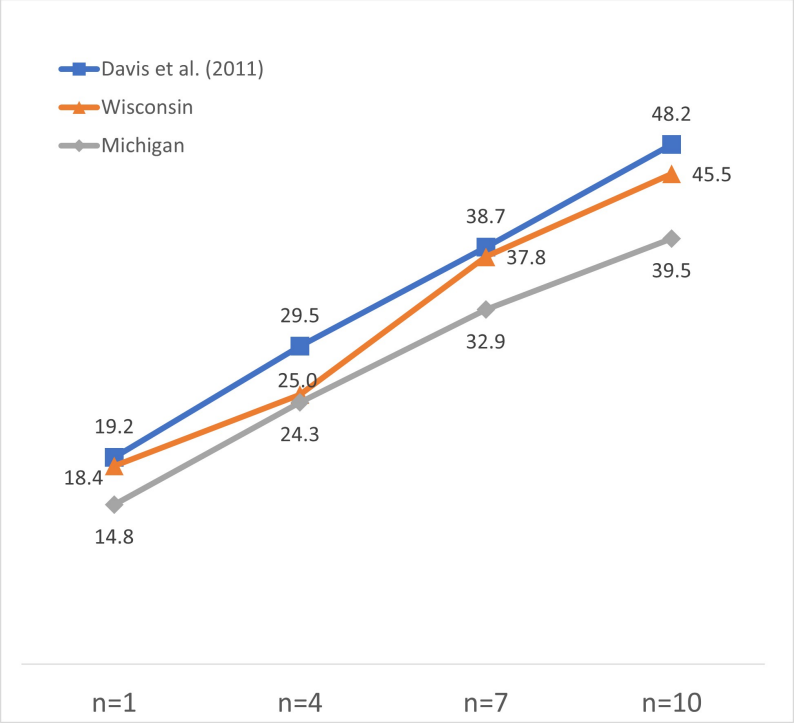

Figure 1 **Average reserve prices for each n in original experiment and in replications**

Table 1 **Regression results for replications and original experiment**

Variable	Davis et al. (2011)	Wisconsin	Michigan
$Constant$	33.598^*	31.983^*	27.306^*
	(2.894)	(1.772)	(2.085)
$n - \bar{n}$	3.311^*	3.200^*	2.791^*
	(0.104)	(0.093)	(0.098)
$Per - \overline{Per}$	0.040	-0.112^*	-0.051
	(0.021)	(0.018)	(0.020)

Note: $^*p < 0.01$. Standard errors reported in brackets. $n - \bar{n}$ is the number of bidders minus the average number of bidders. $Per - \overline{Per}$ is the number of decision period minus the average number of periods.

References

Davis, Andrew M, Elena Katok, Anthony M Kwasnica. 2011. Do auctioneers pick optimal reserve prices? *Management Science* **57**(1) 177–192.