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Yasmine Eissa

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October 2023

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A Comment on The Common-Probability Auction Puzzle (2023)*

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Abstract

Ngangoué and Schotter (2023) investigate common-probability auctions. By running an experiment, they find that, in contrast to the substantial overbidding found in common-value auctions, bidding in strategically equivalent common-probability auctions is consistent with the Nash equilibrium. We reproduce their results in R, conduct robustness checks on how their sample was constructed, and consider possible heterogeneity. We confirm their documented qualitative results.

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1 Introduction

Ngangoué and Schotter (2023), henceforth NS, investigate common-probability auctions. By running an experiment, they find that, in contrast to the substantial overbidding found in common-value auctions, bidding in strategically equivalent common-probability auctions is consistent with the Nash equilibrium.

To evaluate the reproducibility and replicability of Ngangoué and Schotter (2023), we (1) reproduce their results in STATA, (2) replicate their results in R, (3) conduct robustness checks, and (4) explore possible heterogeneity across subsamples. We find that the results are easily replicable and are robust to changing how the sample was constructed, and the documented qualitative effects remain in most subsamples.

2 Reproducibility

The code runs beautifully. We ran the Runme.do file in the replication package without issue and compared the figures produced against the figures reported in the paper, and they are well-corroborated. Overall, we want to acknowledge the high quality of the authors' replication package.

3 Replication

3.1 Re-coding in R

As a first replication exercise, we re-code the main code in R. More specifically, we reproduce Figure 2-9 from Ngangoué and Schotter (2023) and the appendix Figures A3, A4, A6, A7, which constitutes all figures that made use of the experimental data. The results for the main figures can be found in Section 5, while the appendix figures can be found in Section 7. Additionally, we re-run the mean and median regressions of Table A1 to test their robustness. The result can be found in Section 8.

We find that all figures are robust to an re-coding in R, meaning that we produce the exact same density plots. Overall, we also find that the regression results - except

for some minor issues - seem robust. While we find the exact same coefficients and cluster robust standard errors, we are unable to confirm the significance levels of the median regressions in R (but in STATA). Since we could not find an existing function in R to produce cluster robust standard errors in median regressions, we can only confirm that ordinary standard errors lead to more significant coefficients. It is also noteworthy that Ngangoué and Schotter (2023) do report the standard errors for the mean, but not for the median regression.

3.2 Robustness Checks

The main results in the paper are presented as density plots, and there are several regressions in the appendix to supplement the results. In this subsection, we conduct the following robustness checks: (1) we varied the bandwidth and kernel of the density plots (2) we varied the sample selection criterion (3) we ran quantile regressions for quantiles beyond the median. We find that the results in the paper are robust to these additional robustness checks.

The authors used Stata's default Epanechnikov kernel and a default bandwidth. We used a triangular kernel and bandwidth 0.5 to evaluate if the conclusions are qualitatively different. The analog of the authors' figure 2 is given in Figure 13; the analog of the authors' figure 8 is in Figure 14. Evidently, despite slight quantitative differences, there are no qualitative differences.

We varied the sample construction (selection) criterion. Throughout, we maintain the authors' truncation where they discard observations with signals close to the lowest and highest possible values of the random variable. Beyond this selection, the authors additionally select on the variable domnBid. The variable domnBid is defined as the number of times that a subject places a bid above the maximum rational value. In experiment I, the authors select on observations that have $domBid \leq 8$; in experiment III, the authors select on $domBid \leq 4$. While truncating on some number is sensible because we do not want to include subjects who persistently overbid because they obtain massive utility from winning, the choice of where to

truncate seems rather arbitrary. Hence, we conduct robustness checks on where to truncate.

Replicating the authors' figure 2, we have Figure 15 that uses $domnBid == 0$; Figure 16 that uses $domnBid \leq 4$ and Figure 17 that uses $domnBid \leq 20$. Replicating the authors' figure 8, we have Figure 18 that uses $domnBid == 0$; Figure 19 that uses $domnBid \leq 8$ and Figure 20 that uses $domnBid \leq 20$.

The authors' table A1 uses results from the median regression. To check the sensitivity of the results to using the median, we ran quantile regressions for other quantiles. The results are reported in Table 1. Like the median regression, the coefficient are significant for all other quantiles except for 0.1. However, we do not believe this invalidates any of their results. When examining their figure 2, we find that the CV and CP curves are very close to each other in the left tail.

3.3 Heterogeneity

As an extension to explore heterogeneity, we re-estimate the employed quantile regressions in predicting CP and CV after splitting the sample with respect to gender, age, and studying economics dimensions. Studying economics is explored as an extension for a twofold reason. First, it controls for knowledge-based decisions. Second, it controls cognitive abilities that substantially affects overbidding (e.g., Giebe et al. (2023)).

The results are mostly similar across subsamples and are in line with the authors' findings. Table 2 and Table 3 show that subsampling in regard to gender and age is consistent with the all-sample results reported in the first column. On the other hand, Table 4 shows that in CV auction, Nash equilibrium bid becomes insignificant when we exclude economics students. In parallel, it reveals significance in CP auctions only for economics students.

4 Conclusion

We believe that the results are easily reproducible and are robust to several robustness checks. Of course, running an experiment on a larger sample size, future replicators could test the robustness of the results further.

References

Giebe, T., Ivanova-Stenzel, R., Kocher, M. G. and Schudy, S.: 2023, Cross-game learning and cognitive ability in auctions, *Experimental Economics* pp. 1–29.

Ngangoué, M. K. and Schotter, A.: 2023, The common-probability auction puzzle, *American Economic Review* **113**(6), 1572–1599.

5 Figures

Figure 1: Replicated Figure 2.

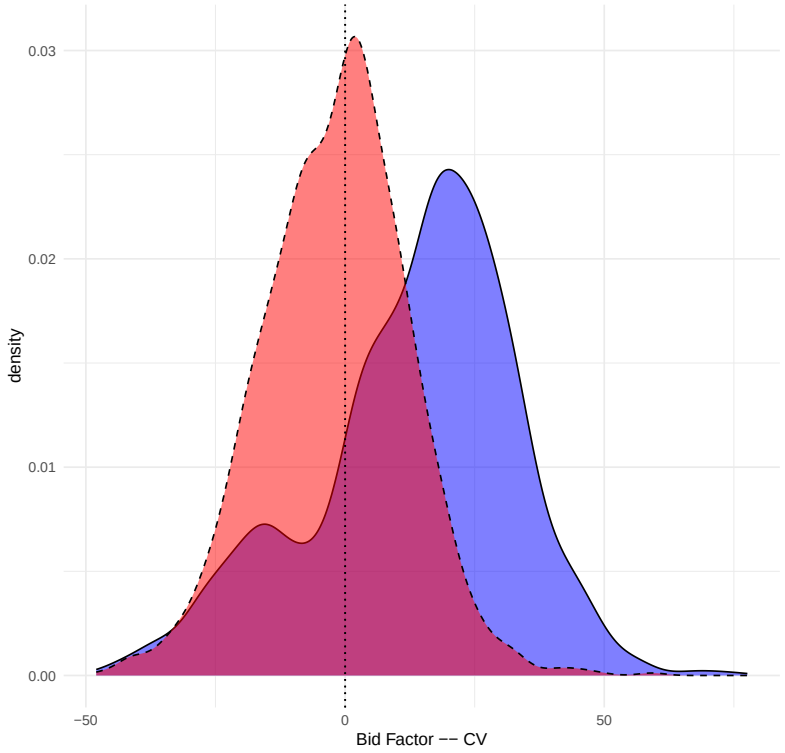


Figure 2: Replicated Figure 3a.

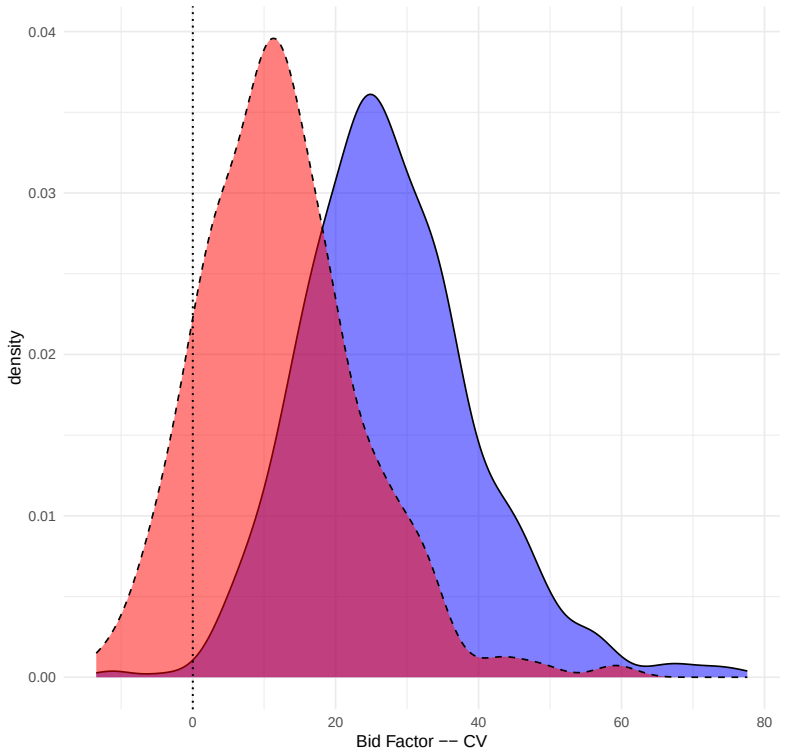


Figure 3: Replicated Figure 3b.

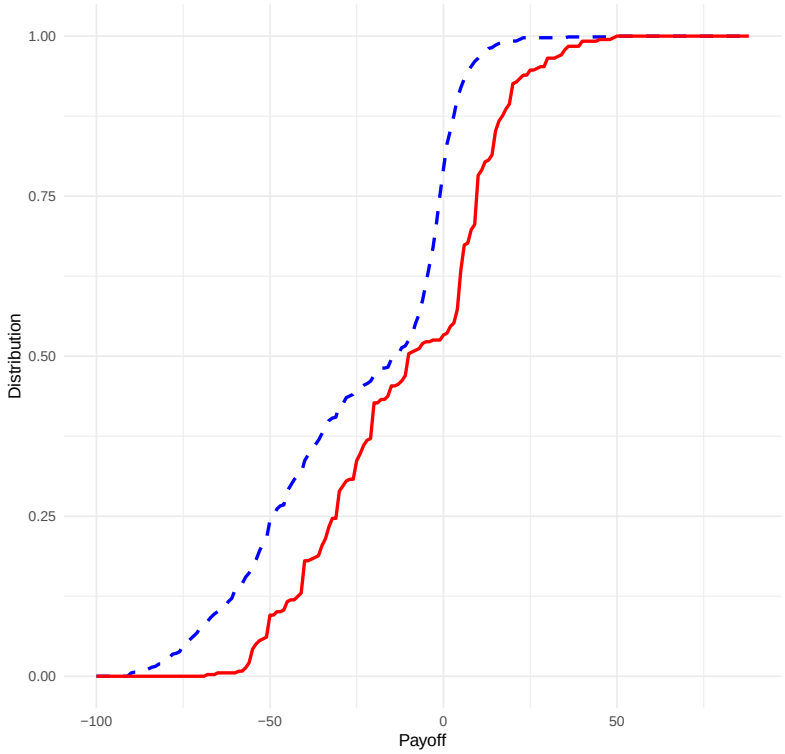


Figure 4: Replicated Figure 4a.

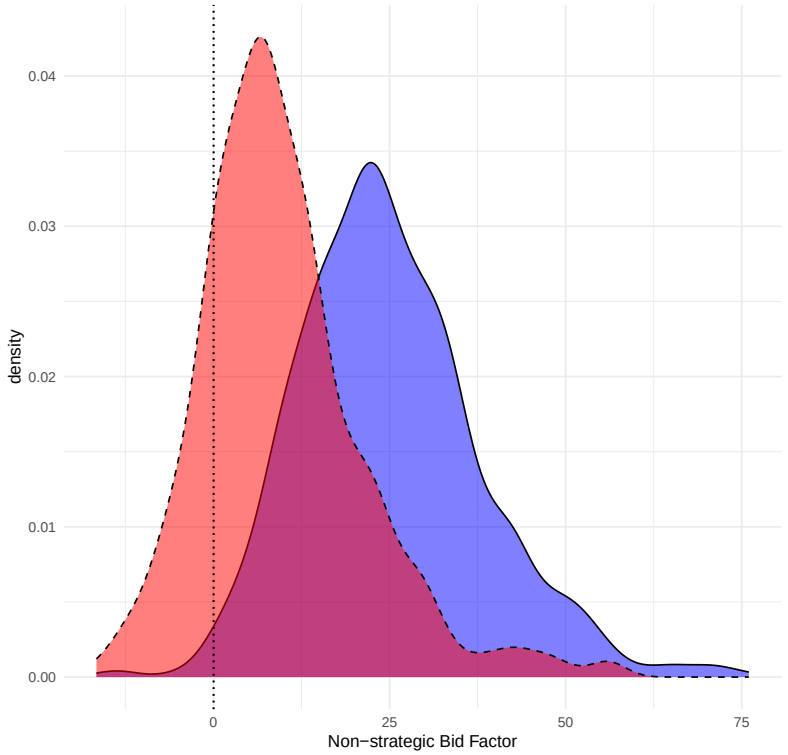


Figure 5: Replicated Figure 4b.

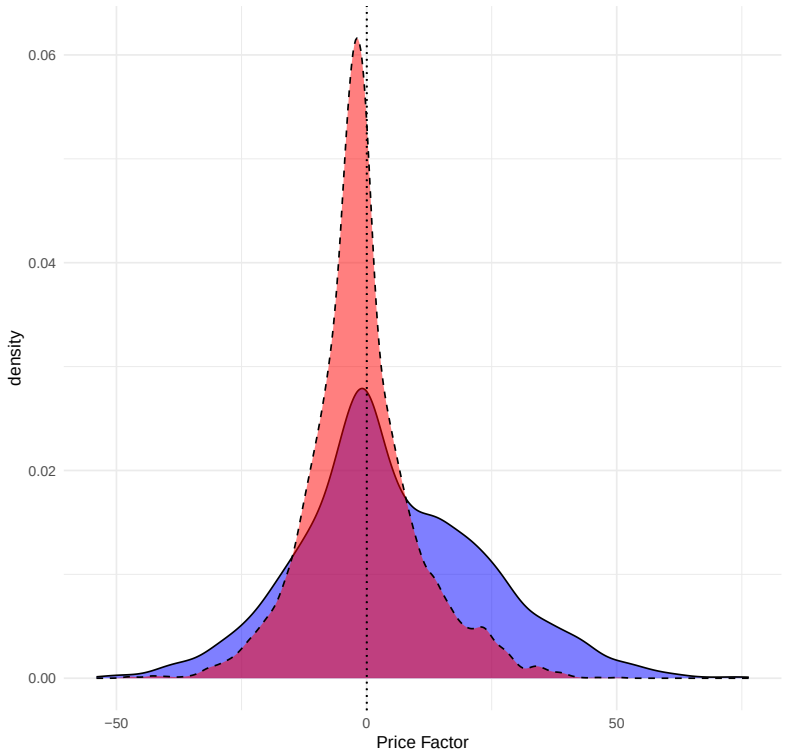


Figure 6: Replicated Figure 5a.

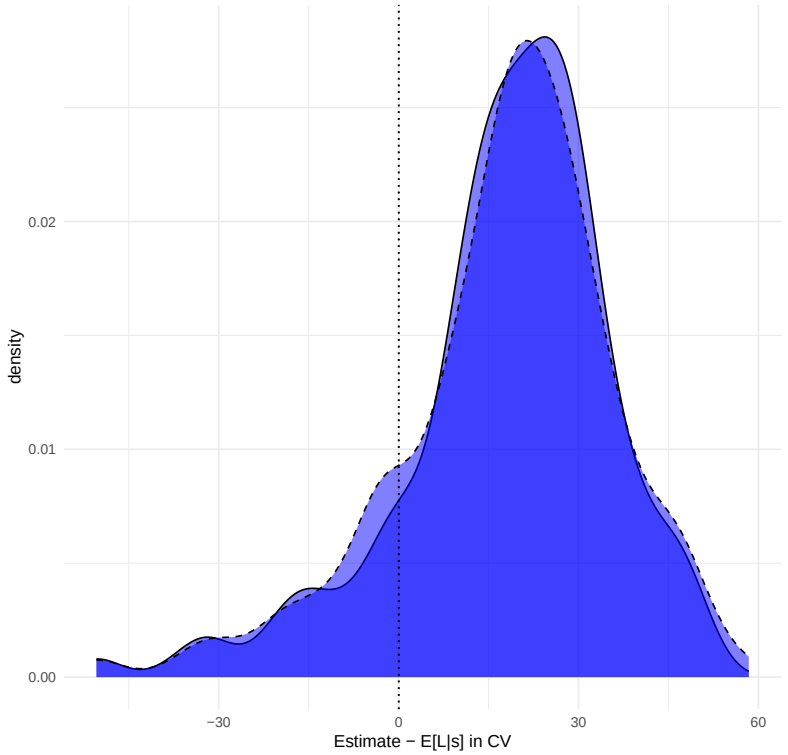


Figure 7: Replicated Figure 5b.

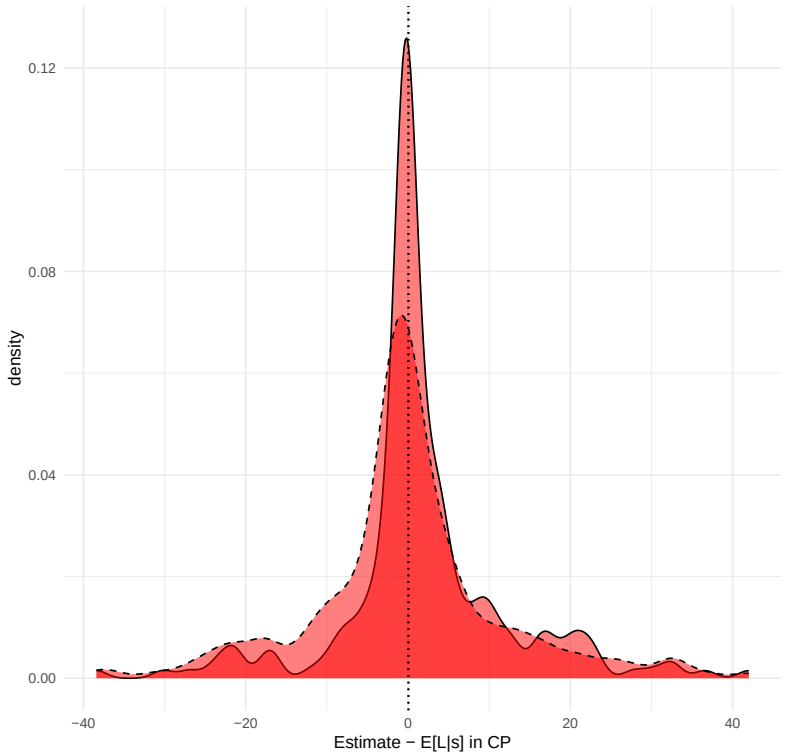


Figure 8: Replicated Figure 6a.

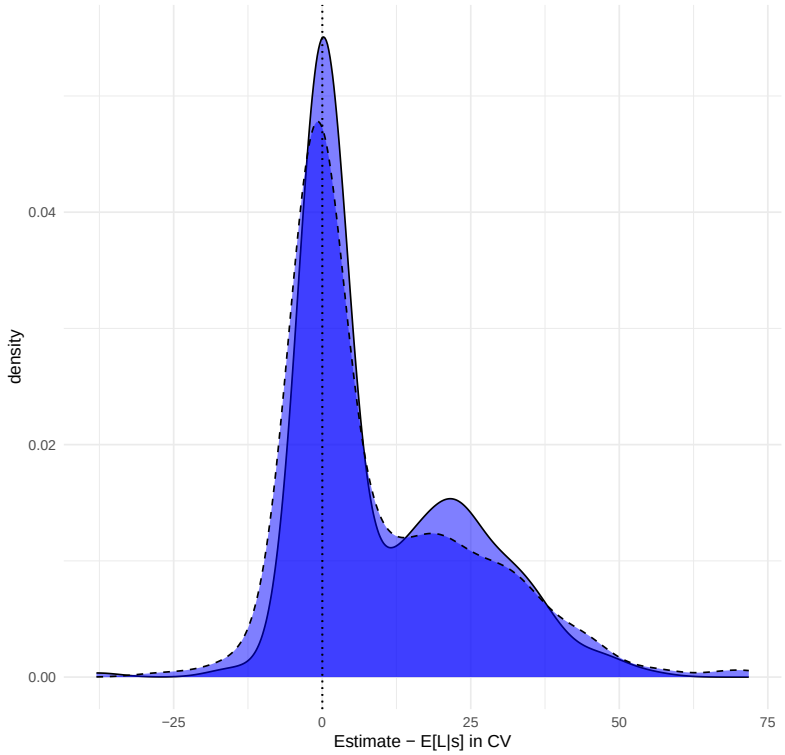
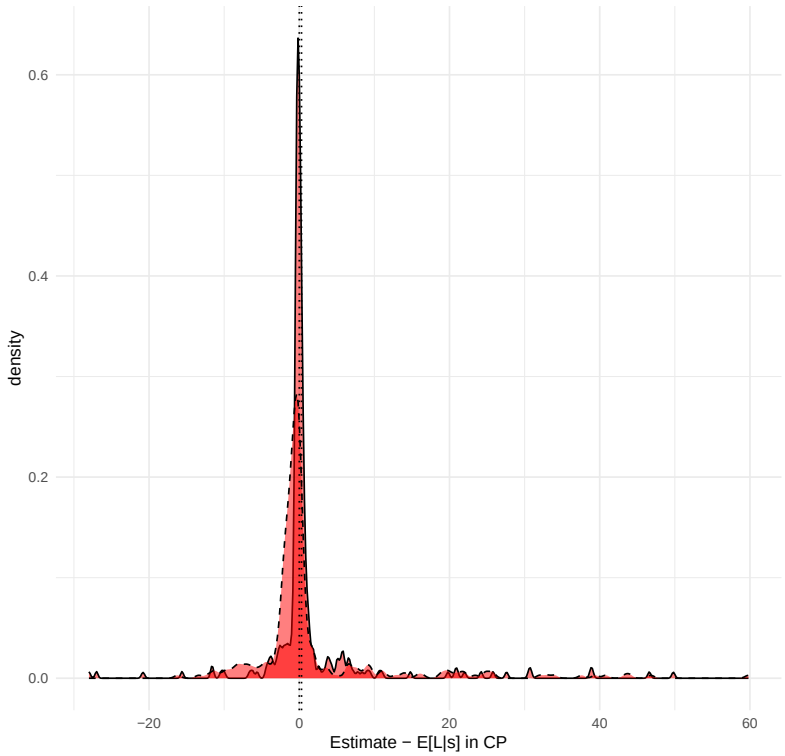


Figure 9: Replicated Figure 6b.



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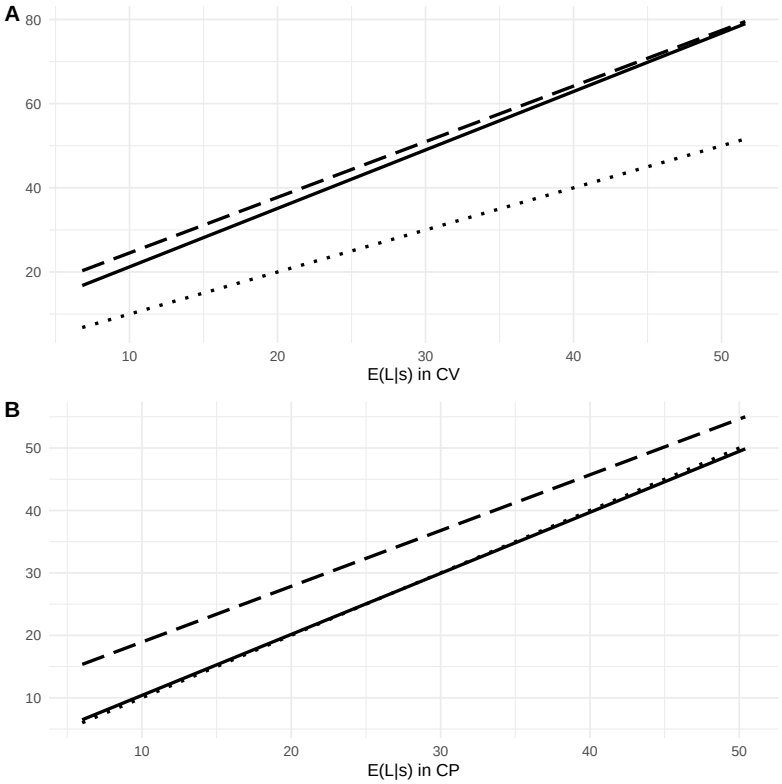


Figure 11: Replicated Figure 8.

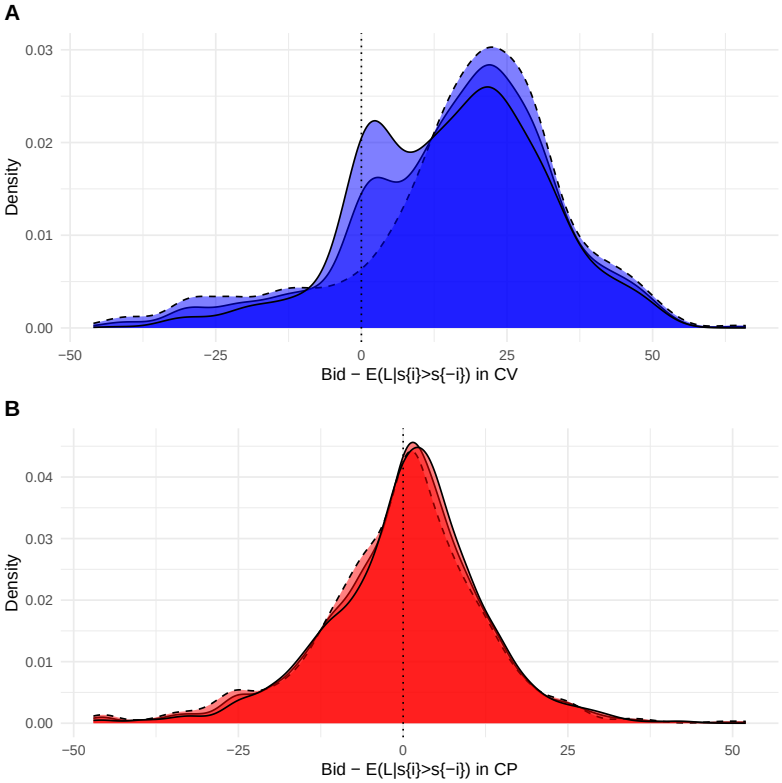


Figure 12: Replicated Figure 9.

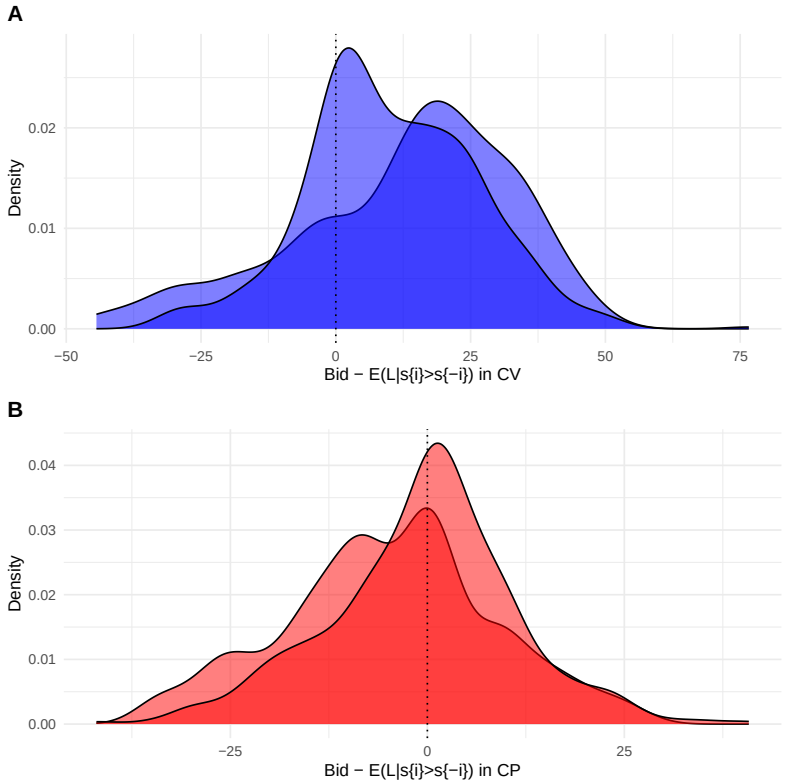


Figure 13: Bid Factors in CV and CP, bandwidth and kernel adjusted

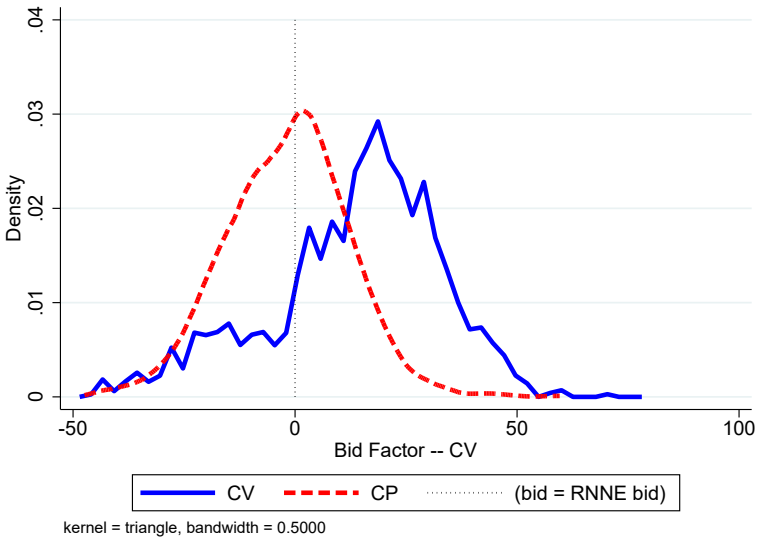


Figure 14: Bids in Experiments IIIb vs I and III, bandwidth and kernel adjusted

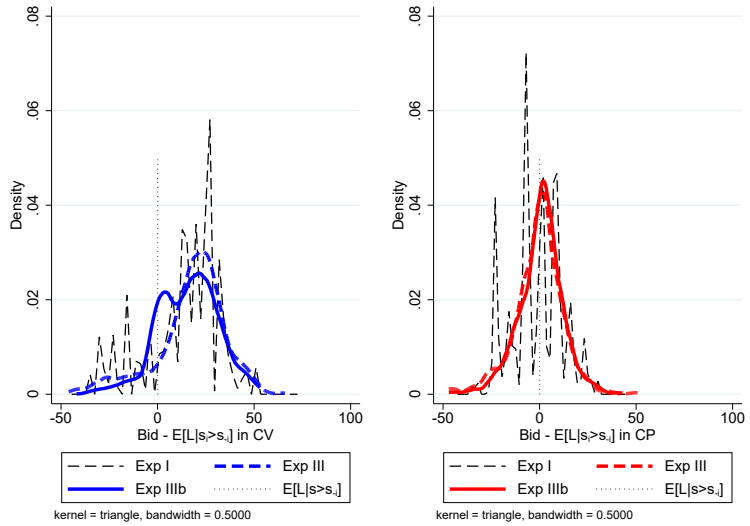


Figure 15: Bid Factors in CV and CP, domnBid==0

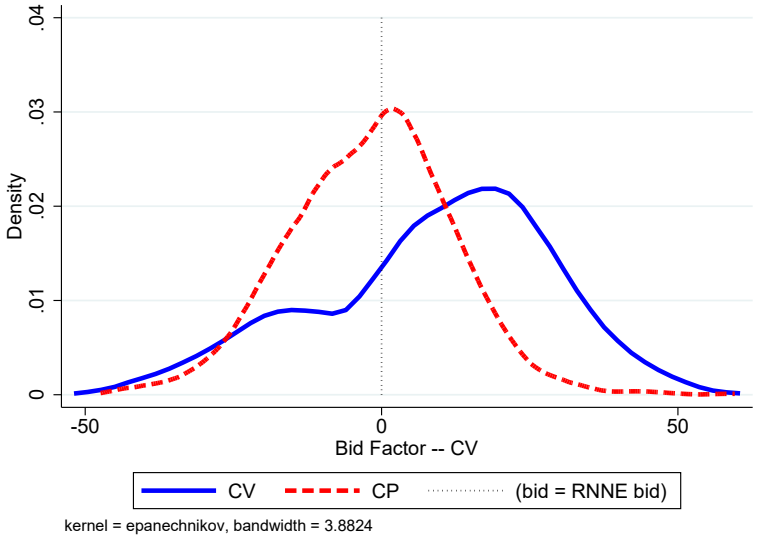


Figure 16: Bid Factors in CV and CP, domnBid≤4

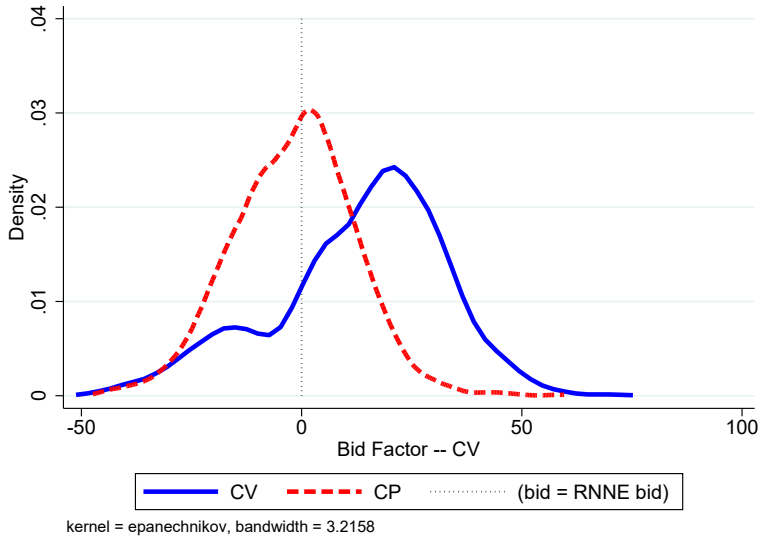


Figure 17: Bid Factors in CV and CP, domnBid≤20

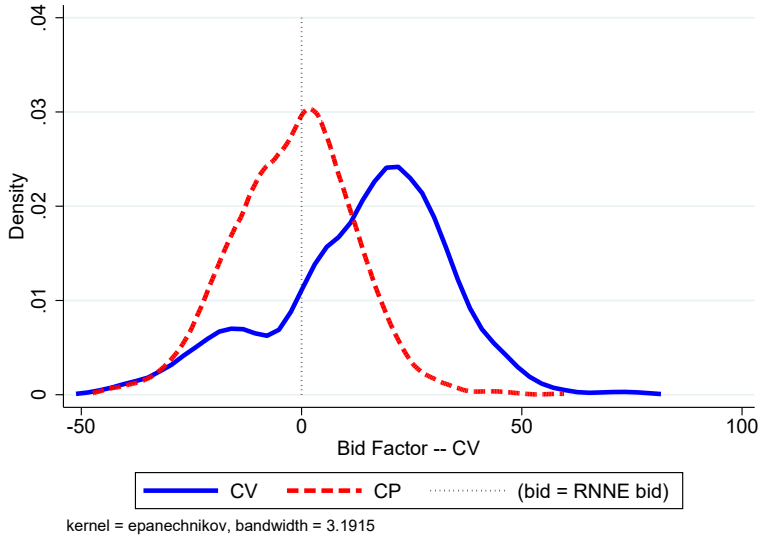


Figure 18: Bids in Experiments IIIb vs I and III, domnBid==0

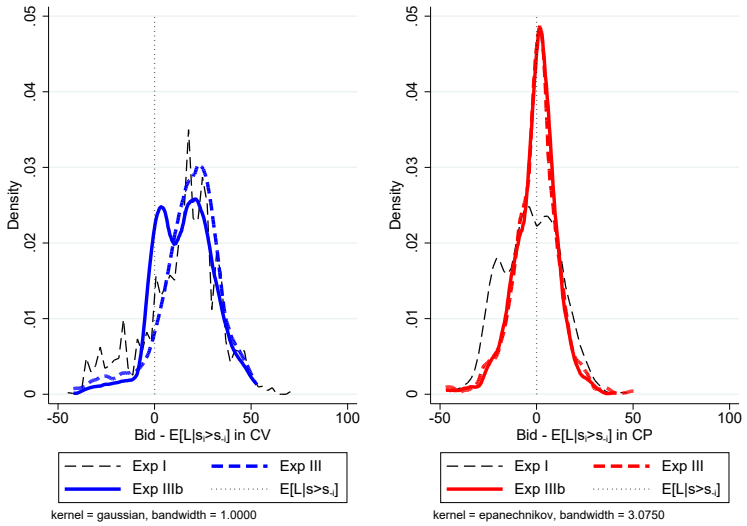


Figure 19: Bids in Experiments IIIb vs I and III, domnBid≤8

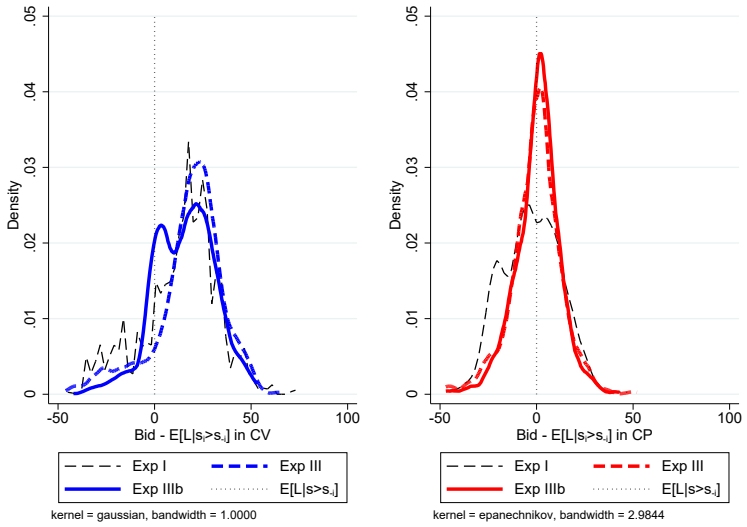
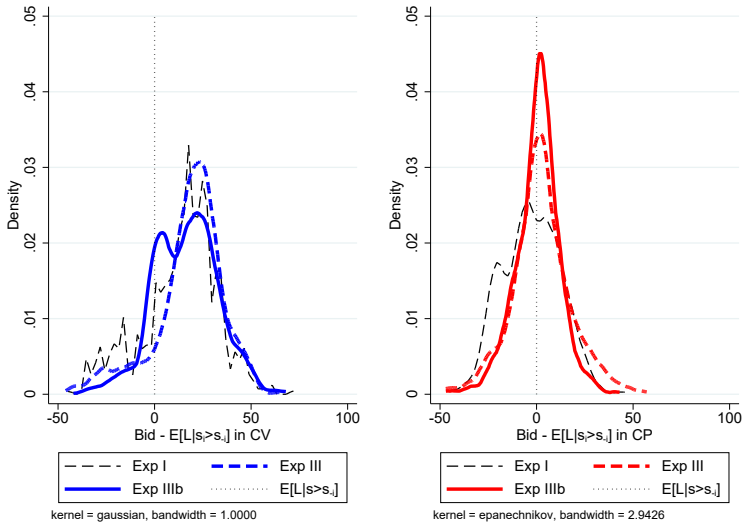


Figure 20: Bids in Experiments IIIb vs I and III, domnBid≤20



6 Tables

Table 1: Quantile Regressions

	$q = 0.1$ BF	$q = 0.25$ BF	$q = 0.5$ BF	$q = 0.75$ BF	$q = 0.9$ BF
CV	3.600	14.00***	17.40***	19.20***	20.40***
	(0.99)	(4.49)	(7.11)	(10.25)	(12.53)
_cons	-22.40***	-13.80***	-3.800*	4.600**	12.20***
	(-12.93)	(-7.01)	(-2.19)	(3.15)	(10.12)
N	5817	5817	5817	5817	5817

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Median Regressions by age

	(1) bid	(2) bid	(3) bid	(4) bid	(5) bid	(6) bid
expV	1.385***	1.425***	1.300***	0.841***	0.594***	1.061***
	(22.58)	(19.34)	(15.54)	(7.13)	(6.24)	(8.29)
nmexpV	1.700***	1.695***	1.720***	1.126***	0.926***	1.321***
	(38.74)	(31.58)	(21.68)	(13.40)	(7.84)	(11.01)
nmexpV2	-0.0169***	-0.0155**	-0.0209*	0.00493	0.00399	0.000584
	(-3.63)	(-3.15)	(-2.07)	(0.63)	(0.45)	(0.04)
NEmnbid	2.780***	2.920***	2.182*	0.474	-0.268	0.936
	(6.41)	(6.49)	(2.54)	(1.03)	(-0.34)	(1.60)
_cons	13.85***	12.87***	15.28**	0.873	3.177	-0.905
	(4.41)	(3.36)	(2.81)	(0.50)	(1.36)	(-0.40)
N	3253	2169	1084	2502	1507	995

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Columns (1)-(3) run median regressions for CV auctions. Column (1) has all subjects; column (2) uses undergraduates; column (3) uses graduates. Columns (4)-(6) run median regressions for CP auctions. Column (4) has all subjects; column (5) uses undergraduates; column (6) uses graduates.

Table 3: Median Regressions by gender

	(1) bid	(2) bid	(3) bid	(4) bid	(5) bid	(6) bid
expV	1.385***	1.400***	1.364***	0.841***	0.722***	0.958***
	(22.58)	(19.28)	(14.80)	(7.13)	(6.25)	(8.00)
nmexpV	1.700***	1.726***	1.657***	1.126***	1.173***	1.085***
	(38.74)	(31.02)	(19.45)	(13.40)	(9.46)	(15.28)
nmexpV2	-0.0169***	-0.0186***	-0.0157**	0.00493	0.00319	0.0128
	(-3.63)	(-4.15)	(-2.66)	(0.63)	(0.25)	(1.32)
NEmnbid	2.780***	2.070***	3.339***	0.474	-0.706	1.134
	(6.41)	(3.50)	(4.70)	(1.03)	(-1.11)	(1.61)
_cons	13.85***	12.53**	15.31***	0.873	-1.007	0.941
	(4.41)	(3.22)	(3.67)	(0.50)	(-0.35)	(0.44)
N	3253	1489	1764	2502	993	1509

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Columns (1)-(3) run median regressions for CV auctions. Column (1) has all subjects; column (2) uses females; column (3) uses males. Columns (4)-(6) run median regressions for CP auctions. Column (4) has all subjects; column (5) uses females; column (6) uses males.

Table 4: Median Regressions by whether student majored in Economics or not

	(1) bid	(2) bid	(3) bid	(4) bid	(5) bid	(6) bid
expV	1.385***	1.354***	0.990	0.841***	0.861***	0.392***
	(22.58)	(25.06)	(1.78)	(7.13)	(8.01)	(9.22)
nmexpV	1.700***	1.710***	1.166	1.126***	1.130***	0.401***
	(38.74)	(39.23)	(1.76)	(13.40)	(13.31)	(105.86)
nmexpV2	-0.0169***	-0.0165***	-0.0239	0.00493	0.00302	-0.00307
	(-3.63)	(-4.14)	(-0.85)	(0.63)	(0.41)	(-0.27)
NEmnbid	2.780***	2.735***	0.286	0.474	0.497	3.364***
	(6.41)	(6.33)	(0.14)	(1.03)	(1.17)	(20.40)
_cons	13.85***	15.36***	6.748*	0.873	0.935	8.096***
	(4.41)	(5.75)	(2.52)	(0.50)	(0.57)	(12.70)
N	3253	2829	424	2502	2440	62

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Columns (1)-(3) run median regressions for CV auctions. Column (1) has all subjects; column (2) uses students who did not major in Economics; column (3) uses students who majored in economics. Columns (4)-(6) run median regressions for CP auctions. Column (4) has all subjects; column (5) uses students who did not major in Economics; column (6) uses students who majored in economics.

7 Appendix Figures

Figure A1: Replicated Figure A3.

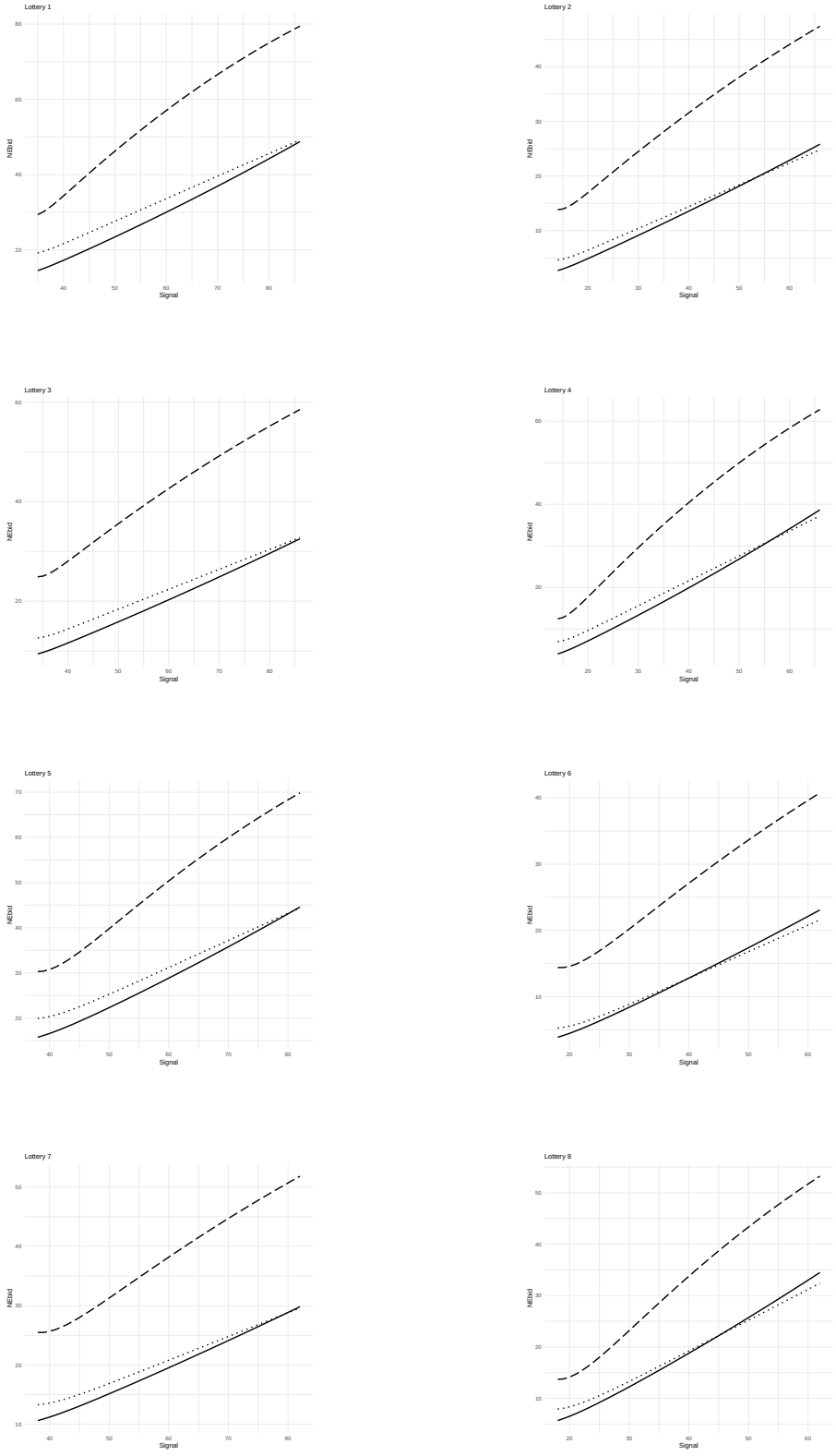


Figure A2: Replicated Figure A4.

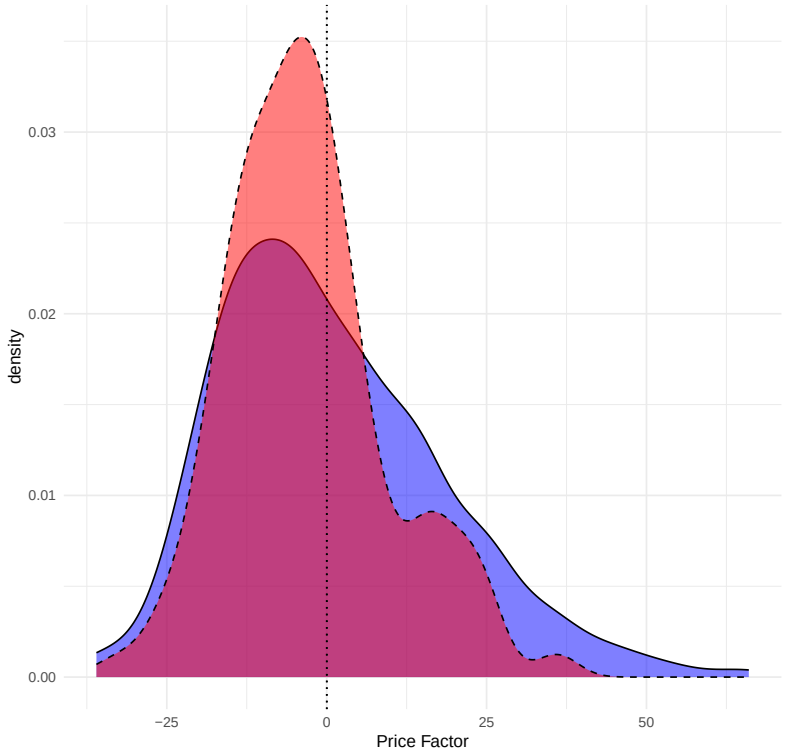


Figure A3: Replicated Figure A6.

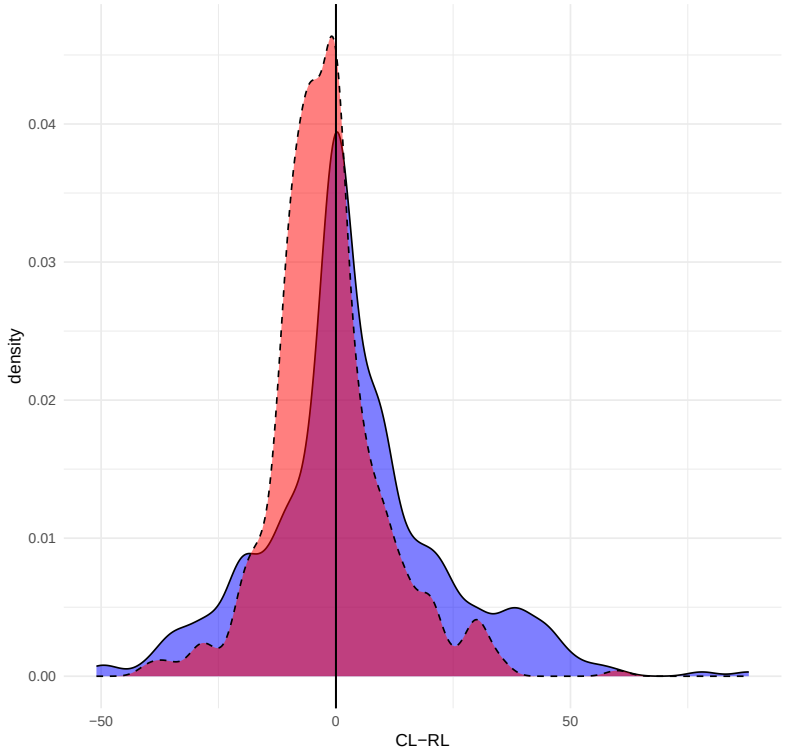


Figure A4: Replicated Figure A7a.

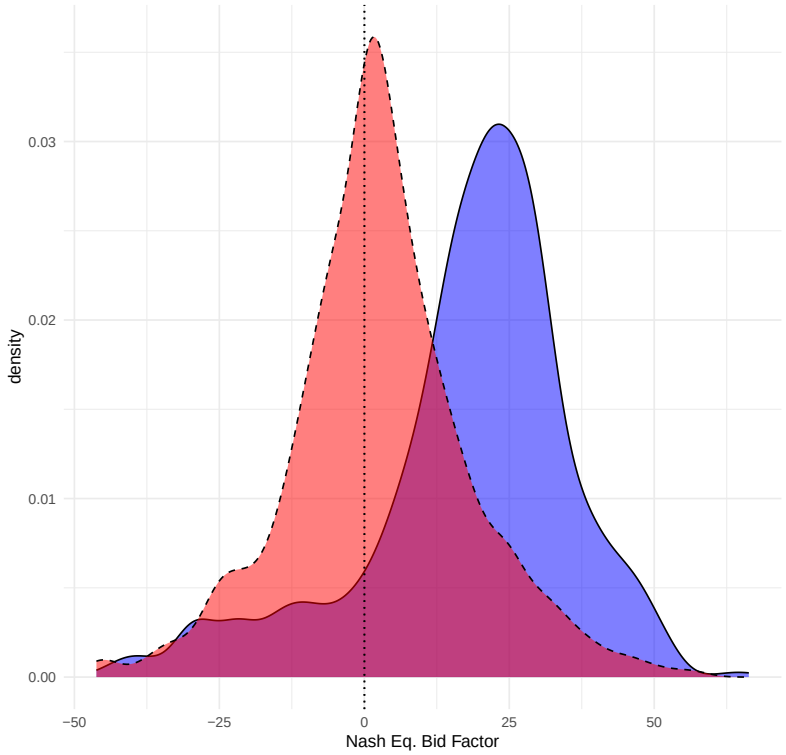
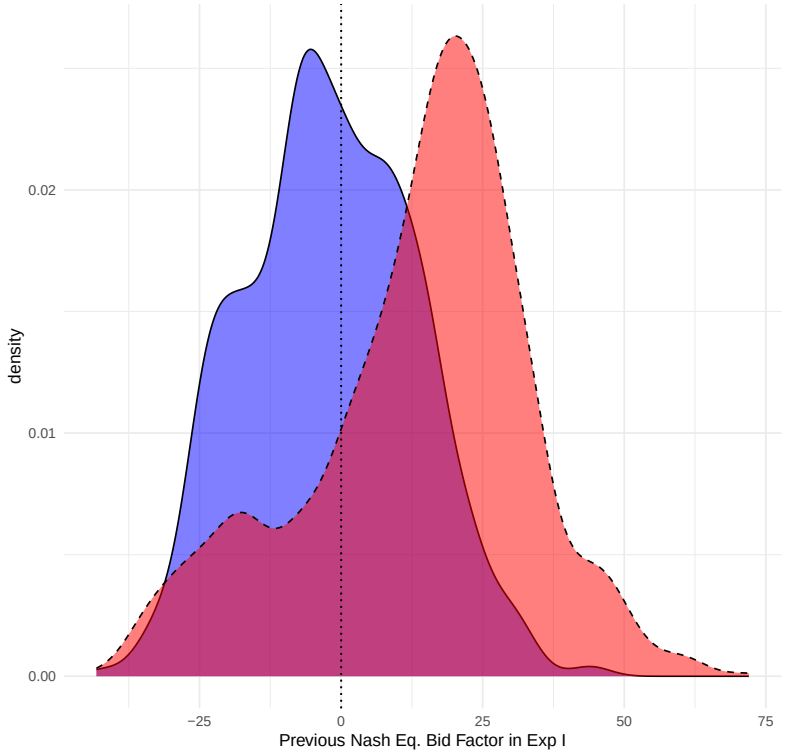


Figure A5: Replicated Figure A7b.



8 Appendix Tables

Table A1: Replicated Table A1.

		Naive bid		**Break-Even bid**		**Nash-Eq. bid**	
		mean	median	mean	median	mean	median
Exp. I	CV	10.53***	13.6***	12.26**	15.32***	13.33***	16.45***
		(1.872)		(1.871)		(1.870)	
	CP	−4.60***	−3.80**	−2.84**	−2.04	−1.77	−0.82
		(1.424)		(1.425)		(1.425)	
	Diff.	15.13***	17.4***	15.11***	17.36***	15.10***	17.26***
		(2.346)		(2.345)		(2.345)	
Exp. III	CV	16.14***	19***	17.80***	21***	17.53***	20.60***
		(2.570)		(2.559)		(2.791)	
	CP	−1.33	−0.40	−0.64	1	−0.31	0.80
		(1.225)		(1.178)		(1.621)	
	Diff.	17.47***	19.4***	17.86***	20***	17.84***	19.80***
		(2.819)		(2.789)		(3.199)	
Exp. IIIB	CV	12.95***	13.2***	14.55***	15***	15.9***	16.8***
		(1.550)		(1.558)		(1.689)	
	CP	−0.60	0	1.23	1**	0.84	1.80*
		(1.099)		(1.141)		(1.380)	
	Diff.	13.54***	13.2***	13.32***	14***	15.07***	15***
		(1.885)		(1.941)		(2.166)	
Exp. IV	CV	9.46***	8.4***	10.66***	9.36***	11.45***	10.00***
		(1.828)		(1.828)		(1.828)	
	CP	−1.61	−0.4	−0.41	0.76	0.39	1.60
		(1.750)		(1.750)		(1.750)	
	Diff	11.07***	8.80***	11.07***	8.60**	11.07***	8.40**
		(2.522)		(2.522)		(2.522)	

Cluster robust standard errors at subject level in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$